ANNUAL REPORT

DICKINSON AGRICULTURAL EXPERIMENT STATION

1981

SECTION I

CROP PRODUCTION TRIALS

REPORT OF
AGRONOMIC INVESTIGATIONS
AT THE
DICKINSON EXPERIMENT STATION
DICKINSON, NORTH DAKOTA
1981

By
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Section I: Crop Production Trials

Dickinson Experiment Station
Dickinson, ND

GROWING CONDITIONS-1981

Precipitation the last four months of 1980 were above average and helped to recharge seriously depleted soil water, aiding germination and fall growth of winter grains. Snowfall was very light, producing only 0.13 inch if precipitation for the three months of January thru March. Precipitation for the first half of the year was 3 inches below average but was fairly distributed.

Early seeded small grain crops were severely frosted by a temperature drop of 24°F on May 9 but recovered well. Oats showed the poorest recovery.

The most severe weather affecting crop growth and development occurred the first 10 fays in July, when temperatures of 93°F and above were recorded on 7 days, with a maximum reading of 110°F. Evaporation measured 3.93 inches during this 10 day period.

Oats and barley were more adversely affected by high temperatures, but all crop growth suffered.

Table 1. Weather Data Summary-Dickinson Experiment Station, 1981.

	Precipitation-inches	
	1980-1981	89 year average
September-December	3.96	3.09
January-March	0.13	1.55
April-June	5.67	7.34
July-August	5.62	3.90
	15.38	15.88

Average temperature-degrees F.

	Maximum	Minimum	Mean	70 year
April	62	3	47	42
May	65	41	53	53
June	73	47	60	62
July	87	56	71	69
August	84	55	70	67

Seeding dates for winter wheat at Beach-September 8, Bowman-September 9, and Dickinson-September 10. Winter rye was seeded at Dickinson-September 10.

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-April 13, Bowman-April 14, Killdeer-April 30, Beulah-April 28, Glen Ullin-April 29, Regent-April 15, Center-April 27, and Beach-April 16.

At Dickinson, durum wheat was seeded April 23, oats and barley on April 24, and wheat on April 22.

All spring grain variety trials were seeded with a double disk press drill on summerfallow.

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

Commercial fertilizer application was made according to soil test for an expected wheat yield goal of 2350 kg/ha.

Hoelon and Bromoxynil were used at all locations for wild oats and broadleaf weed control, following recommended rates and application procedure.

Crop production methods trial was seeded April 29, using the double disk drill for conventional seeding and the John Deere shoe drill for no-till seeding.

The flexible cropping trial was seeded April 29, using the double disk drill for conventional seeding and the John Deere shoe drill for no-till seeding.

Miscellaneous trials included safflower, seeded on May 13, the National sunflower performance trial and a commercial sunflower trial planted on May 11, and Sorghum and Sudangrass trial seeded on June 4 at Dickinson and June 5 at Hettinger.

Because of the severity of the drought, off-station trials at Hettinger wer abandoned.

Table 2. Hard red spring wheat variety trials, 1981.

Variety	Avg. yield bu/acre		Test weight		Heading date	Height inches
Waldron	40.7		58.5		6-30	34
Olaf	44.6		60.5		7-1	29
Butte	41.3		61.5		6-29	33
Cotteau	43.7		60.0		7-1	35
Len	43.5		61.0		7-1	28
Walera	48.7		60.0		7-3	27
Solar	53.1		61.0		7-4	28
Wared	51.7		60.5		7-3	29
Alex	48.1		63.0		6-30	33
Aslo	49.2		59.5		6-27	28
Tracey	50.3		61.0		7-5	31
James	39.3		62.0		6-29	30
Westbred 906R	45.9		60.5		6-29	27
Lew	39.1		62.0		7-3	32
Prodax	47.6		60.5		7-3	30
Aim	53.4		62.0		6-30	29
Benito	43.5		60.5		6-30	33
Pro Brand 711	51.2		62.0		6-30	29
ND 573	49.0		64.0		6-30	33
ND 574	44.6		61.0		6-30	31
ND 575	50.9		62.5		6-29	32
P12 3260	50.9		62.0		6-29	28
ND 582	53.4		63.0		6-29	33
ND 583	45.4		62.0		6-29	32
ND 584	43.2		61.0		6-28	34
ND 585	46.5		62.5		6-28	33

Table 2. Hard red spring wheat variety trials, 1981 cont.

Variety	Avg. yield bu/acre		Test weight		Heading date	Height inches
ND 586	52.0		61.5		7-2	29
MN 701 70R	53.6		62.0		7-1	28
X 6718	46.5		61.0		6-29	32
ND 581	49.2		62.0		6-29	33
Pro Brand 715	48.1		61.0		7-4	30
ND 580	43.7		60.0		7-2	32
Lsd 4.9 bpa						
CV 10%						

Table 3. Long term yield comparison-Hard red spring wheat
Yield in Bushels per acre

Variety	1977	1978	1979	1980	1981	5-yr. Avg.
Waldron	30	46	38	23	41	36
Olaf	34	50	43	24	45	39
Prodax	39	55	45	24	48	42
Wared	43	54	47	26	52	44
Lew	34	47	35	23	39	36
Butte	25	53	39	21	41	36
Coteau	35	51	43	23	44	39
Len	35	45	38	23	44	37
Alex	30	53	38	23	48	38
Solar		63	44	24	53	
Oslo					49	
Tracey					50	

Table 4. Hard red spring wheat-Dickinson and off-station sites, 1981.

	Yield in Bushels per Acre								
Variety	Dickinson	Beach	Beulah	Bowman	Center	Glen Ullin	Manning	Regent	Average 8-sites
Waldron	41	33	37	55	47	31	25	33	38
Olaf	45	38	36	60	46	38	26	38	41
Butte	41	38	31	61	50	31	24	39	40
Coteau	44	34	33	55	49	37	23	36	39
Len	44	38	32	56	46	41	26	36	40
Alex	48	33	34	60	53	37	26	39	41
Walera	49	34	37	61	54	44	25	37	43
Solar	53	41	37	65	53	47	24	38	45
Wared	52	45	29	64	48	38	28	37	42
Oslo	49	43	38	62	52	38	27	35	43
Tracey	50	35	31	56	52	42	24	30	40
James	39	31	31	59	46	35	23	37	38
Lew	39	30	28	45	50	32	19	33	34
Lsd, bpa	4.9	3.0	3.7	4.5	3.9	3.1	1.4	3.4	1.9
CV %	10	8	10	7	7	8	5	9	

Table 5. Hard red spring wheat-Dickinson and off-station sites, 1981.

Variety	Test Weight per Bushel							
	Dickinson	Beach	Beulah	Bowman	Center	Glen Ullin	Manning	Regent	Average 8-sites
Waldron	58	58	58	60	58	56	56	57	58
Olaf	60	60	58	60	60	56	59	59	59
Butte	62	60	60	62	60	60	59	62	61
Coteau	60	58	59	60	59	58	57	58	59
Len	61	59	60	58	60	58	60	59	59
Alex	63	62	60	61	60	59	60	60	61
Walera	60	62	60	60	61	58	60	60	60
Solar	61	62	60	60	61	58	58	60	60
Wared	61	61	60	60	59	58	60	61	60
Oslo	60	56	58	58	56	56	57	56	57
Tracey	61	60	58	58	60	58	61	59	59
James	62	57	59	58	58	57	58	57	58
Lew	62	61	60	60	61	59	58	58	60

Table 6. Hard red spring wheat-Dickinson and off-station sites, 1981.

	Protein Percent at 14% Moisture								
Variety	Dickinson	Beach	Beulah	Bowman	Center	Glen Ullin	Manning	Regent	Average 8-sites
Waldron	15.4	15.6	14.7	16.0	14.9	16.1	12.6	12.9	14.8
Olaf	15.2	14.8	14.2	15.3	14.4	15.6	12.6	11.7	14.2
Butte	14.2	14.1	12.8	15.1	13.4	15.4	10.7	11.1	13.4
Coteau	15.8	16.1	14.0	16.2	14.9	16.1	12.4	12.8	14.8
Len	15.3	14.5	14.0	16.0	14.9	15.8	12.0	12.1	14.3
Alex	13.6	13.4	12.6	15.8	15.2	16.1	11.8	11.4	13.7
Walera	12.8	12.1	11.7	14.4	12.4	14.3	10.4	10.2	12.3
Solar	13.0	11.8	11.3	14.0	12.4	14.0	11.4	10.0	12.2
Wared	12.9	12.5	13.3	14.3	14.5	15.3	12.3	10.8	13.2
Oslo	12.2	12.4	12.2	14.0	13.7	14.8	10.6	11.8	12.7
Tracey	11.3	12.4	11.9	14.1	12.9	14.0	9.7	10.8	12.1
James	13.1	14.3	13.3	15.6	14.3	15.2	13.3	11.9	13.9
Lew	13.3	13.1	13.2	16.1	14.2	15.5	11.8	11.0	13.5

Table 7. Durum wheat variety trials, 1981.

Variety	Avg. yield bu/acre		Test weight		Heading date	Height inches
Kelsey	55.2		34.0		7-1	34
Otana	60.0		34.0		7-2	35
Lancer	54.4		31.5		6-28	33
Marathon	41.6		31.0		7-4	36
Moore	46.0		34.5		7-1	37
Harmon	72.0		32.0		7-2	35
Menoninee	48.4		32.0		7-3	35
Hudson	35.2		27.0		7-3	34
Fidler	60.8		27.0		7-5	32
Ogle (Ill 73-2664)	60.0		32.0		6-30	31
Mammoth	39.2		32.0		7-6	34
77-64-152 Jaycee x Hudson	44.8		30.5		7-3	34
77-61-311 Hudson x Dal	50.8		34.0		7-5	32
77-66-13 Dal x Otee	50.0		36.0		7-3	34
76-530-301 Dal x Kelsey	56.0		35.0		7-5	30
Haylander	46.0		31.5		6-30	36
335M	60.0		31.0		7-2	37
Lsd						
CV						

Table 7. Long term yield comparison of Durum varieties, 1981.
Yield in Bushels per Acre

Variety	1977	1978	1979	1980	1981	5 yr. average
Rolette	35	40	35	14	44	34
Crosby	37	40	38	15	43	35
Ward	39	43	39	16	45	36
Rugby	40	42	40	17	39	36
Cando	51	39	42	17	40	38
Coulter	44	38	40	16	41	36
Vic	42	34	36	18	41	34

Table 9. Durum wheat variety trials-Dickinson and off-station sites, 1981.

Variety	Dickinson	Beach	Beulah	Bowman	Center	Glen Ullin	Manning	Regent	Average 8-sites
	Yield in Bushels per Acre								
Vic	41	43	33	42	57	40	23	31	39
Cando	40	45	35	43	56	40	24	30	39
Rolette	44	40	30	42	52	32	24	30	37
Ward	45	40	33	43	53	37	26	35	39
Rugby	39	39	33	42	53	37	25	34	38
Lsd bpa	3.7	3.4	1.5	3.1	3.6	2.9	1.8	3.5	
CV %	8	7	4	6	6	7	6	10	
	Test Weight per Bushel								
Vic	61	62	61	63	62	59	62	59	61
Cando	59	62	60	62	61	59	62	58	60
Rolette	60	62	62	63	62	59	62	59	61
Ward	61	62	61	63	62	59	61	58	61
Rugby	60	61	61	62	61	59	61	59	61

Table 10. Winter wheat variety trials, 1981.

Variety	Avg. yield bu/acre		Test weight		Heading date	Height inches
Froid	41.7		56.0		6-18	48
Roughrider	40.7		57.5		6-17	43
Norstar	45.4		57.0		6-22	47
Agate	45.4		58.5		6-17	46
Gent	43.3		59.5		6-18	47
Centurk	45.8		59.0		6-17	43
Winoka	49.1		59.5		6-17	44
Eklund	45.0		56.5		6-22	50
Lsd, bpa	3.6					
CV %	7%					

Table 11. Winter wheat variety trials-Dickinson and off-station sites, 1981.

Variety	Yield in Bushels per Acre Dickinson	Beach	Scranton	Average 3-sites
Froid	41.7	32.2	36.9	36.9
Roughrider	40.7	29.9	38.8	36.5
Norstar	45.4	35.1	44.2	41.6
Agate	45.4	31.8	33.8	37.0
Gent	43.3	34.5	35.4	37.7
Centurk	45.8	34.7	38.8	39.8
Winoka	49.1	32.2	44.2	41.8
Eklund	45.0	27.3	38.6	37.0
Lsd, bpa	3.1	5.0	3.5	
CV %	4	14	6	

Table 12. Winter wheat variety trials-Dickinson and off-station sites, 1981.

	Test Weight per Bushel			
Variety	Dickinson	Beach	Scranton	Average 3-sites
Froid	56.0	57.0	59.5	57.5
Roughrider	57.5	57.0	61.0	58.5
Norstar	57.0	57.5	58.5	57.7
Agate	58.5	57.5	58.0	58.0
Gent	59.5	58.0	59.0	58.8
Centurk	59.0	59.0	58.5	58.8
Winoka	59.5	59.0	59.0	59.2
Eklund	56.5	56.0	57.0	56.5

Table 13. Oat variety trials, 1981.

Variety	Avg. yield bu/acre		Test weight		Heading date	Height inches
Rolette	44.2		69.0		6-26	34
Crosby	42.9		59.0		6-27	33
Rugby	39.4		60.0		7-1	33
Cando	39.6		58.5		7-2	22
Coulter	41.1		59.5		7-1	31
Vic	40.8		61.0		7-1	34
Ward	44.6		61.0		6-30	34
D 771	45.4		61.5		7-3	22
D 793	44.4		60.0		6-26	33
D 7609	41.7		61.5		7-1	33
D 7615	42.4		60.0		6-30	33
D 782	42.8		60.0		6-30	29
D 785	45.4		59.5		6-29	28
D 7732	42.5		61.5		6-28	32
D 7733	44.8		62.0		7-1	32
D 7751	39.9		62.0		6-30	31
D 7798	41.2		62.0		7-1	33
D 77189	38.5		62.5		7-2	31
D 77197	42.7		61.5		7-2	27
D 77200	47.2		62.5		7-2	26
D 77204	41.2		61.5		7-4	24
D 794	35.9		61.5		6-26	25
D 792	44.1		61.0		6-28	34
Lsd 3.7 bpa						
CV 8%						

Table 14. Long term yield comparison of Durum varieties, 1981.
Yield in Bushels per Acre

Variety	1977	1978	1979	1980	1981	5 yr. average
Kelsey	51	96	95	45	55	68
Harmon	45	81	85	38	72	64
Hudson	51	92	96	42	35	63
Otana	52	99	98	48	60	71
Menominee		86	93	49	48	
Moore		96	80	41	46	
Lancer		60	75	36	54	
Marathon					42	
Mammoth					39	
Fidler					61	
Haylander					46	

Table 15. Oat variety trials-Dickinson and off-station sites, 1981.

Variety	Dickinson	Beach	Beulah	Bowman	Center	Glen Ullin	Manning	Regent	Average 8-sites
	Yield in Bushels per Acre								
Kelsey	55	47	87	48	69	52	30	59	56
Otana	60	49	87	60	70	50	35	58	59
Menominee	48	50	86	48	73	49	31	63	57
Marathon	42	41	71	41	62	55	25	57	49
Moore	46	43	74	53	62	52	30	51	51
Mammoth	39	30	76	31	61	50	21	45	44
Harmon	72	39	71	36	55	53	22	55	50
Lsd bpa	6.6	4.5	3.9	10.4	9.3	6.6	2.0	3.6	
CV %	12	9	4	12	13	12	6	6	
	Test Weight per Bushel								
Kelsey	34	35	38	40	40	35	38	37	37
Otana	34	36	38	38	39	36	36	38	37
Menominee	32	34	38	35	40	34	34	33	35
Marathon	31	32	38	34	38	32	29	30	33
Moore	35	34	38	36	38	34	34	38	36
Mammoth	32	32	37	37	39	32	38	31	35
Harmon	32	32	38	35	38	32	32	33	34

Table 16. Barley variety trials, 1981.

Variety	Avg. yield bu/acre		Test weight		Heading date	Height inches
Larker	42.9		43.5		6-26	35
Bedford	52.5		44.5		7-1	35
Dickinson	39.3		43.0		7-1	36
Glenn	45.4		42.0		6-26	37
Morex	52.0		43.0		7-1	37
Valley	46.9		41.0		7-1	36
Bumper	48.4		41.5		7-1	36
ND 1156	49.9		41.5		6-29	34
Fairfield	49.9		42.5		7-6	33
ND 3715	42.9		39.5		7-2	33
ND 4208	43.9		39.5		7-1	36
ND 4242	39.9		41.0		6-29	37
ND 5377	43.4		40.0		7-1	35
ND 5424	39.9		42.5		6-29	37
Hector 2R	53.0		45.0		7-5	35
Klages 2R	36.8		47.5		7-12	32
ND 4758	42.8		48.0		7-7	31
Ridawn 2R	38.8		46.0		7-15	30
Summit 2R	47.9		45.5		7-7	31
Clark 2R	53.5		43.5		7-8	32
Lsd	4.4					
CV	10%					

Table 17. Long term yield comparison of Barley varieties, 1981.

Variety	1977	1978	1979	1980	1981	5 yr. average
Larker	35	54	63	27	43	44
Glenn	34	66	56	35	45	47
Hector	58	72	72	44	53	60
Summit	44	76	72	38	48	56
Morex		62	64	34	52	
Ridawn					39	
Bumper					48	

Table 18. Barley variety trials-Dickinson and off-station sites, 1981.

	Yield in Bushels per Acre								
Variety	Dickinson	Beach	Beulah	Bowman	Center	Glen Ullin	Manning	Regent	Average 8-sites
Glenn	45.4	33.1	41.3	33.0	52.3	42.3	22.4	41.9	39.0
Morex	52.0	38.7	42.7	36.2	71.9	39.2	22.0	43.3	43.3
Hector	53.0	40.4	47.5	41.3	58.5	46.1	25.4	51.2	45.4
Bumper	48.4	37.9	50.2	32.5	58.1	45.4	20.2	46.8	42.4
Ridawn	38.8	45.6	46.4	31.6	54.0	36.5	23.2	35.4	38.9
Lsd bpa	4.4	7.0	5.0	1.8	8.7	3.9	1.3	4.1	
CV %	10.0	16.0	10.0	6.0	13.0	8.0	5.0	8.0	
	Test Weight per Bushel								
Glenn	41.0	33.1	41.3	41.5	41.5	46.0	41.5	42.0	41.0
Morex	43.0	38.7	42.7	43.5	44.5	43.5	44.0	43.5	42.9
Hector	45.0	40.4	47.5	46.0	46.0	46.0	47.5	46.5	45.6
Bumper	41.5	37.9	50.2	40.0	48.5	44.0	42.5	41.0	43.2
Ridawn	46.0	45.6	46.4	43.0	45.0	43.0	44.5	42.0	44.4

Table 19. Winter Rye Variety Trial, 1981.

Variety	Avg. yield bu/acre		7-yr. Avg.		Test weight	
Chaupon	74				53.0	
Puma	58		41.8		56.0	
Cougar	50		43.9		55.0	
Hancock	60				55.0	
Lsd, bpa	4.0					
CV	4%					

NURSERY TRIAL WITH SMALL GRAINS

The cooperative nursery trials grown at Dickinson in 1981, 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. R.G. Cantrell, 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 and Spring Barley Nurseries, Dr. E.A. Hockett, ARS-USDA, Plant and Soil Science Department, Montana State University, Bozeman, Montana.

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

In addition to the uniform nurseries, an interstate safflower yield nursery was also grown in cooperation with Mr. Neil Riverland, Williston Branch Station.

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

Seeding dated for wheat, oats, barley, and durum was April 28, and safflower, May 13.

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

Early seeded small grain crops were severely frosted by a temperature drop of 24° on May 9 but recovered well. Oats showed the poorest recovery.

The most severe weather affecting crop growth and development occurred the first 10 days in July, when temperatures of 93° and above were recorded on 7 days, with a maximum reading of 110° F. Evaporation measured 3.93 inches during this 10 day period.

Oats and barley were more adversely affected by high temperatures, but all crop growth suffered.

Table 20. Uniform Regional Hard Red Spring Wheat Nursery.

Variety	Avg. yield bu/acre	Test weight	Heading date	Height inches
CI 3651	23.7	53.0	7-4	28
CI 13751	18.5	53.0	7-4	27
CI 13958	16.5	57.0	7-2	29
CI 13986	13.7	59.0	7-5	24
CI 17681	11.5	57.0	7-1	26
SD 2868	13.8	58.0	6-30	29
SD 2861	23.1	56.0	7-1	24
SD 2854	20.9	55.0	7-2	26
SD 2860	24.5	59.5	7-4	27
MT 7648	21.1	58.5	7-3	25
MT 7836	18.2	58.5	7-1	26
ID 0162	19.1	56.0	7-5	23
RL 4352	19.3	60.0	7-5	29
MN 73168	19.4	55.0	7-6	24
MN 7357	12.4	50.0	7-5	21
MN 73167	21.8	55.0	7-5	23
ND 573	22.4	60.5	7-3	25
ND 574	20.3	58.0	7-1	28
ND 575	19.8	58.0	7-1	27
ND 581	11.7	60.0	7-3	27
ND 585	19.5	58.5	7-1	27
NK 75S2634	11.7	57.0	7-5	23
NK 75S2631	12.7	58.0	7-5	22
HS 7664	14.2	55.5	7-5	27
HS 79304	16.2	57.0	7-7	23

Table 20. Uniform Regional Hard Red Spring Wheat Nursery, cont.

Variety	Avg. yield bu/acre		Test weight		Heading date	Height inches
HS 79348	14.3		55.0		7-4	23
X 6753	19.2		57.0		7-4	24
X 6718	21.1		60.0		7-4	24
WA 6865	14.4		52.0		7-6	22
WA 6870	14.2		54.5		7-7	25

Table 21. Yield and other agronomic data for entries grown in the Elite Winter Wheat Performance Nursery at Dickinson, North Dakota in 1981.

Yield Rank	Pedigree	C.I. or Selection	Yield (bu/a)	Weight (lbs)	1000 Kwt (gms)	Winter Survival (%)	Height (cm)	June Heading
1	L 12-1	L 12-1	42.84	54.0	28.0	87	115	17
2	Wnk/NB 68466	ND 7784	41.02	54.0	24.0	87	113	17
3	Minter/ND 507	ND 7845	40.58	50.0	24.0	85	109	18
4	YTO-117/Trader	ND 7412	40.41	53.5	24.0	88	109	17
5	Froid/NB 68465	ND 7799	37.24	52.5	21.0	85	108	17
6	Minter?NB 68466	ND 7793	36.73	54.5	23.0	82	101	18
7	Hume/NE 69565	ND 7869	36.73	51.0	25.0	82	97	16
8	Roughrider	17439	36.59	52.5	25.0	77	100	19
9	Froid*2/NB 68513	ND 7601	36.44	53.5	22.0	82	111	17
10	Norstar	17735	35.79	51.5	24.0	82	109	21
11	Wink/NB 68466	ND 7708	35.52	54.0	27.0	83	96	16
12	YTO-117*2/ND 498	ND 7752	35.30	53.5	20.0	82	95	17
13	Wink/NB 69457	ND 78106	34.99	51.0	30.0	80	102	18
14	Froid/NB 68465	ND 7712	34.26	50.0	22.0	80	107	19
15	YTO-117/Alab/FRD/3/Ctk	ND 7723	33.85	53.0	23.0	85	104	18
16	Winoka	14000	33.44	55.0	25.0	80	103	17
17	Froid/SD 69103	ND 7813	33.41	52.0	20.0	85	97	19
18	Froid	14486	33.22	53.0	23.0	83	114	19
19	Froid/NB 69457	ND 7810	33.17	51.5	25.0	80	95	17
20	Froid/Lancer	ND 7481	31.47	52.5	23.0	75	105	19
21	Ctk/Frd/Alab	ND 7899	31.23	50.0	21.0	83	96	18
22	TTO-117/Trader	ND 7687	30.96	53.0	22.0	85	111	17
23	Wnk/SD 6910	ND 7794	30.33	55.0	21.0	80	100	17
24	L 15-1	ND 77101	30.29	54.0	27.0	82	102	18
25	Hume*2/Era	ND 7637	30.29	53.0	25.0	85	96	16
26	Ctk/WnkUlkanovka	ND 7896	29.85	49.0	23.0	85	91	18
27	Ctk/WnkUlkanovka	ND 7895	29.63	51.5	21.0	85	78	16
28	Froid/SD 693	ND 7703	28.11	54.0	21.0	88	96	16
29	Ctk/Froid/Sundance	ND 78104	26.12	49.5	26.0	83	94	19
30	Wnk/SD 6914	ND 7733	25.71	55.0	24.0	78	92	16
	Average		33.85	52.6	23.0	83	101	18
	L.S.D. (.05)		8.79 Bu					

Table 22. Uniform Regional Durum Nursery.

Variety	Avg. yield bu/acre	Test weight	Heading date	Height inches
Mindum	17.8	61.0	7-5	30
Rolette	18.1	61.0	7-1	27
Ward	15.8	59.0	7-3	27
Crosby	18.2	59.0	7-7	23
Rugby	15.9	59.5	7-3	27
Cando	22.4	60.0	7-4	26
Coulter	18.7	60.0	7-2	24
Vic	21.4	61.0	7-3	27
D 771	19.3	60.5	7-4	24
D 773	23.0	60.5	7-3	24
D 7609	17.7	59.0	7-2	23
D 7615	16.6	58.0	7-3	25
D 782	19.7	62.0	7-4	27
D 785	21.0	59.5	7-3	26
DT 367	18.4	60.5	7-4	25
DT 433	21.0	61.0	7-1	24
D 7732	16.3	58.5	7-2	23
D 7733	15.8	60.0	7-3	26
D 7751	21.2	61.5	7-3	27
D 7798	22.2	61.5	7-3	28
D 77189	22.3	61.5	7-4	27
D 77197	17.7	60.5	7-3	22
D 77200	20.5	60.5	7-4	25
D 77204	21.4	60.5	7-5	23
D 791	22.3	61.0	7-2	25

Table 22. Uniform Regional Durum Nursery, cont.

Variety	Avg. yield bu/acre		Test weight		Heading date	Height inches
D 792	20.0		60.0		7-2	25
D 793	20.6		58.5		6-30	26
D 794	16.0		60.0		6-30	25

Table 23. Uniform Early Oats Performance Nursery.

Variety	Avg. yield bu/acre		Test weight		Heading date	Height inches
Otee	38.7		32.0		6-27	26
IL 74-5667	26.7		28.5		6-27	27
IL 75-5681	34.9		26.5		6-27	27
IL 77-2588	28.8		28.5		6-27	28
Lang	44.7		26.5		6-27	26
IA Multiline X	37.1		27.0		6-27	27
Clintford	31.5		25.0		6-27	27
PA 7836-9925	31.2		30.0		6-27	20
SD 740065	36.5		32.5		6-27	29
Andrew	26.4		27.0		6-27	29
MO 06528	32.3		34.5		6-29	28
MO 06195	33.1		27.5		6-27	26
MO 06814	36.5		27.0		6-27	27
MO 06967	34.9		29.0		6-27	27
MO 06503	33.7		29.5		6-27	24
MO 06035	29.9		26.0		6-29	26
Bates	29.6		30.5		6-27	26

Table 24. Uniform Mid-Season Oat Performance Nursery.

Variety	Avg. yield bu/acre		Test weight		Heading date	Height inches
WI X3612-2	29.3		29.5		7-9	29
WI X4024-7	36.3		29.5		6-30	31
WI X4041-1	35.7		32.0		7-4	27
WI X 4047-3	34.8		33.5		7-2	27
Dal	32.3		33.5		7-6	27
IL 75-1056	34.8		28.5		7-1	26
IL 75-5860	40.9		32.5		6-29	25
Ogle	37.2		29.0		7-1	27
OA 366	22.3		23.0		6-30	28
OA 436-2	23.2		26.5		7-2	30
OA 437-1	21.2		27.0		7-8	30
W 76-121	19.3		22.0		7-7	26
NY 6083-21	31.7		26.5		7-5	26
NY A-11	34.5		31.5		7-6	24
PA 7527-1079	29.1		26.0		7-5	24
PA 7836-6571	26.4		24.5		6-29	21
PA 7836-2334	29.1		27.0		7-1	26
SD 770064	23.7		25.5		7-2	27
SD 770290	29.6		29.0		6-28	29
SD 751187	33.0		30.5		6-29	28
Clintland 64	23.5		28.0		6-28	28
MN 78135	40.7		31.5		7-1	27
MN 78211	30.5		29.0		7-4	29
MN 78217	36.9		31.0		7-5	29
MN 79229	33.2		33.0		7-1	27

Table 24. Uniform Mid-Season Oat Performance Nursery, cont.

Variety	Avg. yield bu/acre		Test weight		Heading date	Height inches
ND 77-61-311	27.7		33.5		7-6	22
ND 77-66-13	37.2		34.5		7-5	27
ND 76-530-301	30.5		33.5		7-6	26
Gopher	19.3		26.0		7-1	27
P 70408E	30.7		28.0		7-5	25
P 72266B	34.9		31.0		6-29	27
P 72266B	34.9		28.5		6-30	28
P 72282RB	23.2		27.5		7-1	27
P 72288 RB	32.7		28.5		6-30	26
P 73109B	28.3		25.0		7-1	26
P 73118A	39.6		28.0		6-29	28

Table 25. Uniform Great Plains Barley Nursery.

Variety	Avg. yield bu/acre		Test weight		Heading date	Height inches
Farlbecks III	30.2		44.5		7-10	28
Primus II	25.4		37.0		7-7	26
Larker	20.2		38.0		7-7	28
Bedford	28.3		40.0		7-8	27
BR-DS4-I	25.4		36.0		7-6	26
27ND 3529	20.8		38.5		7-8	27
N36D 3715	15.8		35.0		7-6	26
ND 4208	24.6		33.0		7-6	29
SD 79-273	24.8		37.0		7-6	31
SD 79-391	29.6		41.5		7-7	26
SD 79-426	25.0		37.5		7-6	29
SD 79-435	21.0		37.5		7-7	26
SD 79-446	28.2		40.5		7-6	30
Ridawn	19.6		42.0		7-24	25

Table 26. Western Dryland Spring Barley Nursery.

Variety	Avg. yield bu/acre		Test weight		Heading date	Height inches
CI 6009	32.4		38.0		7-11	23
CI 11770	24.0		33.5		7-6	24
CI 15229	26.0		34.5		7-6	22
CI 15514	32.5		41.0		7-9	25
MT 547123	31.6		40.5		7-13	25
CI 15857	31.4		37.5		7-10	24
WA 895375	23.9		40.0		7-18	21
ID 410167	23.0		41.5		7-12	26
MT 311031	25.0		40.0		7-18	23
MT 311576	25.9		38.5		7-8	23
MT 657869	34.2		41.0		7-5	24
WA 969175	21.2		41.0		7-19	21
MT 657395	24.1		41.0		7-9	26
MT 657399	33.5		41.5		7-10	25
MT 312620	32.9		37.0		7-9	24
MT 313104	36.8		38.5		7-6	26
ND 4758	20.5		40.5		7-9	24

Table 27. Western Spring Barley Nursery.

Variety	Avg. yield bu/acre		Test weight		Heading date	Height inches
CI 936	16.5		35.0		7-9	25
CI 15229	29.8		33.0		7-6	25
CI 15478	20.1		41.0		7-21	24
CI 15773	27.9		36.5		7-4	27
MT 547123	30.9		41.0		7-14	24
CI 15 857	30.5		40.0		7-14	23
OR 74226	25.6		34.5		7-9	21
UT 65471	26.1		35.5		7-4	22
WA 895375	26.0		42.0		7-20	21
ID 410167	27.5		42.0		7-13	24
ID 765988	27.5		39.0		7-13	22
MT 547354	32.9		38.5		7-10	24
MT 31972	25.6		43.5		7-11	23
OR 743521	19.5		42.5		7-24	22
WA 969175	26.1		40.5		7-21	23
CA 75790	19.8		43.5		7-23	23
MT 657869	33.0		43.0		7-6	24
MT 311031	21.8		39.0		7-11	22
MT 311576	29.0		37.5		7-7	23
OR 73341	16.6		29.0		7-9	20
OR 73343	24.5		33.5		7-8	22
SK 76333	30.2		36.5		7-11	24
UT 1234	24.8		34.5		7-7	25
UT 1427	43.5		36.5		7-4	25

Table 28. National Sunflower Performance Trial.

Variety	Avg. yield bu/acre	Test weight	200 K wt. gm.
Hyb 894	744.1	28.0	7.6
Hyb 903	694.5	29.0	12
CX 7101	799.2	27.0	9.6
IS 907E	649.5	29.0	11.2
IS 7116	761.1	28.0	9
IS 77755	733.6	28.0	8.6
J 503	857.9	28.5	8.4
Imp 897	683.9	27.5	7.6
Imp 672	737.7	28.0	9.4
Imp 673	613.4	29.0	10
Imp 675	699.6	28.0	10.8
SG 380A	510.6	30.0	10.2
SG 372A	850.3	26.0	7.6
SG 378	779.1	29.5	9.8
Golden Glow	773.4	28.5	10
SGO 472	622.9	28.0	10
SGO 448	971.8	28.0	9.4
SGO 449	653.8	28.5	10.6
P 620	651.5	28.0	9.4
DO 844	760.2	29.0	12
DO 704 XL	723.5	28.5	12.6
DO 164	730.8	28.5	12.2
DO 705	603.7	29.0	10.4
NK 254	632.8	29.5	8.2
NK 265	646.1	29.0	9.2

Table 28. National Sunflower Performance Trial, cont.

Variety	Avg. yield bu/acre		Test weight		200 K wt. gm.	
NK 212	802.0		30.5		11.8	
Hy 54K	740.9		28.5		8.2	
Hy 57K	734.4		28.5		10.0	
Hy 64P	681.8		29.5		7.8	
Hy 42L	823.7		29.0		9.0	
SKA 4000	472.6		28.5		7.0	
SKA 5000	585.9		29.0		8.4	
SKA 6000	548.3		29.0		9.6	
RBA 300G	947.9		29.0		10.4	
RBA 303	636.2		28.5		8.4	
RBA 3101	714.5		30.0		8.4	
ST 315	599.4		26.5		8.8	
ST 327	683.7		28.5		8.6	
ST 349	754.9		27.5		9.2	
GH 10	627.6		28.5		8.4	
Cargill 205	557.1		31.5		9.8	
Cargill 206	718.5		29.0		9.8	

SUNFLOWER VARIETY TRIAL 1981

Data in table 29 is from a sunflower variety trial conducted at the Ron Swindler farm located in Hettinger Country near Mott, ND by Mr. Robert C. Wagner, formerly Area Extension Agronomist, Southwest District, and presently superintendent, Langdon Branch Station. The trial was harvested and calculations made by Mr. Blake Vander Vorst, Area Extension Agronomist, Southwest District.

Table 29. Sunflower Variety Trial, 1981.

Variety	Yield bu/a @10.0%	% Harvest Moisture	% Oil @10.0% Moisture	lbs. oil per acre
DO 164	1358	11.3	43.9	537
DO 704XL	1331	11.1	45.4	544
IS 7775	1270	12.9	43.7	500
JAC 401	1260	10.9	44.4	504
S 301A	1249	11.8	46.0	517
RBA 3101	1201	11.1	38.7	418
Plainsman	1200	11.9	45.1	487
S 315	1197	12.7	44.5	479
JAC 501	1196	12.3	44.6	480
IS 903	1164	12.3	47.6	499
DO 844	1157	11.3	44.7	465
DO 843	1145	12.2	45.4	468
JAC 550	1135	11.8	46.1	471
CAR 205	1134	11.5	46.1	471
SIG 472	1120	13.1	43.7	441
DO 705	1112	11.1	43.6	436
DO 704XL	1112	11.1	44.8	448
SF 101	1102	11.6	45.7	453
IMP 673	1094	13.4	46.7	460
RBA 303	1079	11.7	45.7	444
SIG 454	1061	12.7	43.6	416
DEKALB EXS37	950	12.4	47.4	405
IMP 675	933	12.6	46.2	388
IS 3100	924	11.3	44.6	371
	lsd @ 5%			

Seed-May 12, 1981 Harvested-October 1, 1981

Sprayed-Approximately May 10, 1981, with Prowl at 3 pt/A + Roundup at ½ pt/A .5% by volume noinic surfactant + 10 gal,/A. of 28-0-0 liquid fertilizer (equal to 30 lb/A actual nitrogen) + Unite (a compatibility agent) + water.

Planted with a John Deere Maxi-Merge with serrated coulters in from of each unit 30" rows. No-till planting into wheat stubble.

CV=7.59% 3 reps

CORN VARIETY TRIAL 1981

Data in table 30 is from a corn variety trial conducted at the August Kirschman farm located in Hettinger County near Regent, North Dakota by Mr. Robert C. Wagner, formerly Area Extension Agronomist, Southwest District, and presently superintendent, Langdon Branch Station. The trial was harvested and calculations made by Mr. Blake Vander Vorst, Area Extension Agronomist, Southwest District.

Table 30. Corn Variety Trial, 1981.

Variety	Yield bu/a @15.5%	% Moisture @ Harvest	ND-RM* approx.	Comments **
Sokota 260	65.3	24.1	84	good stand
Agsco 2XA-1	57.3	29.7	85	bad lodging
Sokota X80-18	56.5	20.6	78	bad lodging
Jacques JX733	56.5	23.0	75	bad lodging
Northrup King PX 403	55.6	16.1	70	some breakage-stalk
Jacques JX10	55.0	21.9	75	lodging, thin stand
Sokota TS20	53.4	24.7	83	good stand, short
Sokota X80-28	53.2	27.1	85	some breakage-stalk
Jacques JX21	52.1	30.1	85	little lodging
Cargill 404	51.9	27.5	80	lodging
Cargill 810	49.5	20.9	80	little lodging
Sokota MS-27	48.9	27.9	85	med. stand
Payco SX611	48.6	39.0	95	tall
Payco SX599	48.6	35.8	90	good stand
Agsco 3XB-7	48.2	27.1	90	little lodging, thin stand
Cargill 838	46.2	34.7	100	good stand, tall
Northrup King PX414	46.1	21.2	75	good stand, lodging
Dekalb XL6	46.0	28.0	80	thin stand
Agsco 3X75	44.9	22.5	80	bad lodging
Dekalb XL11	44.7	30.4	85	thin stand
Payco SX386N	43.5	27.0	80	little lodging
Payco SX 499	43.1	28.3	85	thin stand
Agsco 4XA	42.8	27.0	85	little lodging, thin stand
Northrup King PX449	38.5	36.2	90	good stand
Dekalb DX24	34.6	20.8	70	lodging, thin stand
Agsco 3XAAA	34.1	20.9	70	lodging, thin stand
	lsd @ 5% 9.3			

*RM=Relative Maturity, approximate. Minnesota would be 0 to 5 days longer depending on company and hybrid.
Seeded-may 6, 1981. Overall yield average=48.7 bu/a CV=11.76% 3 Reps
** comments taken at Harvest-October 15, 1981

SAFFLOWER PERFORMANCE 1981

Safflower yields in western North Dakota for 1981 are summarized in table 31.

The following information was well as the yield data for Minot and Williston was furnished by Mr. Neil Riveland, Agronomist, Williston Branch Station.

Hartman, Rehbein (two Sidney releases) and Sidwell have good alternaria and bacterial blight resistance, while S541, S208, S317, and S400 have only poor to fair resistance. US-10 has no disease resistance. Hartman is the variety to recommend, though it is slightly later in maturity than @208 and there is limited supply of seed. S317, S400, and US-10 should not be recommended. S317 is high oleic safflower. All others are high in linoleic acid. Rehbein is the earliest maturing variety of the group but is lower in yield potential and oil content compared to Hartman. Sidwell has the lowest oil content of all listed varieties. Both Sidwell and Rehbein can be recommended for disease situations, provided their limitations are realized. With the seed supply limitations on Hartman and Rehbein, there will be quite a number of acres of each of these varieties planted. Both are high yielding with high oil content, but they have little disease resistance. Certainly their production should be discouraged in central and eastern North Dakota and under irrigation where disease potential is greatest.

Continental Grain Company at Culbertson, Montana and Agricom, Inc. of California (area office also located at Calbertson) are the two major contractors of safflower. Continental Grain is now contacting for $200 per ton plus 1% for every 1% oil over 34%. Agricom has not started their contract price.

Tbale 31. Safflower Performance Data, 1981.

Variety	Dickinson		Minot		Williston
S-541	2064		1461		1584
S-208	1032		1455		1553
S-317	1995		1283		1349
Rehbein	1870		1269		1106
S-400	1957		1239		1167
Hartman	2049		1198		1347
Sidwell	1392		1152		1004
US 10	1136		983		778
1/ Calculated yield					

SUDANGRASS AND SORGHUM FOR EMERGENCY FORAGE

Sudangrass and sorghum hybrids were seeded on summer fallow at Dickinson and Hettinger to determine comparative production potential for emergency forage. Piper, Monarch, Trudan 8, Highland, Sumax hybrid and Highland two wer grown in 30 inch row spacing at both locations and Piper sudan was also grown in a solid seeding at Dickinson. Yields calculated at 12 percent moisture content are summarized in table 32.

Table 32. Sudangrass and Sorghum hybrid yields, 1981.

	Yield in pounds per acre		
Variety	Dickinson	Hettinger	2 Station Average
Piper sudan	1680	2200	1940
MOnarch	1680	2800	2240
Trudan 8	2600	3000	2800
Highland	3200	3600	3400
Sumax hybrid	2800	5200	4000
Highland two	3400	3600	3500
Piper sudan in solid seeding	6000	-----	

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 productions methods were remarkably similar for both years.

In 1978, wheat on summerfallow averaged 28.5 bushels per acre in this trial compared with 31.4 on second cropping and 30.6 on continuous cropping. High yields on stubble land were 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.

In 1978, fall precipitation was only 4.58 inches compared to more than 10 inches in 1977. In addition, a late spring planting date and a very dry period extending from April 20 to June 18 was unfavorable for good, uniform germination and early crop growth. The effectiveness of stored soil water in fallow under stressed conditions is readily evident in the harvested yields.

In 1980, severe drought conditions prevailed through the third week in June. Grain production was reduced on summerfallow and was zero on recrop and continuous cropping treatments.

In 1981, early seeded small grain crops were severely frosted by a severe freeze on May 9th, but seemed to recover very well. The most severe weather affecting crop production occurred the first ten days in July when temperatures of 93° F and above were recorded on 7 days, with a maximum reading of 110° F. Evaporation measured 3.93 inches during this ten day period.

Table 33. Wheat production on Fallow, Recrop and continuous Cropping Bushels per Acre.

Treatment	1976	1977	1978	1979	1980	1981	6-yr Avg.
Fallow	43.0	26.9	38.5	32.4	22.3	21.3	30.7
Recrop	27.0	11.5	30.2	15.9	0.0	14.5	16.5
Continuous crop	22.0	5.5	30.6	12.8	0.0	14.0	14.2

MINIMUM TILLAGE AND SEEDING, AND DOUBLE DISKING AND CONVENTIONAL SEEDING ON SECOND CROPPING

In 1976 there was no significant differences in wheat production between minimum tillage and conventional tillage on second cropping. Growing conditions were excellent in 1976.

In 1977, hot, dry spring weather conditions were not particularly favorable to germination and early crop growth 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 groth was also a problem on this treatment. 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 the Power till seeder. Conventional disking and seeding was the best production method in the 1977 comparison.

In 1978 and 1979 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.

In 1980 the Melroe 701 drill and conventional seeding was compared once again. Because of severe drought, production was zero for both treatments.

In 1981 the John Deere how drill was used for seeding the minimum tillage treatment. A good strand of wheat resulted from both the minimum tillage seeding and the conventional seeding, with the minimum tillage treatment producing slightly higher yields for the first time since the trial was begun. Yields for the five year period 1977-1981 year period are summarized in table 34.

Table 34. Minimum Tillage and Double Disking for Wheat Production on Recrop.

	Yield bushels per acre					
Treatment	1977	1978	1979	1980	1981	5 yr. avg.
Minimum tillage & seeding	12.6	10.3	9.6	0.0	15.3	9.6
Double disk and conventional seeding	15.0	28.5	15.9	0.0	14.3	14.7

CROPPING SYSTEMS STUDY

This study evaluates alternate methods of crop production in southwestern North Dakota.

The cropping systems compared include: (1) conventional fallow-crop, (2) chemical fallow-crop, (3) flexible cropping and (4) no-till cropping. The systems consist of:

1. Alternate fallow-crop where regular tillage operations are used during the fallow season.

2. Chemical fallow-crop where herbicides are used to control weed growth duirng the fallow season. Tillage will be used if necesssary.

3. Flexible cropping where a crop will be grown each year based on moisture supply. If recharge of moisture is low, fallow will be introduced into the operation. If the soil contains 2 inches of available moisture at seeding time a crop will be sown.

4. No-till cropping where a crop will be grown each year and be seeded directly into stubble using a no-till planter. Conventional tillage and/or fallow may be introduced if necessary.

The individual cropping system will have fertility variable included each year on soil test values and expected yield potentials based on stored soil water and expected growing season precipitation. These cropping systems will be compared and evaluated for a minimum of 5 years.

In 1980 the flexible series was fallowed because of inadequate soil water supply. Conventional fallow, eco-fallow no-till and continuous cropping were seeded to Coteau hard red spring wheat on May 1. Fargo-treflan tank mix was applied on May 2. Fertilizer application was as shown on the accompanying field plan. No-till and continuous cropping failed completely because of drought.

The higher yields recorded in 1981 reflect more favorable growing conditions than those of 1980, with severe frost on May 9 and high temperatures the first ten days in July being the principal factors limiting yield. Results for 1980 and 1981 are summarized in table 35.

Table 35. Crop Systems Production Trial, 1980-1981 (cont.).

Treatment	Fertilizer	1980	1980	1980	Average	1981	1981	1981	Average
Flex-crop	Check	Fallow	Fallow	Fallow	---	18.8	18.8	20.0	19.2
Flex-crop	NH_3 S	Fallow	Fallow	Fallow	---	18.8	18.8	20.0	19.2
Flex-crop	NH_3 D	Fallow	Fallow	Fallow	---	21.3	20.0	22.5	21.3
									19.9
Flex-crop	Urea P	Fallow	Fallow	Fallow	---	17.5	17.5	17.5	17.5
Flex-crop	Urea T	Fallow	Fallow	Fallow	---	17.5	13.8	16.3	15.9
Flex-crop	Farm rate	Fallow	Fallow	Fallow	---	22.5	21.3	23.8	22.5
									18.6
No-till	Urea P	---	---	---	---	18.8	18.8	20.0	19.2
No-till	Urea T	---	---	---	---	18.8	20.0	21.3	20.0
No-till	Farm rate	---	---	---	---	22.5	25.0	26.3	24.6
									21.3

Table 35. Crop Systems Production Trial, 1980-1981.

Treatment	Fertilizer	1980	1980	1980	Average	1981	1981	1981	Average
Black fallow	NH_3 60#/A	15.4	15.4	23.1	18.0	27.5	28.8	25.0	27.1
Black fallow	Check	15.4	15.4	24.2	18.3	30.0	32.5	25.0	29.2
Black fallow	Farm rate	17.6	18.7	25.3	20.5	33.8	26.3	27.5	29.2
					18.9				28.5
Eco-fallow	NH_3 60#/A	16.5	16.5	17.6	16.9	23.8	21.3	26.3	23.8
Eco-fallow	Check	16.5	19.8	17.6	18.0	23.8	20.0	27.5	23.8
Eco-fallow	Farm rate	16.5	24.2	18.7	19.8	26.3	25.0	27.5	26.3
									24.6
Continuous	Soil test	---	---	---	---	15.0	15.0	20.0	16.7
Continuous	Check	---	---	---	---	13.8	20.0	22.5	18.8
Continuous	Farm rate	---	---	---	---	13.8	12.5	21.3	15.9
									17.1

SECTION II

FEEDING AND MANAGEMENT TRIALS

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Section II: Feeding and Management Trials

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COMMERCIAL WEANING RATIONS AND HOME GROWN FEEDS COMPARED FOR PRE-CONDITIONING CALVES

J.L. Nelson and D.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 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 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 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 Hereford and Angus-Hereford-heifer calves from the station herd as well as two lots of Angus calves purchased at the local livestock auction market. The 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 local sale dates, the heifers were on trial for 27 days while the steers were fed a period of 25 days.

In 1979 the trial was repeated, using Angus steer calves purchased at the local livestock auction market. The calves were fed for a period of 20 days, at which time one lot on the home grown ration and one lot on the commercial ration were sold, to evaluate marketability and buyer appeal. Three remaining lots were continued on feed in the backgrounding phase of this study.

The 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. In 1979 the ration did not exceed 30% oats, because the shorter 20 day feeding period didn't safely allow time for the additional 10% increase in oats used in previous years. The commercial feed used was selected at random from feeds available in Dickinson, and was fed according to the manufacturer's recommendations. 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 trail was weighed back to give an accumulate record of the amount of feed used. Feed waste was monitored throughout the trial, and was very minimal for both rations.

All calves in the trial were vaccinated. Station calves used in 1977 and 1978 were vaccinated approximately two weeks before weaning with a seven way vaccine and received a booster for enterotoxemia at weaning time. The purchased Angus calves were given the same vaccination, and branded upon arrival at the station. No booster for enterotoxemia was administered to the purchased calves that were sold. Careful daily observations for any health problems were made throughout the trail with treatment made were necessary. All calves were observed daily and those showing signs of lung congestion, heavy nasal discharge or fever were treated with a combination of penicillin (combiotic) sulfamethazine (Spanbolet) bolus according to label directions.

Table 1. Three Year Combined Results of Pre-conditioning Trial.

	Home grown fed	Commercial fed
Total number head	61	73
Average body weight gain, lbs	49.5	56.9
Average daily gain, lbs/day	1.98	2.23
Average pounds of feed/head	302	336
Average pounds of feed/head/day	11.8	13.3
Average cost of feed/calf	$9.98	$21.12
Average feed cost/Cwt gain	$21.04	$36.58
Average pounds of feed/lb gain	6.1	5.9

Table 1. Three Year Combined Results of Calves Pre-conditioned and Sold.

	Home grown fed	Commercial fed
Total number head	23	23
Average initial weight	417	411
Average final weight	465	469
Average weight gain	48	58
Average daily gain	1.95	2.33
Average pounds of feed/pounds gain	5.8	6.6
Average pounds of feed/head/day	11.2	15.1
Cost of feed/head	$9.32	$23.90
Feed cost/Cwt gain	$19.30	$41.28
Average calf selling value	$276.72	$286.27
Average return over feed	$267.40	$262.37
Average selling price/Cwt	$59.03	$61.00

Pre-conditioning Discussion:

Based on three year's feeding of sixty one calves fed home grown feeds and seventy three calves fed a commercial pelleted pre-conditioning feed, we observed that:

1. Commercial fed calves gained 7.4 pounds (56.9 vs 49.5) more weight during the 20-28 day feeding period.

2. Average daily gain favored the commercial fed calves by 0.25 pounds/head/day (2.23 vs 1.98).

3. Calves fed commercial feed consumed thirty four more pounds of feed per calf or 1.5 pounds more per day than control calves.

4. Due to the greater consumption and higher feed costs per pound, the feed cost per calf was $11.30 more when commercial feed was fed.

5. The cost per hundred pounds of gain was $15.54 higher with the commercial ration even though the commercial fed calves were slightly more efficient (5.9 vs 6.1 pounds of ffeed per pound of gain).

At the end of the trial, calves form both feeding programs were marketed at the local livestock auction market.

Three year selling results with forty six calves sold indicate the following results:

1. Commercial fed calves had gained ten pounds more weight (58 vs 48 lbs) or 0.38 pounds more gain per day.

2. Commercial fed calves grossed $9.55 more ($286.27 vs $276.72) than the control calves, although these calves incurred a $14.58 higher feed cost.

3. Commercial fed calves sold for $61.00 per Cwt vs $59.03 per Cwt for the controls.

4. Because of lower feed costs, the control (home grown fed) calves returned $5.03 more per calf fed and sold.

While disease problems were not serious during the first two years of the trial, in 1979 calves in both treatment groups required individual medication for lung congestion and other "shipping fever" symptoms. We could not see any apparent advantage for the medicated feed as fed in these trials. Close observation and early specific treatment may have tended to mask some of the medicated feed benefits.

Summary:

Complete mixed rations composed of chopped mixed hay and ground oats self-fed will compare favorably with a complete peletted commercial for getting weaned calves started on feed and in a gaining condition.

The commercial feeds were nutritionally sound and offered convenience and ease of feeding, although at a higher total cost. In these trials, calves fed the commercial feed consumed more feed, gained faster and sold for more gross dollars than the control calves. However, because of the lower cost of the home grown ration, calves fed this ration returned $5.50 more per head than those fed the commercial ration.

This trial did not show any particular advantage for the use of medications in the pre-conditioning ration. We prefer to rely on close observation and early treatment on an individual basis when needed.

In order for producers to utilize the complete mixed rations, they must have access to either a portable grinder-mixer or other similar feed processing equipment. Producers with limited number of calves to feed may not be able to justify this equipment expense. Also, when roughage quality is poor and grain supplies are tight, producers may want to consider commercial feed during the pre-conditioning phase.

COMMERCIAL AND HOME GROWN FEEDS COMPARED FOR PRECONDITIONING AND BACKGROUNDING

J.L. Nelson and D.G. Landblom

Cattlemen who want to background their calves afer weaning have more than one feeding option. Commercial pelleted rations are popular because of their convenience and ease of handling as bagged or bulk feed, and also because of the availability of several medications desired by some producers. Home grown feeds can also be used with excellent results.

In 1977 and 1978, straightbred Hereford steer calves averaging 425 pounds were allotted into two groups and fed a preconditioning ration for 28 days. Group one was self fed a commercial pelleted ration according to the manufacturers directions. Long hay and pellets were available on day one only, with pellets being available free choice for the remainder of the trial. The control group was self-fed a mixed ration of 20% oats and 80% hay at the beginning of the trial. The percentage of oats was gradually increased so that by the end of the 28 day period 40% oats and 60% hay was being fed.

Following the 28 day preconditioning period, group one was self-fed a commercial backgrounding ration for the remainder of the trial. The control group was self-fed a mixed ration of 50% oats and 50% tame hay for the entire backgrounding phase.

In 1979 and 1980 feeding seasons, straightbred Angus steer calves that averaged 382 and 347 pounds respectively were randomized and allotted into two groups and were fed either a commercial or home grown preconditioning ration for 23 days. At the close of the preconditioning phase the two groups were re-allotted into three treatment groups for the following backgrounding comparisons: 1) Preconditioned and background on home grown feeds, 2) Preconditioned on commercial feed and backgrounded on home grown feeds, 3) Preconditioned and backgrounded on the commercial ration. The rations were fed the same as was done in 1977. Those calves that were preconditioned on the commercial ration and changed to the home grown backgrounding ration were started at 30% oats, which was increased to 50% after an average of 39 days where it remained until the end of the trail.

All calves were vaccinated for enterotoxemia, blackleg, malignant edema and hemorrhagic septicemia.

The steers were sold at ht3e local auction market at the end of March each year.

<u>Summary:</u>

Preconditioning with either ration type resulted in no difference in rate of gain or feed efficiency. Cost per pound of feed for the commercial product was nearly twice that of the home grown ration (3.36¢/lb vs 6.42¢/lb). The three year average cost per hundred weight gain for the home grown preconditioner was $16.56 compared to $32.78 for the commercial preconditioning ration.

Backgrounding rations comparing commercial and home grown feeds performed satisfactorily. Gains for steers receiving the commercial ration were significantly faster and were more efficient. The increased rate of gain and feed efficiency, was not enough to offset the traditional feed cost. Feed cost per hundred weight gain amounted to $61.44 for steers fed the commercial ration and $38.04 for those steers fed the home grown complete mixed ration. Feed cost per hundred weight gain in the third ration treatment, which combined commercial predonditioning with home grown backgrounding, amounted to $34.74.

While rate of gain, the feed efficiency was greatest for the commercial rations, the three year average net returns were greatest for steers preconditioned and backgrounded on home grown complete mixed rations. Three year average net returns amounted to $62.25 for the home grown groups; $39.39 for the commercially preconditioned and home grown backgrounded group, and -$10.61 for the commercially fed steers.

When home grown feeds are in short supply, are of poor quality, or where too few animal numbers are being backgrounded to justify the necessary investment for equipment, the stockman's best option would be to use a commercial ration.

Table 1. Home Grown Preconditioning and Backgrounding Ration Composition, 1979-1980.

	Start, %	1st Change, %	2nd Change, %
Preconditioning:			
Days Fed	7	13	
Chopped Mixed Hay	70.5	60.5	
Ground Oats	20	30	
Mollasses	7	7	
Salt	2	2	
Dical	.5	.5	
Backgrounding:			
Days Fed	18	22	97
Chopped Mixed Hay	60.5	57.5	47.5
Ground Oats	30	40	50
Mollasses	7	--	--
Salt	2	2	2
Dical	.5	.5	.5

Table 2. Three Years Combined Economic Results of Preconditioning and Backgrounding.

	Home Grown Ration	Commercial P.C. Home Grown Background	Commercial P.C. & Background
Returns-			
Gross return/hd, $			
1977-1978	351.02	-	361.00
1978-1979	511.04	524.03	552.11
1979-1980	409.70	382.31	450.01
3-yr. avg.	$423.92	$453.17	$454.37
Expenses-			
Preconditioning Feed			
cost/hd, $	12.25	-	22.56
1977-1978	8.08	17.70	17.70
1978-1979	8.98	18.59	18.92
1979-1980	$9.77	$18.14	$19.73
3-yr. avg.			
Background feed cost/hd, $			
1977-1978	97.43	-	156.33
1978-1979	74.79	74.26	172.24
1979-1980	93.27	94.49	213.50
3-yr. avg.	$88.50	$84.38	$180.69
Feeder calf cost, $			
1977-1978	165.36	-	166.92
1978-1979	288.02	286.50	286.50
1979-1980	337.56	336.29	340.27
3-yr. avg.	$263.65	$311.40	$264.56
Net Return, $			
1977-1978	75.98	-	15.19
1978-1979	140.15	145.57	75.67
1979-1980	-30.11	-67.06	-122.68
3-yr. avg.	$62.01	$39.26	$-10.61

Table 3. Three Year Combined Results on Backgrounding Trial. 1977-1980.

	Home Grown Preconditioned and Backgrounding	Commercial Preconditioned Home Grown Backgrounding	Commercial Preconditioning and Backgrounding
Total number of calves	17 1/	12 2/	19
Average days fed	128	133	128
Average starting weight, lbs	444	432	442
Average final weight, lbs	676	674	735
Weight gain, lbs	232	242	293
Average daily gain	1.81	1.82	2.29 3/
Feed Summary:			
Feed consumed per head, lbs	2315	2294	2637
Feed cost per Cwt, $	3.81	3.67	6.83
Feed per pound of gain, lbs	10.00	9.50	9.02
Feed cost per head, $	88.25	84.08	180.03
Feed cost per Cwt gain, $	38.04	34.74	61.44

1/ One steer died of bloat.
2/ Preconditioning with a commercial feed and backgrounding with a home grown ration are for two years only.
3/ Average daily gain was significantly (>.05) faster.

Table 4. Three Year Combined Results on Preconditioning Trial. 1977-1980.

	Home Grown	Commercial
Total number of calves	19 1/	20
Average days fed	24	24
Average starting weight, lbs	386	385
Average final weight, lbs	445	445
Average gain, lbs	59	60
Average daily gain, lbs	2.46	2.50
Feed consumed per calf, lbs	290	306
Feed cost per Cwt, $	3.37	6.43
Feed per pound of gain, lbs	4.92	5.13
Feed cost per head per day, lbs	12.00	12.80
Feed cost per calf, $	9.77	19.67
Feed cost per Cwt gain, $	16.56	32.78

1/ One steer died of bloat.

Table 5. 1979-1980 Results of Combined Preconditioning and Backgrounding.

	Home Grown Ration	Commercial P.C. Home Grown Background	Commercial P.C. & Background
Preconditioning:			
Gains, lbs	74	76	62
Feed/lb gain, lbs	3.2	3.2	4.0
Feed cost Cwt, $	3.86	7.80	7.80
Feed cost/head, $	8.98	18.59	18.92
Backgrounding:			
Gains, lbs	239	236	314
Feed/lb gain, lbs	10.2	10.4	8.8
Feed cost Cwt, $	3.83	3.84	7.73
Feed cost/head, $	93.27	94.49	213.50
Returns/Calf:			
Selling price/Cwt, $	62.00	58.00	62.00
Gross return/hd, $	409.70	382.31	450.01
Expenses:			
Precondition feed/hd, $	8.98	18.59	18.92
Backgrounding feed/hd, $	93.27	94.49	213.50
Feeder calf cost @ 97.00/Cwt, $	337.56	336.29	340.27
Total dollars	$439.81	$449.37	$572.69
Net (gross return minus expenses)	-30.11	-67.06	-122.68

Table 6. 1979-1980 Results of Backgrounding with Home Grown or Commercial Feed.

	Home Grown Precondition & Backgrounding	Commercial P.C. Home Grown Background	Commercial P.C. & Backgrounding
Number of head	6	6	6
Initial weight, lbs	422	423	412
Final weight, lbs	661	659	726
137 day weight gain, lbs	239	236	314
Average daily gain, lbs	1.74	1.72	2.29
Feed consumed/head, lbs	2434	2462	2762
Feed cost/Cwt, $	3.83	3.84	7.73
Feed/lb gain, lbs	10.2	10.4	8.8
Total feed cost/head, $	93.27	94.49	213.50
Feed cost/Cwt gain, $	39.02	40.03	67.99

Table 7. 1979-1980 Results of Preconditioning with Home Grown or Commercial Feed.

	Home Grown Precondition & Backgrounding	Commercial P.C. Home Grown Background	Commercial P.C. & Backgrounding
Number of head	6	6	6
Average initial weight	348	347	351
Average final weight	422	423	412
Average 20 day gain/hd	74	76	61
Average daily gain, lbs	3.7	3.8	3.1
Feed consumed/head, lbs	233	238	242
Feed consumed/hd/day, lbs	11.6	11.9	12.1
Feed/lb gain, lbs	3.17	3.22	3.99
Feed cost/head, $	8.98	18.59	18.92
Feed cost/Cwt gain, $	12.14	24.46	30.52

BULL FEEDING-PHASE I
COMPARING BACKGROUNDING PERFORMANCE
OF STEERS WITH LATE CASTRATED BULL CLAVES

D.G. Landblom and J.L. Nelson

Research conducted at this station and elsewhere has shown that bull calves fed to slaughter weights by 15-16 months of age gain faster, are more efficient, and yield higher net returns than steers fed similar rations. Other research in which taste panels, steers tests, and consumer appeal were evaluated resulted in favorable acceptance of the retail bull beef cuts. Although acceptable feeding and marketing results have been reported, only a small percentage of bulls are being fed commercially because the federal grading standards do not allow carcasses from either bulls or steers that have dark colored lean, coarse texture, and crests to grade higher than bullock or "stag". Bull carcass data from this station has shown that about half of all bulls fed had dark pigmented muscle tissue and that crests wer always present. However, the coarse texture commonly reported was not a problem. These disadvantages have resulted in a bull beef market that is closely tied to the slaughter cow market and without changes in the grading system, feeding bulls to slaughter will never become popular.

Feeding bulls to background weights of 750 pounds before castration has been proposed as a method to take partial advantage of the increased rate of gain and feed efficiency characteristics bulls are noted for. Research in this area of feedlot cattle management is limited and requires further investigation. This experiment was designed to compare the performance of bull valves 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 over 500 pounds were randomly allotted 12 head per treatment.

The steer calves were implanted at the beginning of the trial with 36 mg Zeranol (Ralgro). Implanting was done according to the manufacturer's directions, which specified that the implant was to be placed just under the skin approximately one 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, indicate that crushing results in a rapid release of the chemicals 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.

Roughages used were chopped in a tub grinder through a 3/4 inch screen and were blended with grain and minerals in a portable mixing wagon. The complete mixed rations were self-fed in straight sided feeders of Station design. The rations and changes as they were fed each year of the study are shown in table 1. Weights, gains, feed costs and a partial economic analysis are shown in table 2.

Summary:

Implanted crossbred steer calves, when compared to crossbred late castrated bulls, gained .2 pound faster in an average 134 day backgrounding period and were more efficient. Three year average net return was $10.29 greater for the implanted steers.

The bulls in this study gained faster than the steers before they were castrated, but were substantially set back by castration. Results of this study show no advantage for delaying castration until the end of backgrounding if steers are to be marketable end product.

Table 1. Ration Percentages and Changes as They Were Fed 1978-1980.

	Warm-up	1st Change	2nd Change	3rd Change	4th Change
1978					
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		
1979					
No days fed	12	7	93	15	15
Oats, %	30	40	50	50	50
Barley, %	--	5	5	20	30
Mixed hay, %	67.5	25	15	15	19.3
Oat straw, %	--	29.5	29.5	14.3	--
Di-calcium phosphate, %	.5	--	--	--	--
Limestone, %	--	.23	.23	.4	.4
Salt, %	2	.27	.27	.3	.3
1980					
No days fed	21	82	16		
Oats, %	30	25.1	25.1		
Barley, %	--	31.2	41.2		
Mixed hay, %	67.5	--	--		
Oat straw, %	--	22.4	12.4		
Alfalfa, %	--	20.7	20.7		
Di-calcium phosphate, %	.5	.2	.2		
Limestone, %	.1	.1	.1		
Salt, %	2	.3	.3		

Table 2. 1980 and Three Year Average Backgrounding Weights, Gains, Feed Summary, Costs, Returns, and Partial Economic Analysis for Crossbred Steers and Late Castrated Bulls.

	Beef Steers		Late Castrated Beef Bulls 1/	
	1980	3 yr avg	1980	3 yr avg
Gains:				
No head	12	36	11 2/	34 3/
Days fed	119	134	119	134
Initial wt, lbs	536	515	564	531
Final wt, lbs	800	799	790	794
Gain, lbs	264	284	226	263
ADG, lbs	2.22	2.1	1.9	1.93
Feed Summary:				
Feed/head, lbs	2325	2691	2617	2719
Feed/head/day, lbs	19.5	20.0	22.0	20.3
Feed/lb of gain, lbs	8.8	9.5	11.6	10.5
Feed Costs:				
Feed cost/head, $	88.92	100.83	99.83	101.38
Feed cost/cwt gain, $	33.68	35.38	44.17	38.55
Returns:				
Sale weight, lbs	774	760	771	764
Percent shrink, %	3.2	4.9	2.4	3.8
Selling price/cwt, $	65.00	68.28	66.00	66.97
Gross return/hd on sale wt, $	503.21	518.98	508.75	511.67
Partial Economic Analysis 4/:				
Feed cost/hd, $	88.92	100.83	99.83	101.38
Implant cost, $	.60	.60	---	---
Feeder calf cost, $	482.40 5/	385.38	479.40 6/	388.41
Net return, $	-68.71	32.17	-70.48	21.88

1/ Bulls were castrated three weeks before marketing.
2/ One bull removed in 1979 and 1980.
3/ One bull removed in 1979 and 1980.
4/ Economic analysis accounts for only direct feed costs, grinding costs at $20.00/ton, estimated feeder calf value and implant expense. No value has been placed for other variable and fixed costs associated with livestock feeding.
5/ Feeder calf cost per pound for steers in 1980-90¢.
6/ Feeder calf cost per pound for bulls in 1980-85¢.

BULL FEEDING-PHASE II
COMPARING FINISHING PERFORMANCE
OF STEERS WITH LATE CASTRATED BULL AND BULLS

D.G. Landblom and J.L. Nelson

In Phase I of this study the backgrounding performance of steers implanted with Zeranol (Ralgro) was compared with bull calves in which castration was delayed until the end of the backgrounding phase. In Phase II one-half of the animals in each treatment were retained and continued on feed to evaluate the effects that castration at approximately 700 pounds would have on finishing performance, overall economics and carcass quality.

The steers used in this trial were implanted with 36 mg. Ralgro at the beginning of the backgrounding and finishing phases. The bulls and late castrated bulls were not implanted in this study.

Self-fed complete mixed rations blended in a potable mixing wagon and consisting of mixed hay, oats, barley, salt, and minerals were used. The AGNET computer system was used in 1979 and 1980 to formulate least cost rations for this study.

Ration changes and the days they were fed are shown in table 1. Animal weights, gains, feed summary, carcass, data and net returns are shown in table 2 and 3.

Summary:

Crossbred steers grown out to slaughter weights gained faster, were more efficient, graded higher and yielded higher gross returns than did crossbred bulls castrated at the end of the backgrounding phase. Crossbred bulls that remained intact, produced the fastest gains, ate less feed, yielded the highest average gross returns and were more economical than either of the other treatments. Bull carcasses were higher yielding, progresses 1.5 sq. inch larger loin eye areas, and had a very desirable .3 inch fat cover.

There was no feeding profitability from any of the treatments in this study. However, the smallest net loss was received for the slaughter bull group. Castration, as shown in this study, is very detrimental and should be done before feeding starts or not at all.

Table 1. Ration Percentages and Changes as They Were Fed 1978-1980.

	Ration Changes						
	Warm-up	1st	2nd	3rd	4th	5th	6th
1978							
No days fed	20	90	30	95	--	--	--
Oats	40	50	75	50	--	--	--
Barley	--	--	--	--	--	--	--
Mixed hay	57.5	47.5	22.5	22.5	--	--	--
Di-calcium phosphate	.5	.5	.5	.5	--	--	--
Salt	2	2	2	2	--	--	--
1979							
No days fed	12	7	93	15	97	32	17
Oats	30	40	50	50	50	40	40
Barley	--	5	5	20	30	40	40
Mixed hay	67.5	25	15	15	19.3	19.3	17.5
Oat straw	--	29.5	29.5	14.3	--	--	--
Di-calcium phosphate	.5	--	--	--	--	--	.5
Limestone	--	.23	.23	.4	.4	.4	--
Salt	.2	.27	.27	.3	.3	.3	.2
1980							
No days fed	21	82	22	19	92	--	--
Oats	30	25.1	25.1	25.1	25	--	--
Barley	--	31.2	41.2	41.2	50	--	--
Mixed hay	67.5	--	--	20.7	24.2	--	--
Oat straw	--	22.4	12.4	12.4	--	--	--
Alfalfa	--	20.7	20.7	--	--	--	--
Di-calcium phosphate	.5	.2	.2	.2	.2	--	--
Limestone	.1	.1	.1	.1	.3	--	--
Salt	2	.3	.3	.3	.3	--	--

Table 2. 1980 and 3 Year Average Weights, Gains, and Feed Summary for Steers, Bulls, and Late Castrated Bulls.

	Beef Steers		Late Castrated Beef Bulls		Beef Bulls	
	1980	3-yr	1980	3-yr	1980	3-yr
No head	6	17 1/	5	17 2/	6	18
Days on feed	236	248	236	248	208	205
Initial wt, lbs	535	513	567	533	575	578
Final wt, lbs	1058	1081	1059	1055	1120	1126
Gain, lbs	523	568	492	522	545	548
ADG, lbs	2.26	2.29	2.1	2.10	2.62	2.67
Feed Summary:						
Feed/hd, lbs	5247	5601	5601	5614	5373	5089
Feed/hd/day, lbs	22.2	22.6	23.7	22.6	9.9	9.3
Feed/lb of gain, lbs	9.8	9.9	11.4	10.8	9.9	9.3
Feed cost/hd, $	212.88	217.92	226.24	217.97	214.63	199.09
Feed cost/cwt gain, $	40.70	38.37	45.98	41.76	39.38	36.33

1/ One steer and one bull died.
2/ One steer and one bull died.

Table 3. 1980 and 3 Year Average Carcass Data and Returns for Steers, Bulls, and Late Castrated Bulls.

	Beef Steers		Late Castrated Beef Bulls		Beef Bulls	
	1980	3-yr	1980	3-yr	1980	3-yr
Hot carcass wt, lbs	611	635	612	606	643	641
USDA Grade: Choice	3	7	3	7	--	--
Good	3	10	2	7	4	11
Stag	--	--	--	3	--	3
Std.	--	--	--	--	2	4
Dressing, %	57.7	57.0	57.8	57.6	57.4	57.0
Loin eye area/sq in	10.7	11.3	11.1	11.4	12.1	12.9
Fat thickness/in	.57	.49	.42	.42	.38	.31
Gross return/carcass, $	669.16	570.30	644.78	552.43	621.50	572.89
Partial Economic Analysis 1/:						
Implant cost, $	1.20	1.20	--	--	--	--
Feed cost/hd, $	212.88	217.92	226.95	217.97	214.63	199.09
Feeder calf cost, $	481.50	383.05	481.95	376.02	488.75	386.40
Net profit or loss, $	-26.42	-30.67	-63.41	-41.56	-81.88	-12.60

1/ Economic analysis accounts for only direct feed costs, grinding expense at $20.00/ton, estimated feeder calf value, and implant expense. No values have been placed for other variable and fixed costs associated with livestock feeding.

PRODUCTION OF LEAN OR ECONOMY BEEF

D.G. Landblom and J.L. Nelson

Emphasis by consumers in this country is towards leaner beef. Consumer demand in this direction is evidenced by the significant increased in beef consumption through the fast food trade. Lean ground beef and economy steak consumption utilize approximately one-half of all beef produced.

Inflation continues to erode both the consumer's and beef producers's dollar leaving each of them with less real buying power. The consumer is being forced to shop for economical meat and the producer must produce economical beef if he is going to survive.

Cow beef supplies a portion of the lean beef used in making hamburger, and the remainder is supplied by other classes if cattle. Which cattle class is the most profitable to produce has not been fully answered. Young bulls, dairy steers, and exotic crossbreds are a logical choice since they grow rapidly, have been shown to be a efficient converters of feed to beef, and have a high lean to fat ratio.

Th purpose of this trial is to evaluate feed efficiency, carcass type, quality and overall economics of rapid gaining "exotic" crossbred steers and conventional "British" bred crossbred bulls fed for the production of lean beef.

In 1978, a pilot trial compared Simmental crossbred steers and Angus X Hereford bulls as a source of lean beef. The trial was expanded, and in 1979 and 1980, Charolais crossbred steers were included in the comparison.

All calves were vaccinated for blackleg, malignant edema, hemorhagic septicemia and enterotexemia types C + D. The steers were implanted with 36 mg of Ralgro at the start of the trial and were reimplanted after being on feed 100 days.

Rations fed in the expanded trial in 1979 and 1980 were formulated with the assistance of the AGNET Computer and are shown in detail in table 1.

Feeding results and economic analysis are shown in table 2.

Summary:

Crossbred "exotic steers" and "British" bulls gained rapidly, were efficient and produced high quality lean beef that possesses a minimum fat cover.

The Simmental cross steers and crossbred bulls reached projected quality grades of average to high good in an average 191 days, while Charolais cross steers required more time on feed in 1980, resulting in an average feeding period of 205 days. Daily gains, averaged 26, 2.4, and 2.8 pounds per head for the crossbred bulls, Charolais and Simmental cross steers, respectively.

No difference in feed efficiency was measured in 1980. However, the two year average favored the Simmental cross steers by 0.5 pound per pound of gain, which amounted to a $2.00 reduction in feed costs per hundred weight of gain when compared to the bulls.

Quality grades ranged from Choice to Stag. Crossbred bull carcasses were evenly split between USDA Good and Standard, with none grading "Stags". However, in 1979 two of the Charolais cross steers were graded as "Stags", which was unexpected, because the animals didn't express any visible staggy features. Highest quality grades were measured among the Charolais steers in which 75% graded Good or low Choice. Simmental cross steers had the heaviest carcasses, averaging 679 pounds, and graded 66.6% Good and 33.3% Standard.

Profitability among these treatments when fed to average high Good quality grades was up and down. Feeding in 1979 was profitable for all types; however, 1980's performance results were offset when the trial was analyzed economically. High feeder calf costs coupled with a significantly depressed fat cattle market at the time these cattle had reached their predetermined end point resulted in substantial net losses.

Table 1. AGNET Rations Fed in Hamburger Beef Study.

	Rations Changes				
	Warm-up	1st	2nd	3rd	4th
1979					
Days fed	11	8	93	14	47
Oats, %	30	40	50	50	50
Barley, %	--	5	5	20	20
Mixed tame hay, %	67.5	25.0	15.0	15.0	19.3
Straw, %	--	29.5	29.5	14.3	--
Di-calcium phosphate, %	.5	--	--	--	--
Limestone, %	--	.2	.2	.4	.4
Salt, %	2	.3	.3	.3	.3
1980					
Days fed	27	76	22	19	92
Oats, %	30.0	25.1	25.1	25.1	25.0
Barley, %	--	31.2	41.2	41.2	50.0
Mixed tame hay, %	67.5	--	--	20.7	24.2
Alfalfa, %	--	20.7	20.7	--	--
Straw, %	--	22.4	12.4	12.4	--
Di-calcium phosphate, %	.5	.2	.2	.2	.2
Limestone, %	--	.1	.1	.1	.3
Salt, %	2	.3	.3	.3	.3

Table 2. Weights, Gains, Feed Summary, Carcass Data, and Partial Economic Analysis for Crossbred Cattle Fed to High Good and Low Choice Grades.

	Beef Bulls		Steers			
			Charolais X		Simmental X	
	1980	2-yr avg	1980	2-yr avg	1980	2-yr avg
No head	6	12	6	12	6	12
Days on feed	208	191	236	205	208	191
Initial wt, lbs	575	598	505	534	693	680
Final wt, lbs	1120	1109	1048	1033	1255	1215
Gain, lbs	545	511	543	499	562	535
ADG, lbs	2.62	2.67	2.30	2.40	2.70	2.80
Feed Summary:						
Feed/hd, lbs	5373	4875	5373	4607	5547	4807
Feed.hd/day, lbs	25.8	25.5	22.8	22.5	26.7	25.2
Feed/lb of gain	9.9	9.5	9.9	9.4	9.9	8.9
Feedcost/hd, $	214.63	176.88	216.46	169.62	220.54	174.74
Feed cost/cwt of gain, $	39.38	34.61	39.86	33.99	39.24	32.66
Carcass Summary:						
Hot carcass wt , lbs	643	625	616	592	712	679
USDA Grade: Choice	--	--	3	4	--	--
Good	2	6	1	5	6	8
Standard	4	6	--	1	--	4
Stag	--	--	2	2	--	--
Dressing, %	57.4	56.2	58.7	56.8	56.7	55.4
Loin eye area/sq in	12.1	12.2	12.9	12.6	12.4	13.0
Fat thickness/in	.39	.29	.26	.20	.28	.20
Carcass value, $	621.50	606.14	626.62	591.70	711.66	658.79
Partial Economic Analysis:						
Feed cost/hd, $	214.63	176.88	216.46	169.62	220.54	174.74
Implant cost, $	--	--	1.20	1.20	1.20	1.20
Feeder calf cost, $	517.50	469.55	480.00	431.42	555.74	504.31
Gross Return, $	621.50	606.14	626.62	591.70	711.66	658.79
Net Return, $	-110.63	-40.29	-71.04	-10.54	-65.82	-21.46

FEEDING MANAGEMENT SYSTEMS
for
WINTERING REPLACEMENT HEIFERS

D.G. Landblom and J.L. Nelson

Wintering replacement heifers under conditions common to the Northern Great Plains can result in lowered reproductive performance if nutritional levels are inadequate. While it is a known fact that heifers bred to calves at three years of age have less calving and rebreeding problem, economics of modern beef cattle production demand that heifers be bred to calve at two years of age. Timing becomes a very important factor because heifers must cycle and conceive by fifteen months of age or earlier if they are expected to calve as two year olds. Attaining a high percentage of pregnancies by fifteen months or sooner hinges directly upon the onset of the first ovulatory estrus in heifers, which has been shown to be quite variable. Numerous studies with heifers have shown that the interaction between heifer breed typw and variations in winter energy level during the growing period can significantly alter the age at which heifers reach puberty (Bellows et al., 12965; Short and Bellow, 1971; Lester et al., 1972; Gombe and Hansel, 1973; Dufour, 1975; Varner et al, 1977; Long et al., 1979, and Stewart et al, 1980).

Timing becomes especially critical among heifers destined to become herd replacements because not only is the variation in the onset of puberty a factor, but gestation length is long and the interval between calving and rebreeding is normally longer than it is among mature cows. Therefore, those heifers that reach puberty early have a much better chance of conceiving early with their first calf, thereby insuring them adequate time for uterine repair and return to normal estrus cycling before the start of their second breeding season. Lesmeister, et al. , (1973), evaluated the effect of forst calving date in beef heifers with their first calf tended to calve earlier throughout the remainder of their productive lives. Those calves that were born in the earlier calving groups grew significantly more than calves from later calving groups.

Current heifer management guidelines as outlined by Wiltback, (1972) recommend that Hereford and Angus replacement heifers be wintered to gain from 1.25 to 1.50 pounds per head per day; that from 30% to 50% more heifers than are required for replacement purposes be wintered or purchased for breeding; and, that a short 45 day breeding period be used followed by pregnancy testing near the end of the grazing season. In addition to the recommendations by Wiltbank, more recent investigations by Varner et al., (1977), suggests that sorting replacement heifer calves into weight groups according to the amount of weight gain required to reach a specified weight at the beginning of the breeding season will result in a higher percentage of light-weight heifers reaching puberty before the beginning of the breeding season.

Two experiments have been conducted at the Dickinson Experiment Station with replacement quality weanling heifer calves to evaluate winter feeding methods and subsequent breeding success when managed according to the procedure as outlined by Wiltbabk, (1972), and suggested by Varner et al., (1977), self-feeding a complete mixed ration was compared with a conventional daily hand feeding of long hay and grain in experiment I. Sorting weanling Hereford heifer calves into uniform weight groups and feeding them according to the amount of gain required to reach a pre-determined target weight of 650-700 pounds at the beginning of the breeding season was evaluated in experiment II.

Experiment I

One hundred nineteen weanling Hereford heifer calves weighing approximately 430 pounds were randomly allotted to receive either a chopped complete mixed self-fed wintering ration, or long form, hay and ground oats. Mixed hay used consisted of about equal parts of alfalfa (Medicago sativa), crested wheatgrass (Agropyron cristatum), and bromegrass (Bromus inermis). Oat grain used in the trial was processed in a portable mixer-grinder while the mixed hay was chopped in a tub grinder equipped with a 1 inch screen. Ration ingredients; oats, chopped mixed hay, di-calcium phosphate, and trace mineral salt were blended in a mobile mixing wagon equipped with an electronic scale. Straight sided self-feeders designed at the Dickinson Experiment Station for high roughage diets were used for the self-fed ration.

The complete mixed ration feeding method was compared to feeding a conventional long form of hay and grain supplemented with a free choice salt mineral mixture. The long hay group received ground oats as the first feed each day followed by hay free choice.

Heifers in this study were housed in well drained feedlot pens equipped with pole shed shelters and automatic waterers. Straw bedding was provided on a weekly basis.

Calfhood vaccinations against clostridiam diseases including blackleg, (Clostridium chauvaei); malignant edema, C. speticum), and infectious hemoglobinaria, (C. Haemolyticum), were administered at 2½ months of age. Two weeks before weaning, at approximately 6½ months of age, a 3-way vaccination booster was administered as well as an initial injection for enterotoxemia (C. perfringens). Once the intial stress of weaning subsided the calves were given a booster injection in January of each year and was followed by a leptospirosis/vibriosis combination bacteria administered 30 days before breeding.

The wintering phase was terminated at the beginning of the breeding season on May first of each year, an average of 161 days. At the close of the wintering phase the heifers were re-allotted and exposed to either Angus or Texas Longhorn sires that had been semen evaluated prior to the beginning of breeding. A sixty day breeding interval, which is 15 days longer than suggested by Wiltbank was used to allow additional exposure time in order to determine the number of females conceiving late in the breeding season. In September of each year pregnancy determination was made by rectal palpation.

Heifers grazed early spring pasture of crested wheatgrass at a stocking rate of 1.5 AUM's from mid May until the third week of June, when they were moved to native range. Predominant native grass species grazed were blue grama (Bouteloua gracilis), needle and thread (Stipa comata), Western wheatgrass (Agropyron smithii), and thread leaf sedge (Carex filifolia). Wintering weight gains, feed consumption and economics of feeding, comparing hand feeding long form roughages and complete mixed self-fed rations are shown in table 1. Feeding method effects on reproductive performance has also been summarized in table 1.

Experiment II

A total of one hundred twenty-two Hereford heifer calves, over a period of three years, were weaned in mid October and given a forty-five day adjustment period before being weighed and assigned to one of four projected gain categories. Gain category assignments were made according to the amount of winter gain required for each heifer to weight 650-700 pounds at the beginning of the breeding season on My 1st. The four levels of gain, 1.00, 1.25, 1.50, and 1.75 pounds per head per day, were used to accommodate a wide spread in weaning weights. All heifer calves of replacement quality from the Dickinson Experiment Station herd were used. However, due to limited numbers, particularly in the lightweight group, additional heifers had to be purchased.

Complete mixed rations were fed an average 116 days and contained equal parts of hard red spring wheat and oats as the grain portion. Ration ingredients were blended with chopped mixed hay, as described in experiment I, and were self-fed in straight sided self-feeders designed for all roughage rations. The heifers were weighted at 28 days intervals, and adjustments in the ration energy levels were made each weigh period to achieve the levels of gain desired. During the first two winters, as shown in table 4, only small ration changes were required. However, two events occurred during the last winter of the trial which resulted in significant ration changes. First, wheat became uneconomical as a cattle feed and had to be replaced with oats. Second, prolonged cold weather during the 1979 wintering period coupled with the lower energy level of oats, required substantial adjustments to the amount of oats included in the rations to ofset significantly slower gains. Compensation for slower gains during the early part of the trial resulted in grain levels being increased several times.

Average levels fed were 30%, 39%, 53%, and 63% respectively for those heifers projected to gain 1.0, 1.25, 1.50, and 1.75 pounds per day.

The winter growing phase was terminated at the beginning of the breeding season each year. Vaccination schedule, sire breeds, breeding season interval, pasture type, grass species composition and stocking rate described in experiment I did not change in experiment II. A flushing ration containing 4 pounds of oats extended with 2 pounds of chopped hay was fed daily in bottomless bunks on early spring crested wheatgrass pasture during the first 21 days of the breeding period.

Winter weight gains, feed efficiency, economics of feeding and reproductive efficiency have been summarized in table 2.

Summary:

Experiment I

Self-feeding a complete mixed heifer wintering ration during the wintering period from December to May resulted in faster average daily gains, greater daily feed intake, more efficient gains and a total winter gain that was 50 pounds heavier than heifers fed the same ingredients in the long form.

Heavier weights at the beginning of the breeding season reflected a 6.4% increase in the number of heifers pregnant at the end of the first breeding cycle. Only a very small differences in pregnancy rates were measured in the second and third breeding cycles.

Heifers that were hand-fed long form roughage compensated for slower winter gains with .2 pound per day faster gain on pasture. The reduction in first breeding cycle conception rate would indicate that energy level during wintering should be adjusted upward when long form roughage are eing fed.

Experiment II

Weanling Hereford heifer calves were sorted into uniform weight groups and self-fed a wintering ration according to the projected gain required for each group to weight 650-700 pounds at the beginning of the breeding season. Gain projection groups were 1.00, 1.25, 1.50, and 1.75 pounds per head per day. These gain projections were met each year, but adjustments in ration energy level were required to compensate for variations in temperature.

Only slight differences were measured in total wintering expenses because grain and hay costs were very close during the course of this experiment. While costs were not different, the results were largely different in many respects. Feed conversion to weight gain was significantly different between the low energy group (1.00 lbs/day gain) and the high energy group (1.75 lbs/day gain). No difference was measured between those heifers wintered for moderate gains, but did exist between each of them and those wintered at either the high or low energy levels.

Performance rate, at the end of the first breeding cycle, was greatest among those heifers wintered for moderate gains and amounted to 51.6% and 46.4% respectively for groups projected to gain 1.25 and 1.50 pounds per head per day.

Cycling activity measured among heifers wintered to gain 1.00 pounds per head per day was lower than anticipated. A possible explanation is that the heavier weaning heifers in the Dickinson Experiment Station herd possessed larger frames. It is felt that the larger frame sized heifers would have responded more favorable when wintered to gain 1.3 to 1.5 pounds per head per day.

Lowest pregnancy rates in the first breeding cycle were obtained among heifers in the high energy group wintered to gain 1.75 pounds per head per day, followed by the low energy group wintered at 1.10 pounds per head per day. Although the plant of nutrition on pasture during the first breeding cycle included six pounds of flushing ration per head, the energy level was not great enough to offset the transition from drylot to pasture.

Combined pregnancy rates at the end of the second breeding cycle (45 days) varied only slightly, and ranged from 72.7% in the low energy groups to 70% in the high energy group.

In the study reported here an average of six fewer heifers were pregnant at the end of the first breeding cycle in the high and low average wintering groups. Calf gains among BWF calves born to first calf heifers at this station have averaged 1.85 pounds per day. Using an average cyclic interval of 21 days, Hereford heifers of the type used in this experiment can be expected to produce 39 pounds less calf weaning weight for each cycle they fail to become pregnant. Each heifer that fails to settle on the first bredding cycle reflects a loss of 239 pounds in calf weaning weight. At 80¢ per pound, $31.00 per head is potentially lost.

Comparing this data with that of Varner, et al., (1977), the number of light weight heifers reaching puberty at the beginning of the breeding season and pregnant after 45 days of breeding was 9% less; and compared to group fed heifers in their study, 10% more heifers reached puberty and were pregnant after 45 days of breeding.

These data also agrees with Wiltbamk’s recommendation that an additional 30% more heifers be wintered than are needed for replacement purposes when a shot 45 day breeding season is used.

Table 1. Four year average winter gain, feed consumption and economics among Hereford heifers hand-fed daily or self-fed.

	Hand fed-daily	Self-fed
Total no of head	52	75
No days fed	161	161
Gain summary		
Initial wt, lbs	429	417
Final wt, lbs	623	669
Winter gain, lbs	194	252
Avg daily gain, lbs	1.20	1.57
Feed Summary		
Feed/hd/day, lbs	14.5	16.0
Feed/lb/gain, lbs	12.1	10.2
Economics		
Feed cost/hd, $	57.87	61.41
Feed cost/hd/day, ¢	35.90	37.90
Feed cost/cwt gain, $	29.82	24.32
Reproductive performance		
1st breeding cycle	5-10%	12-16%
2nd breeding cycle (45 days)	27-52%	38-51%
3rd breeding cycle	15-29%	19-25%
Open	5-10%	6-8%

Table 2. Three year average weights, gains, feed summary, economics and reproductive performance among weanling Hereford heifers wintered at four projected levels of gain.

Projected daily gain	1.0 lb	1.25 lb	1.50 lb	1.75 lb
No head	33	31	30	30
No days fed	116	116	116	116
Gain summary				
Initial wt, lbs	571	529	496	464
Final wt, lbs	683	686	675	659
Gain, lbs	112	157	179	195
Actual ADG, lbs	.97	1.35	1.54	1.68
Feed summary				
Feed/hd/day, lbs	16.4	15.5	16.3	14.6
Feed/lb gain, lbs	17.0	11.5	10.6	8.73
Economic summary				
Feed cost/hd, $	59.40	59.23	64.28	62.37
Feed cost/day, ¢	.51	.51	.55	.54
Reproductive performance 2/				
No head	33	31	28 1/	30
1st cycle	10; 30%	16; 52%	13; 46%	6; 20%
2nd cycle (45 days)	14; 42%	6; 19%	7; 25%	15; 50%
3rd cycle	1; 3%	2; 6%	1; 4%	4; 13%
Open	8; 24%	7; 23%	7; 25%	5; 17%

1/ Two heifers removed.
2/ Percent may not add due to rounding.

Table 3. Hand-fed and complete mixed self-fed wintering ration composition fed to weanling Hereford heifers.

	Self-fed		Hand-fed	
	lbs	percent	lbs	percent
Ingredients				
Oats	3.36	21.0	4.35	30.0
Mixed hay	11.46	71.6	8.48	58.4
Alfalfa	.8	5.0	1.45	10.0
Di-calcium phosphate	.12	.8	.08	.6
Trace mineral salt	.26	1.6	.15	1.0
	16.00	100%	14.51	100%

Table 4. Composition of rations fed to weanling Hereford heifers wintered at four projected gain levels.

	1977	1978	1979
Projected gain 1.0 lb			
Oats, %	---	---	30
Oats & HRS wheat, %	---	---	---
Mixed hay, %	98.6	98.8	68.0
Di-calcium phosphate, %	.5	.24	.4
Trace mineral salt, %	.9	1.0	1.6
Projected gain 1.25 lb			
Oats, %	---	---	39.0
Oats & HRS wheat, %	14.6	19.2	---
Mixed hay, %	84.0	78.9	58.5
Di-calcium phosphate, %	.48	.4	.5
Trace mineral salt, %	1.0	1.5	2.0
Projected gain 1.50 lb			
Oats, %	---	---	53.5
Oats & HRS wheat, %	25.7	29.0	---
Mixed hay, %	73.0	69.0	44.0
Di-calcium phosphate, %	.4	.4	.5
Trace mineral salt, %	.9	1.6	2.0
Projected gain 1.75 lb			
Oats, %	---	---	63.0
Oats & HRS wheat, %	43.5	38.7	---
Mixed hay, %	55.0	59.2	34.7
Di-calcium phosphate, %	.5	.4	.5
Trace mineral salt, %	1.0	1.7	1.9

Feeding Systems	Self-fed	Hand-fed
Avg grazing period/days	148	148
Range in days	138-159	138-159
Avg gain/hd/lbs	148	175
Range in lbs	139-167	166-184
ADG, lbs	1.0	1.18
Range in lbs	.87-1.2	1.0-1.33

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IMPROVING STRAW QUALITY WITH ANHYDROUS AMMONIA

J.L. Nelson and D.G. Landblom

According to the 1980 issue of North Dakota Agricultural Statistics, North Dakota farmers harvested more than twelve million acres of small grain. According to the same source there were approximately two million head of cattle on North Dakota farms on January 1980. Figuring a conservative yield of one third ton of straw per harvested acre, livestock producers have a potential feed source of approximately two tone per head. Cereal straws in their natural state have low protein levels and poor digestibility which limits their use in rations for cattle to some percentage of the ration, usually less than fifty percent. Straw digestibility and intake by cattle can be improved by treatment with Sodium hydroxide ((NaOH) or anhydrous ammonia (NH_3). Research by Dr. Hugh Nicholson at the University of Saskatchewan indicates an improvement from 4% crude protein for untreated straw to 10-12% for straw treated with 3.5% anhydrous ammonia. He also reports a 7-10% increase in total digestible nutrients to a level of 45-48% for treated straw. This level of crude protein and T.D.N. is about to most medium quality hays. This improvement in straw quality could be worth many dollars to North Dakota grain and livestock producers.

In the fall of 1979, a trial was designed to evaluate the treatment of wheat straw with 3.5% anhydrous ammonia. Steer calves fed a backgrounding ration were used to evaluate treatment effects.

Coteau wheat straw was field baled with a New Holland big roll baler, and hauled to the experiment station feedlot. A moisture sample was taken and the bales were sampled for quality. Sixteen bales were weighted and adjusted to a 100% dry matter content, averaging 686 pounds per bale. Average moisture content in the bales was 6 percent. The bales were lined up sis by side on a sheet of 4-mil black plastic, which was then wrapped over the bales and sealed to make air tight package. Used rubber tires were piled on top and along the sides of the stack to prevent wind damage, an anhydrous ammonia nurse tank was furnished by the local Farmers Union Company. After calibration of flow rate under water, each bale was injected with as close to 3.5% by weight of NH_3 as possible. Injection was made into the core of each bale using a four foot perforated metal pipe that was sealed and brought to a point on one end. The other end was fitted with an adaptor that allowed the injection pipe to be connected to the nurse tank delivery hose. Extreme care and safety was exercised while handling the liquid NH_3.

Anhydrous injection took place on the 24th of September. The treated bales remained sealed until the 20th of November, a period of 57 days. The plastic cover was then removed and any free NH_3 allowed to escape. The straw processed through a tub grinder prior to feeding. The additional cost of NH_3 at $195.00 per ton plus the cost of the plastic at $47.50 per roll, amounted to $15.50 per ton of straw needed.

On November 27, 1070, 36 head of 450-550 pound Hereford steer calves were allotted to six uniform lots of six head per lot. Two lots received a complete mixed ration of oats, mixed hay,, and minerals and served as rhw control. Two lots received a mixed ration that contained 30% NH_3 treated straw, while another two lots received a complet mixed ration containing 30% untreated straw.

Rations fed were formulated with the aid of AGNET to promote gains of 1.5 to 2.0 pound per head per day.

The steers on trial were weighed every 28 days and were sold at backgrounded weights of 750-800 pounds at the local auction market. Results of the trial are shown in table 1.

Discussion:

Calves on the ammoniated straw ration failed to either gain more or consume more than the control steers. This can be explained in part by the fact that a feed analysis failed to show any improvement in either crude protein level or estimated digestibility (TDN). It appears that moisture level in straw at the time of ammoniation should be rather high, approaching 20% for maximum treatment effects, according to Dr. H. Nickolson (personal visit). During the trial, no problems were noticed with the evidence of the ammoniated straw by the steers.

Summary:

Coteau wheat was ammoniated with NH_3 at the rate of 3.5% of dry weight. After a 57 day rotation period sealed in plastic, the straw was uncovered, processed through a tub grinder and mixed in complete mixed rations for backgrounding steer calves. The straw was fed at the level of 30% of ration. Samples of feed, analyzed for crude protein and TDN, failed to show any advantage for the ammonia treatment.

Steers on the control ration of all mixed hay and grain gained the fastest at 2.31 lbs/hd/day. Steers fed either treated or untreated straw at the level of 30% gained at 2.08 or 2.02 lbs/hd/day.

The trial will be continued in 1980-1981 with straw having a higher initial moisture content.

Table 1. Results from the Feeding Trial with Ammoniated Straw, 1980.

	30% Ammoniated Straw		30% Untreated Straw		All Hay-Control	
	Lot 2	Lot 6	Lot 3	Lot 5	Lot 4	Lot 7
No head	6	6	6	6	6	6
Final wt Apr 22	846	749	757	824	838	818
Initial wt Nov 27	513	474	472	518	507	474
Gain/lbs	333	275	285	306	331	344
Days fed	146	146	146	146	146	146
ADG/lbs	2.28	1.88	1.95	2.10	2.26	2.36
Actual market wt	818	723	750	818	818	783
Avg market value	$484.86	$452.08	$461.25	$482.32	$484.86	$485.66
Percent shrink	3.25 %	3.45 %	.9 %	.8 %	2.3 %	4.3 %
Feed Information						
lbs/hd/day						
Barley	3.71	3.50	3.61	4.10	--	--
Oats	2.73	2.97	2.66	2.88	7.19	7.21
Alfalfa	3.22	3.05	3.14	3.57	--	--
Mixed hay	4.03	4.17	3.95	4.27	13.33	13.46
Straw	5.50	5.57	5.35	5.99	--	--
Di cal	.02	.02	.02	.01	.11	.11
Limestone	.01	.02	.01	.01	.11	.11
White salt	.11	.13	.11	.12	.42	.42
lbs/hd/day	19.33	19.43	18.85	20.95	21.16	21.31
Feed cost/hd $	102.96	103.28	94.52	105.12	113.99	114.07
Return/calf $	381.90	348.80	366.73	377.20	370.87	371.59
Market value-fed	30.89	37.56	33.16	34.47	34.46	33.15
Av feed $/Cwt gain $	34.22		33.81		33.80	

Table 2. Two Year Combined Results from the Feeding Trial with Ammonia Treated Straw.

	30% Ammoniated Straw	30% Untreated Straw	Control All Hay
No head	24	24	24
Final wt	798	776	847
Initial wt	507	508	508
Gain	291	268	339
Days fed	148	148	148
ADG lbs	1.96	1.82	2.29
pounds feed/lb/gain	9.81	11.02	9.28
Actual market wt	768	759	815
Avg market value	$465.75	$458.10	$495.90
Percent shrink	3.8%	2.2%	4.0%
Pounds feed/hd/day	19.1	19.6	21.2
Avg feed cost/hd/day	.76	.73	.91
Avg total feed cost/hd	$112.58	$108.86	$135.16
Feed cost/cwt gain	$38.69	$40.62	$39.75
Return/calf	$353.16	$349.24	$360.75

Discussion:

Results of the first years' feeding using ammoniated straw indicated that steers failed to either gain more or consume more than the calves fed untreated straw. This can best be explained in part by the fact that the feed analysis failed to show any improvement in either crude protein level or estimated digestibility.

However, results from the second year' feeding seem to indicate both an improvement in rate of grain and in feed efficiency. Evidently the higher initial moisture content of the straw allowed for improvement in digestibility. We have not noticed any problems with calves rejecting the ammoniated feed since total feed intake was comparable with the non-treated straw ration. The biggest problem with treatment of straw appears to be the difficulty in getting the straw baled at moisture levels approaching 20%.

Summary:

Wheat straw, packaged in large round bales, was treated with anhydrous ammonia at the rate of 3.5% of dry weight while sealed in plastic. After a 60 day reaction period, the straw was uncovered, processed through a tub grinder and mixed in complete mixed rations for background feeding to steer calves. The straw was fed at the level of 30% of the ration.

In 1979-1980, steers on the control ration of all mixed hay and grain gained fastest at 2.31 lbs/hd/day. Steers fed either treated or untreated straw at the level of 30% of the ration gained at 2.08 or 2.02 lbs/hd/day.

In 1980-1981, steers on the control ration of all mixed hay and grain again gained the fastest at 2.26 pounds per head per day. Their feed efficiency averaged 9.38 pounds per pound gain and the return per calf over feed cost averaged $350.26. Steers fed the ammoniated straw gained 1.84 pounds per head per day with an average feed efficiency of 10.28 pounds per pound gain. Return per calf over feed cost averaged $340.98. Steers fed the untreated straw as 30% of the ration gained the slowest at 1.60 pounds per head per day with an average of 12.15 pounds feed per pound of gain. They returned an average of $326.51. This was $14.47 less than similar steers fed the ammoniated straw. The two year average as shown in table 2 show the all hay mixed ration having the fastest average daily gain at 2.29 and the best efficiency at 9.28 pounds of feed per pound gain. Dollar return over fees was $360.75. Steers fed the ammoniated straw gained faster (1.96 vs 1.82) and were more efficient (9.81 vs 11.02) and returned more net dollars ($353.24 vs $349.16) than steers fed untreated straw.

The trial will continue in 1981-1982 to better substantiate the results gained to date.

USING AN ENZYME PRODUCT IN BACKGROUNDING RATIONS FOR STEER CALVES

J.L. Nelson and D.G Landblom

The vitamin-mineral enzyme supplements used in this trial are being used and sold in this area with apparent success. Earlier research work reported by E.D. Holfield and D.L. Hixon in the 1975 Illinois Beef Cattle Day Report indicate and improvement in performance of 0.28 pounds per head per day. However, in the 53rd Roundup Report of Beef Cattle Feeding Investigations of the Fort Hayes Branch Station, little or no advantage was found for feeding the enzyme product. Because of questions being asked by producers and the divergence of opinion in the literature, the product is being evaluated under conditions in southwestern North Dakota.

“Vita Charge and Vita Ferm Cow Calf 5" are trade names of a commercial vitamin-mineral enzyme product containing an enzyme component Amafirm[R], produced by the fermentation of sucrose by Aspergillus Flavus-oryzae (a fungus). These products were evaluated when fed to backgrounded steer calves for approximately 145 days.

In this trial, light weight steer calves, born in the spring were purchased at a local livestock market. Following an overnight shrink without feed or water, they were weighed, ear tagged and allotted into two uniform feeding groups with respect to weight, breed, and prior owner. The steers were handled and fed as recommended by the Vita-Ferm company representatives. These recommendations included an initial oral drench of approximately 1½ quarts of a solution made up of 4 oz. Vita Charge, 1 oz. C.R. (Corn) oil and 1½ quarts warm water. The steers were drenched at the time of processing (branding, vaccination for blackleg and enterotoxemia, ear tagging, etc). Immediately after processing they were started on a control feeding system or the control feeding system plus the Vita Charge supplement as recommended by the Vita-Ferm company. The treatment calves were fed the control ration plus 4 oz/hd/day of Vita-Charge for the first fourteen days. They were then switched to the control ration plus 4 oz/hd/day of Vita-Ferm Cow Calf 5 for the duration of the trial. All feed was self-fed in straight sided self feeders. The calves started on a ration of ⅓ oats, ⅔ roughage for the first fourteen days and were then switched to a ration of approximately 50% roughage for the balance of the trial. Vita-Charge and Vita-Ferm Cow Calf 5 were added to the total mix so that each calf would consume a minimum of 4 oz. of supplement per day. Rations as fed are shown on table 1.

Table 1. Rations as fed in the Vita-Ferm trial, 1980 & 1981.

Ration I for first 14 days	Control	Vita-Charge
Oats	330.0	330.0
Chopped Tame Hay	657.5	636.5
Di cal	2.5	2.5
Vita Charge	---	21.0
	990.0	1,000.00
Ration II-Day 15 to end of trial	Control	Vita-Charge
Oats	500.0	500.0
Chopped Tame Hay	487.5	469.5
Trace mineral salt	10.0	10.0
Di cal	2.5	2.5
Viat-Ferm Cow Calf 5	---	18.0
	1,000.0	1,000.0

A record was kept of feed eaten, twenty-eight day weights, final weight and selling weight and price. The calves were sold in two groups representing each method of feeding. All performance and total economic records are shown in table 2, 3, and 4.

Table 2. Performance and economic summary for Vita-Ferm trial, 1979-1980.

	Control	Vita-Ferm
Number of Head on Trial	9	9
Initial weight-lbs-Dec 18	3225	3225
Average per head-lbs	358	358
Weight off trial-lbs-May 22	5815	5905
Average per head-lbs	646	656
Gain for 145 days	2590	2680
Average gain/head	288	298
Average gain/day	1.98	2.05
Weight at market	5825	5900
Average/lot	647	656
Total price	$3951.59	$3992.35
Value/head	$439.07	$443.59
Value/lb	67.8¢	67.7¢
Pounds feed/lot	23,015	23,830
Pounds of feed/hd	2,557.2	2,647.8
Pounds of feed/day	17.6	18.26
Pounds of feed/lb gain	8.89	8.89
Cost of feed + grinding/lot	$882.95	$1030.37
Cost of feed + grinding/hd	$98.10	$114.71
		(Includes 23¢ for drench)
Cost/lb of gain	$0.34	$0.38
Return over feed/hd	$340.97	$328.88
Difference	+$12.09	

Table 3. Performance and economic summary for Vita-Ferm trial, 1981.

	Control	Vita-Ferm
Number of Head on Trial	10	10
Initial weight-lbs-Dec 3	3790	3780
Average per head-lbs	379	378
Weight off trial-lbs-Apr 21	6255	6300
Average per head-lbs	625.5	630.0
Gain for 139 days	2465	2520
Average gain/head	246	252
Average gain/day	1.77	1.81
Weight at market	6140	6028
Average/lot	614.0	602.8
Total price	$4087.40	$4129.18
Value/head	$408.74	$412.92
Value/lb	$66.57	$68.50
Pounds feed/lot	22,380	22,415
Pounds of feed/hd	2,238	2,241.5
Pounds of feed/day	16.1	16.1
Pounds of feed/lb gain	9.1	8.9
Cost of feed + grinding/lot	$1560.73	$1627.10
Cost of feed + grinding/hd	$156.07	$162.71
Cost/lb of gain	$0.63	$0.65
Return over feed/hd	$252.67	$250.21
Difference	$2.46	

Table 4. Performance and economic summary for Vita-Ferm trial, 1979-1980.

	Control	Vita-Ferm
Total head	19	19
Avg initial wt	369	369
Avg final wt	635	642
Avg gain	266	273
Avg days gain	142	142
Avg daily gain	1.87	1.92
Avg wt at market	630	628
Avg value/head	$423.10	$427.45
Avg value/cwt	$62.16	$68.06
Avg pounds of feed/hd	2389	2434
Avg pounds of feed/day	16.8	17.1
Avg pounds feed/lb gain	8.98	8.91
Avg cost of geed & grinding/lot	$1221.84	$1328.73
Avg cost of feed & grinding/hd	$128.61	$139.87
Avg cost/cwt gain	$48.35	$51.23
Avg return over feed fed	$294.49	$287.58
Avg difference/hd	+$6.91	

Discussion:

During both years this trial has been conducted, calves in both groups made a rapid adjustment to rations and physical facility. Neither group required any medication or treatments for problems normally anticipated when stating calves on feed.

As shown in table 2, the calves fed Vita-Ferm were about ten pounds per head heavier than the control calves after 145 days on feed. They also had a $4.52/hd. advantage at the market. However, because of higher feed cost per head, the actual dollar return over feed cost per head favored the control calves by $12.09 per head.

In 1981 (see table 3) the Vita Ferm calves were six pounds heavier after 139 days on feed (252 vs 246) than the control calves. At the market they sold for $1.93 more per hundred weight. This amounted to $4.18 more gross dollars per head. Again, in 1981, feed cost for the Vita Ferm fed calves was $6.64 higher than for the controls. Return over feed cost favored the control calves by $2.46.

The two year combined results (as shown in table 4) show weight gain advantage for feeding the Vita Ferm. Higher feed cost however, offset weight gains and market advantage. The control calves average $6.91 more dollar return based on two year average results.

Summary:

It appears that the Vita-Charge Vita-Ferm supplemental feeding program may improve weight gains when fed in backgrounding rations to calves. However, greater feed costs due to feeding the supplement were not offset by the heavier weights and higher market value. Total economics do not seem to justify the use of the enzyme product in this trial to date. The trial is to continue in 1982.

SYSTEMS OF FEEDING FOR EARLY WEANED CALVES

J.L. Nelson and D.G. Landblom

Early weaning of beef calves in the cattle producing areas of the United Stated is practices very little, and is particularly uncommon among cattlemen in southwestern North Dakota. Weaning calves early has been shown to be a beneficial management tool with young cows or under drought conditions.

Early weaning increases the number of cows coming into heat early in the breeding season, and has been shown to be particularly effective in increasing the percentage of two year old cows being bred early foe their second calf. Early weaning in these young cows at the U.S. Meat Animal Research Center increased estrus onset 29% and pregnancy rate by 26% when compared to two year old cows nursing calves.

The reason reported here addresses the problems associated with rearing the early weaned calf, leaving reproductive performance among young early weaned cows for future research. The year of 1980 was the driest on record in 88 years of recordkeeping, surpassing the record low during the growing season recorded in 1936 of 2.03 inches. Response to the drought by stockmen had the telephones ringing. Questions such as, should I cull my herd because of dwindling feed supplies wondered if they should sell cow-calf pairs or if there would be any profitability in feeding the early weaned calf. The next question, how and what will I feed them, and what special handling is necessary if I keep the calves, was the most difficult to answer. This trial was designed to help find the answers to some of htese questions.

Since early weaning research with beef calves is limited, we looked to the dairy industry and to the limited work that was available from Self and Burwell at Iowa State University, Bellows at Miles City, Montana and Haukins and Greathouse at Michigan State University. Information gained from these scientists and Dr. Chung S. Park of the U.D.S.U dairy department indicated that to be successful the following criteria were necessary: 1) Calves should be at least 35 days old if supplemental milk wasn't going to be supplied. 2) Calves should be supplied a highly palatable ration that is high in protein, available energy, vitamins and minerals. 3) Starter rations should be available to the calves during a 2-3 week adjustment period before they are actually weaned. 4) Calf-hood vaccinations for black leg, malignant edema, hemoglobulinurea, pasterellosis, and enterotoxemia should be administered at the beginning of the adjustment period. Injections of vitamins A and D should be given at this time also. 5) Calves should be checked regularly as needed to reduce or eliminate fly and pink eye problems.

The question asked by most producers was, whay should I feed the calves? Answers range from a complete commercial calf blended on the farm using home grown or purchased feed ingredients.

To address the questions posed to us, calves from young or poorer producing cows were randomized by age, sex, breed, size and age of dams into four feeding treatments as follows: 1) Complete commercial calf growing program, 2) commercial program during the critical first 1/3 pf the growing phase followed by a home grown preparation, 3) home grown ration formulated around an oat base and 4) home grown ration formulated around a barley base. The calves ranged in age from 38-89 days during the first year and from 64-105 days of age the second year.

At the start of the trial, all calves were weighed, vaccinated with Electroid-7 and allowed to remain with their mothers in drylot for three weeks while they became accustomed to the started rations. The starter rations, as shown in table 1, were fed in low through feeders inside, a creep area during the adjustment period. After weaning, the rations were self-fed with long hay provided throughout the entire trial in all treatments groups. In 1981, calves were exposed to the creep rations for three weeks at the Ranch Headquarters near Manning, North Dakota. At weaning, they were hauled to the feedlot facilities at the Dickinson Experiment Station in Dickinson, a trip of approximately 23 miles. Calves in the study were weighed at the start of the trial, when actually weaned from the cow, when feed changes were made , and every 28 days during the study. Final (205 day) weights were taken after an overnight feed and water shrink.

<u>Discussion:</u>

In the summer of 1980, mollasses was used to control dust and increase palatability of the starter rations. Unfortunately, large numbers of files were attracted to the feed and so the mollasses was discontinued in the ration. Flies were a general problem in both 1980 and 1981, but were controlled by spraying the calves with a mixture of mineral oil and toxaphene. Pink eye was a problem in 1980 but not in 1981. In 1980, one calf suffered from a reoccurring bloat problem while in 1981, two calves were afflicted with a pneumonia or lung congestion problem early in the trial. Both calves responded to antibiotic treatment but were removed from the trial data records.

Rations, weights, gains and feeding economics are shown in the following tables:

Table 1. Percentage of ingredients and various ration changes in the home grown oat and barley based rations.

	Oat Base				Barley Base					
	Starter	(1)	2	3	4	Starter	(1)	2	3	4
Ingredients:										
Alfalfa, %		34	39	39	39		36	41	41	41
Corn, %		20	20	20	40		20	20	20	20
Oats, %		27	27	33	34		--	--	--	--
Barley, %		--	--	--	--		27	27	31.5	32.5
Soybean meal, %		12	12	6	5		10	10	5.5	4.5
Mollasses, %		5.1	--	--	--		5.1	--	--	--
Minerals & Vit.1/										
Protein % as fed		16.0	16.4	14.5	14.2		15.5	15.8	14.4	14.1

Table 2. Gains, feed and ration economics among early weaned calves fed four different ration types in 1980.

Rations:	Commercial	Commercial/ Home Grown Oat Base	Home Grown Oat Base	Home Grown Barley Base
No Head	14	14	14	14
Days	140	140	140	140
Gains:				
Initial wt, lbs	149	161	148	157
Final wt, lbs	446	428	395	368
Gain, lbs	297	267	247	211
ADG, lbs	2.12	1.91	1.76	1.51
Feed:				
Feed/head, lbs	1596	1317	1462	1202
Feed/hd/day, lbs	11.4	9.4	10.4	8.58
Feed/lb, gain, lb	5.4	4.9	5.9	5.7
Economics:				
Feed cost/hd, $	152.56	96.49	91.15	74.61
Feed cost/hd/day, $	1.09	0.69	0.65	0.53
Feed cost/cwt gain $	51.36	36.14	36.90	35.36

Table 3 Data on gains, feed and ration economics among early weaned calves fed four different ration types in 1981.

Rations:	Commercial	Commercial/ Home Grown Ot Base	Home Grown Oat Base	Home Grown Barley Base
No Head	7	7	7	7
Days	145	145	145	145
Gains:				
Initial wt, lbs	161	154	157	156
Final wt, lbs	533	490	473	474
Gain, lbs	372	336	316	318
ADG, lbs	1.57	2.32	2.18	2.19
Feed:				
Feed/head, lbs	1913	1451	1784	1616
Feed/hd/day, lbs	13.2	10.0	12.3	11.1
Feed/lb, gain, lb	5.14	4.32	5.64	5.08
Economics:				
Feed cost/hd, $	201.10	111.17	110.04	102.22
Feed cost/hd/day, $	1.39	0.77	0.76	0.70
Feed cost/cwt gain $	54.06	33.09	34.82	32.14

Table 4. 1980 and 1981 two year combined data on early weaned calf study.

Rations:	Commercial	Commercial/ Home Grown Ot Base	Home Grown Oat Base	Home Grown Barley Base
No Head	21	21	20	20
Days fed	142	142	142	142
Gains:				
Initial wt, lbs	155	158	152	156
Final wt, lbs	490	459	434	421
Gain, lbs	335	301	282	265
ADG, lbs	2.34	2.12	1.97	1.85
Feed:				
Feed/head, lbs	1754	1384	1623	1409
Feed/hd/day, lbs	12.30	9.70	11.35	9.84
Feed/lb, gain, lb	5.27	4.60	5.77	5.39
Economics:				
Feed cost/hd, $	176.83	103.83	100.60	88.42
Feed cost/hd/day, $	1.24	0.73	0.70	0.62
Feed cost/cwt gain $	52.71	34.62	35.86	33.75

Summary:

The early weaning of beef calves (64-105 day old) in 1981 again supported the 1980 data showing good average daily gains (2.18-2.57) and excellent fed efficiency (4.32-5.64 lbs/lb gain) on all rations as fed. Feed cost per hundred pounds of gain ranged from a low of $32.14 for the barley based ration to $54.06 for the all pelleted commercial ration. Except for two cases of pneumonia early in the trial, health in all treatment pens was excellent. Fly control was the most serious problem.

A combination of 1980 and 1981 results do no change the picture appreciably. Livestock producers wanting to wean calves at an early age have several options to choose from, depending upon individual circumstances.

SUPPLEMENTAL FEEDING OF COWS AND CALVES ON LATE FALL PASTURE

D.G. Landblom and J.L. Nelson

Supplemental or “creep” feeding is generally recommended for calves nursing cows that are grazing short or drought stricken pastures of creep feeding conducted throughout the United States, as summarized by Kirkeide and Johnson (1979), show that an increase in weaning weight of from 30 to 60 pounds can be expected when calves are creed fed from mid-season to weaning.

The extra energy available from creep feeding results in additional gain because the average beef cow does not produce enough milk to promote maximum gains in calves once they reach approximately 150 pounds of body weight. Butson and co-workers (1977) evaluated the lactation performance of beef cows and found that milk production per cow averages only about 13 pounds, which should satisfy the nutrient requirements for calves weighing 100-150 pounds. Heavier calves, therefore, must obtain the rest of their nutrients from grazing.

Peak milk production among beef cows occurs approximately two months after calving and then starts to decline. In the Northern Great Plains, declining milk production closely parallels declining forage quality, as pastures and rangelands mature.

During seasons when adequate grazing exists, long-term creep feeding has not been recommended by the Dickinson Branch Station because creep feeding minimizes weight differences among calves at weaning, masking the milking ability of cows and making sound selection based on performance all but impossible. Most of the additional gain from creep feeding is deposited as fat, and over fattening of replacement heifers has been shown to interfere with milking ability and to lower lifetime productivity. Following weaning, non-creep fed calves make compensatory gain and tend to catch up with calves that were creep fed; and, in many years, the ratio between calf selling price and feed costs is unfavorable, resulting in a net loss of creep feeding.

While summer long creep feeding may not be advantageous because of the reasons just cited, research with short-term creep feeding on mature late fall pasture has not been fully investigated.

A request for information on the subject directed to the Current Research Information System data base, which includes projects form 56 state agricultural experiment stations, 30 forestry schools and three USDA-SEA research agencies, reveled no reported information available on this practice under conditions normal to the Northern Great Plains.

At the request of the North Dakota Hereford Association, a two-phase experiment was designed to evaluate either creep feeding calves or supplementation of cows grazing on late fall pastures. The objective in Phase I was to determine the effects of short-term creep feeding on calf gain when compared to the supplemental feeding of cows instead of their calves. Cow and calf gains, time required for adaptation to the creep ration, and overall economics were monitored.

Phase II evaluates the effect of either form of supplementation on late fall pasture with respect to reducing stress on calves at weaning, effect of disease frequency associated with weaning, and effect of creep feeding on adaptation of calves to weaning rations.

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

Each experimental group grazed on approximately 40 acres of reseeded native pastures in excellent condition with easy and uniform access to water. All calves were vaccinated for blackleg, malignant edema, hemorrhagic septicemia and enterotoxemia when allotted.

Group one as the control and received no supplemental feed other than a salt and di-calcium phosphate mineral mixture, which was made available to all groups free choice.

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% rolled oats and 5% liquid mollasses.

Cows in group three received a supplemental feeding of 6 pounds ground oats per head on a daily basis. Bunk space was limited so that competition among cows would not allow calves to eat grain.

Advanced pasture maturity common to North Dakota ranges occurs during the period from August to October, and nursing calves grazing these ranges are normally weaned from their mothers near the end of the period. To coincide with weaning and normal pasture deterioration, a 40-day supplementation period prior to weaning was selected.

Gains, feed consumption and economics are summarized in tables 1 & 2.

Phase II started immediately after weaning, when the calves were allotted to feedlot pens. The calves were separated by sex, but remained in the same pasture groups. Bulls from each treatment were all fed and handled alike to evaluate any carryover effects of late fall pasture supplementation on weaning stress, weight gains, and disease frequency. They were self-fed a complete mixed ration of 20% oats, 70.5% chopped hay, 0.5% di-calcium phosphate, 2% trace mineral salt and 7% mollasses.

The heifer calves were used ro evaluate two feeding management systems in drylot after weaning. Heifers from control cows and cows supplemented with oats on pasture were exposed to self-feeders containing a mixed ration of 20% oats, chopped hay, 0.5% di-calcium phosphate and 2% salt. Those heifer calves that had creep fed on pasture were continued on the same creep ration in drylot. This ration was 60% barley, 35% oats and 5% mollasses. In addition, these heifers were also self-fed chopped mixed hay in a separate feeder.

Table 1. 1981 Average gain, feed consumption and economics of cow and calf supplementation of late fall pasture.

	Group I Control calves	Group II Calves creep fed	Group III Calves from supplemented cows
Days on trial	53	53	53
Number of pairs	20	20	20
Starting wt., lbs (Sept 3, 1981)			
Cows	1054	1125	1106
Calves	378	378	376
Final wt, lbs			
Cows	1101	1122	1158
Calves	462	467	473
Average daily gain, lbs			
Cows	0.88	-0.06	0.98
Calves	1.58	1.67	1.84
Supplemental feed/hd			
Cows-oats	-	-	288
Calves-creep fed	-	106	-
Feed/hd/day, lbs	-	2.0	5.4
Total feed cost 1/	-	$99.53	$264.52
Feed cost/calf	-	$4.98	$13.22

1/ Average price in 1981=$1.15/bu oats, $1.80/bu barley, 8.0¢/lb mollasses, and $20/ton processing.

Table 2. Summary-supplemental feeding on late fall pasture.

	Group I Control		Group 2 Creep		Group III Supplement	
	Cows	Calves	Cows	Calves	Cows	Calves
ADG-1978	2.90	2.37	1.52	2.15	1.74	2.15
1979	-0.08	1.68	-0.17	1.84	0.22	2.07
1980	3.40	2.31	2.28	2.04	3.19	2.25
1981	0.88	1.58	-0.06	1.67	0.98	1.84
Avg	1.78	1.98	0.89	1.92	1.53	2.08
Final wt						
Oct 31, 1978 (20 hd)	1140	474	1124	463	1124	478
Oct 8, 1979 (20 hd)	1130	440	1138	436	1113	450
Oct 27, 1980 (19 hd)	1149	520	1149 (18 hd)	517	1174	520
Oct 26, 1981 (20 hd)	1101	462	1122	467	1158	473
Avg	1130	474	1133	471	1142	480
Initial wt						
Sept 21, 1978 (20 hd)	1024	379	1063	377	1054	394
Aug 30, 1979 (20 hd)	1133	374	1144	364	1104	370
Sept 23, 1980 (19 hd)	1033	441	1072 (18 hd)	447	1066	444
Sept 3, 1981 (20 hd)	1054	378	1125	378	1106	376
Avg	1061	393	1101	392	1082	396
Weight gain						
1978	116	95	61	86	70	84
1979	-3	66	-6	72	9	80
1980	116	79	77	70	108	76
1981	47	84	-3	89	52	97
Avg	69	81	32	79	60	84
Feed/hd, lbs		Oats	Bly	Mollasses	=Total	Oats
1978	-	43	78	9	=130	240
1979	-	55	118	7	=180	245
1980	-	46	79	7	=131	197
1981	-	35	71	-	=106	288
Avg	-	45	87	6	=137	243
Cost of feed, $	Oats,	Bly,	Mol	Proc	=Total	
1978	24.18	45.79	10.50	13.02	=93.49	159.00
1979	30.82	64.02	9.73	18.00	=122.56	162.18
1980	41.59	79.88	3.91	11.79	=137.17	221.25
1981	25.34	52.98	-	21.20	=99.53	264.52
Avg	30.48	60.67	6.03	16.00	=113.19	201.74

Table 2. Summary-supplemental feeding on late fall pasture (cont).

	Group I Control		Group 2 Creep		Group III Supplement	
	Cows	Calves	Cows	Calves	Cows	Calves
Cost/calf, $						
1978	-		4.67		7.95	
1979	-		6.13		8.11	
1980	-		7.62		11.64	
1981			4.98		13.22	
Avg			5.85		10.23	
Days on trial						
1978	40		40		40	
1979	39		39		39	
1980	34		34		34	
1981	53		53		53	
Avg	42		42		42	

Table 3. 1981 Weaning Gains, Feed Consumption and Economics for Bull Calves in Phase II.

	Group I Control Calves	Group II Calves Creep Fed	Group III Calves From Supplemented Cows
Total No	11	11	11
Starting wt	474.1	473.8	488.6
Final wt	494.5	510.5	518.2
Gain, lbs	20.4	36.8	29.5
Days Fed	21	21	21
Ave Daily Gain, lbs	0.97	1.75	1.40
Feed Summary			
Feed/hd lbs	251.4	304.5	312.7
Feed/hd/day	12.0	14.5	14.9
Economics			
Feed Cost/CWT $	5.10	5.10	5.10
Feed Cost/CWT gain $	62.86	42.23	54.08
Feed Cost/hd $	12.82	15.54	15.95

Table 4. Weaning Gains and Economics Summary for Bull Calves in Phase II.

	1978	1979	1980	1981	Average
No of Calves	10	11	11	11	11
Days Fed	21	23	23	21	22
	CONTROL CALVES				
Final Wt, lbs	505	501	558	494	514
Starting Wt, lbs	480	447	542	474	486
Gain, lbs	25	54	16	20	28
Ave Daily Gain	1.20	2.35	0.69	0.97	1.27
Total Feed/hd, lbs	302	334	299	251	296
Feed Cost/CWT, $	2.80	3.10	5.92	5.10	4.23
Feed/hd/day, lbs	14	14	13	12	13
Feed Cost/CWT gain $	33.58	18.85	111.38	62.86	56.67
Feed Cost/hd $	8.48	10.36	17.71	12.82	12.34
	CREEP FED CALVES				
Final Wt, lbs	551	509	558	511	532
Starting Wt, lbs	506	445	534	474	490
Gain, lbs	45	64	24	37	42
Ave Daily Gain	2.10	2.80	1.05	1.75	1.92
Total Feed/hd, lbs	340	394	324	304	340
Feed Cost/CWT, $	2.56	3.12	5.92	5.10	4.18
Feed/hd/day, lbs	16	17	14	14.5	15.4
Feed Cost/CWT gain $	19.33	19.20	79.75	42.23	40.13
Feed Cost/hd $	8.70	12.29	19.22	15.54	13.94
	CALVES FROM SUPPLEMENTED COWS				
Final Wt, lbs	534	517	562	518	533
Starting Wt, lbs	504	462	531	487	496
Gain, lbs	30	55	31	29	37
Ave Daily Gain	1.40	2.39	1.34	1.40	1.68
Total Feed/hd, lbs	301	380	332	313	332
Feed Cost/CWT, $	2.78	3.06	5.92	5.10	4.22
Feed/hd/day, lbs	14	17	15	15	15
Feed Cost/CWT gain $	28.02	21.20	63.59	54.08	41.72
Feed Cost/hd $	8.39	11.66	19.65	15.95	13.91

Table 5. Four Year Average Gains and Economics for Bull Calves in Phase II.

	Control Calves	Creep Calves	Supplement Cows
No Head	43	43	43
Final Wt	514	532	533
Starting Wt	486	490	496
Gain, lbs	28	42	37
Ave Days Fed	22	22	22
Ave Daily Gain	1.27	1.92	1.68
Economics			
Total Feed/hd lbs	296	340	332
Feed Cost/CWT $	4.23	4.18	4.22
Ave Feed/day, lbs	13	15	15
Feed Cost/CWT Gain $	56.67	40.13	41.72
Feed Cost/hd $	12.34	13.94	13.91

Table 6. 1981 Weaning Gains, Feed Consumption and Economics for Heifer Calves Fed Two Ration Types in Phase II.

	Group I Control Calves	Group II Calves Creep Fed	Group III Calves From Supplemented Cows
Total No Heifers	9	9	9
Starting Wt, lbs	446.1	459.4	454.4
Final Wt lbs	458.9	489.4	462.2
Gain, lbs	12.8	30.0	7.8
Days Fed	21	21	21
Ave Daily Gain lbs	0.61	1.43	0.37
Feed Summary			
Feed/hd/lbs	255	327	230.6
Feed/hd/day	12.1	15.6	11.0
Creep Feed, lbs	--	9.7	--
Chopped Hay lbs	--	5.9	--
Economics			
Feed Cost/CWT, $	4.80	4.80	4.80
Feed Cost/CWT gain $	95.70	52.33	141.92
Feed Cost/hd $	12.25	15.70	11.07

Table 7. Summary-Weaning Gains and Economics for Heifer Calves in Phase II.

	1978	1979	1980	1981	Average
No of Calves	10	9	8	9	9
Days Fed	21	23	23	21	22
	CONTROL CALVES				
Final Wt, lbs	489	476	498	459	480
Starting Wt, lbs	468	431	489	446	458
Gain, lbs	21	45	8.7	13	22
Ave Daily Gain	1.0	1.98	0.38	0.61	1.0
Total Feed/hd, lbs	299	283	364	255	300
Feed Cost/CWT, $	2.54	2.77	5.75	4.80	3.97
Feed/hd/day, lbs	14	12	15.8	12.1	13.47
Feed Cost/CWT gain $	36.14	17.42	240.34	95.70	97.40
Feed Cost/hd $	7.61	7.84	20.91	12.25	12.15
	CREEP FED CALVES				
Final Wt, lbs	474	484	521	489	492
Starting Wt, lbs	420	423	498	459	450
Gain, lbs	54	61	23.2	30	42
Ave Daily Gain	2.57	2.69	1.01	4.13	1.91
Total Feed/hd, lbs	312	298	341	327	320
Feed Cost/CWT, $	3.11	3.27	5.21	4.80	4.10
Feed/hd/day, lbs	15	13	14.8	15.6	14.6
Creep Feed	10.2	10.7	12.2	9.7	10.7
Creep Hay	4.8	2.2	2.6	5.9	3.9
Feed Cost/CWT gain $	18.10	15.99	91.16	52.33	44.40
Feed Cost/hd $	9.71	9.75	21.15	15.70	14.08
	CALVES FROM SUPPLEMENTED COWS				
Final Wt, lbs	482	474	522	462	485
Starting Wt, lbs	452	436	506	454	462
Gain, lbs	30	38	15.6	8	23
Ave Daily Gain	1.42	1.69	0.68	0.37	1.04
Total Feed/hd, lbs	295	281	398	231	301
Ave Feed Cost/CWT	2.54	2.78	5.75	4.80	3.97
Feed/hd/day, lbs	14	12	17.3	11	13.5
Feed Cost/CWT gain $	25.12	20.56	146.67	141.92	83.57
Feed Cost/hd $	7.50	7.81	22.88	11.07	12.32

Table 8. Four Year Average Weaning Gains and Economics for Heifer Calves in Phase II.

	Control Calves	Creep Calves	Supplement Cows
No Head	36	35	36
Ave Final Wt	480	492	485
Ave Starting Wt	458	450	462
Gain, lbs	22	42	23
Ave Days Fed	22	22	22
Ave Daily Gain	1.0	1.91	1.04
Economics			
Total Feed/hd lbs	300	320	301
Feed Cost/CWT $	3.97	4.10	3.97
Ave Feed/hd/day	13.47	14.6	13.5
Creep Feed	--	10.7	--
Creep Hay	--	3.9	--
Feed Cost/CWT Gain $	97.40	44.40	83.57
Feed Cost/hd $	12.15	14.08	12.32

Summary:

In phase I, the pasture phase, the four year average calf gains were not very different. The calves nursing cows receiving six pounds of supplemental grain tended to make the best pasture gains, followed by the control calves and then those calves exposed to the creep feeder. Gains of both cows and calves were better in 1978 and 1980 than in either 1979 or 1981. During all four years, the control pastures have supported better than expected cow and calf gains. Cows receiving supplement gained weight in all four years the trial has been conducted.

Short term creep feeding prior to weaning allowed the calves to make the transition to feedlot conditions with little stress and continued good gains.

Results to date indicate that during years of good grass production, net returns from supplementing cows or creep feeding calves would be negligible. The control calves have gained as mich or more than calves nursing cows receiving a grain supplement or calves that had access to a creep feeder during the forty day trial period. However, the carry over effect on calves following weaning makes short-term creep feeding on fall pastures very desirable.

Upon weaning,, which was the beginning of Phase II, the calves were separated by sex into two post-weaning trials. Bull calves were used to evaluate the effects of supplementation, while the heifer calves were used to evaluate two types of weaning rations following late fall supplementation. In both post-weaning experiments, bull and heifer calves that had been creep fed on pasture gained the fastest and were the most efficient. Feed consumption in the feedlot after weaning averaged 15 pounds per day for creep fed calves and for calves that had nursed supplemented cows and 13 pounds for the control calves.

Heifer calves used to evaluate two types of weaning rations were fed either a high energy creep ration or a high roughage complete mixed ration. Heifers from the control and supplemented cow groups were self-fed the high roughage/low energy ration, and those heifers that had been creep fed on pasture received the same high energy creep ration free choice in drylot.

Using the same creep feeder and high energy creep ration fed under pasture conditions resulted in significantly faster gains, greater feed consumption and easier acclimation to the feedlot environment. In twenty tow days the creep fed calves gained 20 pounds more than the control calves.

Caution should be used when putting fresh weaned calves on a high energy ration such as the one used in this experiment. This ration is not recommended for calves that have not been exposed to the creep ration while nursing their dams on pasture.

It is also recommended that any calves that are to be creep fed should be vaccinated for blackleg, malignant edema, hemorrhagic speticemia and enterotoxemia.

It is important to note that high energy rations, typical of the creep ration used in this study, should only be fed during a short pre-conditioning period following weaning when fed to heifers of replacement potential. Longer feeding periods may result in undesirable fat deposits in the udder, which can adversely affect future milking ability.

Calf hood weaning diseases were very minimal in all of the treatments, and no advantage was measured for any of the treatments in terms of disease management.

SECTION II A

Compudose, Rumensin and Supplement for Grazing Yearling

Effect of Previous Pasture Treatments on Subsequent Feed Lot Gains and Efficiency

Dr. W.E. Dinusson

Compudose, Rumensin and Supplement for Grazing Yearling

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Appreciation is expressed to Mrs. Doug (Pat) Schonert for daily feeding and observation of cattle.

Introduction

A new growth stimulant Compudose (Estradiol 28), implanted in the ears of yearling steers, was evaluated with a supplement, and supplement plus Rumensin under pasture trials at the Central Grasslands Station.

The Lilly Research Laboratories of Greenfield, Indiana, bought the steers, paid for feed and operational expenses for the experiment.

Experimental Procedure

Seven hundred twenty acres of native grassland were divided into six pastures of comparable carrying capacity, all radiating out from a deep well. Temporary corrals were erected around the well to hold cattle for weighing, etc.

One hundred thirty -one yearling steers were purchased at an auction market and trucked to the station. There they were vaccinated with a four-way vaccine, wormed and ear-tagged. All steers were held in a 2.5 acre enclosure for ten days to acclimate them to an electric fence and accustom them to eating a 15% protein barley pellet. The steers were then individually weighed on two consecutive days. The first weighing provided for the removal of 11 steers. The remaining 120 steers were allotted at random within weight and breed groups to six lots of 20 steers each. Three of the lots were "heavy" and three lots were "lights" (Table 1). A second ear tag was added to color code the treatment groups at the second weighing. Steers within each lot were "paired" and one steer within each pair was implanted with Compudose (45 mg) in the ear. An average of the two-day consecutive weights was used as initial weights.

The steers were individually weighed every 28 days. They were weighed on two consecutive days for final weights at the end of a 112 day grazing period. The steers were not kept off feed prior to any weighing. The treatment groups were rotated from one pasture to another within replicate groups (i.e. "Light" and "heavy" replicates), every 14 days to minimize any effect of differences in pastures. A complete salt-mineral mix was provided in protected mineral feeders at all times. The 15% protein barley pellet was commercially prepared to specifications. Two types of pellets were made, plain and with 100 mg Rumensin per pound. For the initial seven days of the experiment one pound of the Rumensin supplement and one pound of supplement were fed to acclimate the steers to Rumensin for the two groups receiving the supplement plus Rumensin. Thereafter, two pounds of the Rumensin supplement were fed to provide 200 mg of Rumensin per steer daily. The other two supplemented groups received two pounds of the plain barley pellets daily. The pelleted supplement was hand fed daily in feed bunks. All implants were checked and those that had lost the Compudose were reimplanted at the first 28 day weigh period. The Compudose implants were removed from the ears at the end of the pasture phase.

Results and Discussion

Timely and adequate rains provided for good to excellent pasture. The grazing period was 112 days, from June 17 to October 7, 1980.

The results for the first 28-day weight period were very erratic. Excessive outbreaks of pink eye and root rot occurred during this period across all lots. Treatment for pink eye was either a neomycin-gentian violet spray or a Tylan and Neomycin powder. Very serious cases were also covered with an eye patch. Foot rot cases were treated with either an antibiotic (Pen-Strep, Terramycin or Tylam) injection or long-acting sulfaquinoxalin boluses. The problem with pink eye was minimal after the first 28 days. Near the end of the experimental pasture period, two steers were losing weight. Both had had serious pink eye as well as foot rot problems and on further checking were found to have BVD. They were removed and are not included in the final reports.

The lots receiving supplement gained 46% faster than those without after 56 days on trial. The Compudose implanted steers were gaining 18% faster than their nonimplanted mates.

The supplemented steers were gaining 6.5% faster than the nonsupplemented after the third weigh period (84 days). The Compudose steers were gaining 12.5% faster than the nonimplanted and the Rumensin supplemented steers were gaining 10.5% faster then the steers receiving the supplement without Rumensin.

TABLE 1. RESULTS OF CENTRAL GRASSLANDS GRAZING EXPERIMENT (112 DAYS).

	Supp + Rumensin	Supp	No Supp	Supp + Rumensin	Supp	No Supp
Lots:	1	2	3	4	5	6
	"Heavy" Replicate			"Light" Replicate		
No Steers	20	20	20	20	19	19
Initial wt (lb)[1]	578.5	577.0	577.0	484.0	487.8	481.4
Final wt (lb)[1]	799.6	782.1	738.8	713.6	704.6	682.2
Daily gain (lb)[2]	1.97	1.83	1.44	2.05	1.94	1.79
Daily gain-implants (lb)[3]	2.19	1.97	1.59	2.19	2.09	1.83
Gaily gain-implanted (lb)[4]	1.85	1.70	1.30	1.91	1.80	1.75
Supp per day (lb)	1.84	1.86	-	1.95	1.93	-

[1] Averages of two weights on consecutive days.

[2] Averages for 20 steers (19 in lots 5 and 6) both implanted and nonimplanted.

[3] Averages for the 10 implanted steers.

[4] Averages for the 10 nonimplanted steers.

The steers receiving the supplement gained 16.7% faster than the nonsupplemented controls for the entire 112-day grazing experiment. Part of this difference might be sue to the maturity of the forage late grazing period., when the forage drops in protein. The steers implanted with Compudose gained about 15% faster than nonimplanted mates. The steers receiving Rumensin ub the supplement gained 6.7% faster than the supplemented lots without Rumensin.

The final results are summarized in Table 1. The steers receiving supplement did not average 2 lb intake per day. There were several days when the steers did not come up to the feed bunks. However, the feeder Mrs. Pat Schonert, was very successful in calling the cattle to the feed bunks for the daily feeding of the supplement.

When the steer gains are regrouped by an alternate method, i.e., ½ of no supplement lots (lots 3 and 6) - those that received neither Compudose, supplement nor Rumensin and use these as a "negative" control, a different summary evaluates each treatment alone and in combination. This summary is presented in Table 2.

Table 2. Effects of Rumensin, Compudose and Supplement on Average Daily Gains of Yearling Steers on Pasture.

Compudose	Rumensin	Supplement	Number of Animals	Average Daily Gain lbs	Control =100
-	-	-	19	1.53	100
-	-	†	20	1.70	111
-	†	†	20	1.88	123
†	-	-	20	1.76	115
†	-	†	19	2.03	133
†	†	†	20	2.14	140

As can be seen from Table 2, those steers which received only pasture gained 1.53 pounds per day for 112 days. If they received about 2 pounds of a 15% barley supplement, they gained 1.70 or 11% faster than the negative control with pasture only. By the same token, two pounds of supplement with Rumensin increased gains by 23% over the negative control or 10.6% more than those receiving supplement only. The Compudose implants increased gains by 15% over negative controls (1.76 vs 1.53). The Compudose and supplement gained 33% faster than the negative control; whereas, the 20 steers receiving Compudose. Rumensin and supplement gained 2.14 pounds per day or 40% faster than the 19 steers which had only grass.

From a statistical point of view, all these differences were highly significant (P=0.01). As of this writing, Compudose has not received FDA approval and is not available for use in the United States.

Summaries for the feed lot phase and a measure of possible "carry-over" of the pasture treatments on feed lot performance is presented in the following report.

Compudose, Rumensin and Supplement for Grazing Yearling
Effect of Previous Pasture Treatments on Subsequent Feed Lot Gains and Efficiency

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Introduction

When different treatments or management practices are used on pasture, it is desirable to ascertain if any of these treatments would have an affect on subsequent gains and performance during finishing in the feed lot. To investigate this possibility steers from a grazing experiment conducted at the Central Grasslands Station were trucked to the Dickinson Experiment Station for the final finishing phase.

Experiment Procedure

At the conclusion of the pasture phase following the final weighing at the Central Grasslands Station, 118 yearling steers were loaded and trucked to the Dickinson Experiment Station. Upon arrival in the late afternoon, the steers were given a feeding of hay, and allowed to rest. The following morning they were vaccinated with a seven way Clostridium-Bacterin, implanted with 36 mg Ralgro and reallotted at random within previous treatment and weight groups to 12 lots. The steers from the two replicate pasture treatments were pooled and reallotted into four pens. Thus the twenty (or nineteen) steers in each pasture treatment were in two lots of 10 steers (or 9) to receive either Rumensin or none. One half of the 12 lots received Rumensin and half did not. All cattle were started on rations of 68 percent chopped mixed hay, 20 percent dry rolled corn, 4.8 percent soybean oil meal and 7 percent limestone, dicalcium phosphate and salt for about two weeks. Rumensin was mixed with corn and included in rations for half of the lots. During the first two weeks a level of 10 grams Rumensin per ton of premixed ration was used. The Rumensin then increased to 20 grams per ton for four weeks and finally increased to 30 grams per ton for the remainder of the trial. These levels approxima 100, 200, and 300 mg per steer per day.

The corn was increased and hay decreased until corn formed about 80 percent of the ration after 30 days on feed. The concentrate to hay ratio was 72.28 for the entire feeding period.

All steers were individually weighed at 28 day intervals with two consecutive day weighings for the trial weight. The steers were removed and sent to slaughter in three groups as they reached low choice grade or 1100 pounds. Complete carcass data was obtained. Statistical analysis were used to assist in interpretation of data.

Results and Discussion

The cattle receiving Rumensin grained an average of 3.05 pounds per day as compared to 2.84 pounds for those steers which did not receive Rumensin (table 1).

TABLE 1. RUMENSIN VS. NONE IN FEED LOT

	Average Daily Gain lbs	% Improvement Over Control	Feed Dry Matter per lb of Gain	% Improvement Over Control
No Rumensin (57 steers)	2.84	-	8.17	-
Rumensin (59 steers)	3.05	6.89%	7.65	6.36%

Although this was a difference of 6.89% faster for the Rumensin treated cattle, it was not statistically because of variation within treatment groups. The steers receiving Rumensin required 6.36% less feed per pound of gain (7.65 pounds of dry matter compared to 8.17 pounds). To convert these dry matter values to an "as fed" basis, increase by about 10%. The avearge daily dry matter intakes were 23.33 pounds for those fed Rumensin vs 23.20 for the steers not receiving Rumensin. Thus, Rumensin did not reduce daily feed intake. This was not expected with such high energy rations.

Two steers died during the finishing phase. One died within 12 days after starting on feed from enterotoxemia and a second steer died after 38 days on feed from becoming caught under a division fence. These two steers were removed from the data and were not included in these summaries.

One of the objectives of this experiment was to measure "carry over" effects, that is, whether previous pasture treatments had any effect on feed lot performance. The use of Compudose implants on the pasture phase did not affect the subsequent gains in the feed lot. The gains averaged 2.99 pounds per day for steers which had the Compudose compared to 3.08 pounds for those that did not. Of course, all steers in the feed lot were implanted with Ralgro.

Table 2 gives a summary of the steers by main pasture treatments and subsequent performance in the feed lot. There were no statistical differences in gains or feed efficiencies. Therefore, there were no carry-over effects of the pasture treatments.

If the steers are regrouped as was done in Table 2 of the previous paper pasture summary, this further substantiates the lack of carry over effect. This summary presented in Table 3.

There were no measured differences in carcass characteristics between cattle which received Rumensin and those which had not, nor between cattle from the different pasture treatments. The average quality grade was low choice and the yield was 2.7 for the steers which had not received Rumensin in the feed lot vs an average choice quality grade and a yield grade of 2.8 for the steers receiving Rumensin.

The percent of abscessed livers in cattle receiving Rumensin in the feed lot was more than twice that of the steers which did not receive Rumensin in the feed lot (17 vs 7%). However, there were no abscessed livers in the cattle that received Rumensin in both on pasture in the feed lot. Explanations as to this observation awaits further research.

<u>Pasture and Feed Lot Combined</u>

Combining the gain data from both the pasture and feed lot phase permits a summary of the 112 days during the pasture phase and 112 days feed lot phase. (The time the steers were in the feed lot varied from 93 days for an average of 112 days).

The 57 steers that had received Compudose implants on pasture gained an average of 2.46 pounds per day; whereas, the steers without Compudose ghained 2.38 lbs or 3.4% less. This is entirely due to the effect of Conpudose on the pasture phase because the Compudose implants were removed at the end of the pasture period and all steers were implanted Ralgro at the beginning of the feed lot phase.

Grouping by pasture treatment, the 39 control steers gained an average of 2.32 pounds per day for the entire two phase experiment. The 38 steers receiving only supplement gained 2.47 pounds and the 39 steers receiving Rumensin in the pasture supplement also gained 2.47 pounds per day. Both pasture supplemented lots gained 6.5% faster than the control.

If the steer gains are regrouped as was done in Table 3, performance can be measured for both pasture and feed lot phases. Table 4 presents such a summary. All the pasture treatments showed improvement for total gains ranging from 3 to 9% increase over the negative pasture control. All these increases are the result of the differences of gains on pasture because there were no "carry over" effects of pasture treatment on the feed lot gains. For example, using per steer for the 19 head by about 45 pounds over those received only pasture in phase one. These same steers had gained about 68 pounds more on pastuure and 23 pounds less in the feed lot phase but still maintained a 45 pounds advantage for the combined pasture and feed lot performance.

TABLE 2. EFFECT OF PREVIOUS PASTURE TREATMENTS ON FEED LOT PERFORMANCE

Pasture Treatment	Initial wt lbs	Final wt lbs	Avg Daily Gain Lbs	% Charge	Feed DM/ lb Gain	% Charge
Control No. Supp., No Rumensin (39 Steers)	711	1043	2.93	-	7.83	-
2 lbs Supp. No Rumensin (38 Steers)	744	1075	3.03	+3.4	7.84	+0.1
2 lbs Supp. 200 mg. Rumensin (39 Steers	757	1062	2.92	-0.4	7.99	+2.0

TABLE 3. EFFECT OF RUMENSIN, COMPUDOSE AND SUPPLEMENT PASTURE TREATMENTS ON FEED LOT GAINS

Compudose	Rumensin	Supplement	No. Animals	Average Daily Gain	Control=100%
0	0	0	19	3.09	100
0	0	†	20	3.09	100
0	†	†	20	3.06	99
†	0	0	20	2.99	97
†	0	†	18	3.09	100
†	†	†	19	2.89	96

TABLE 4. EFFECT OF RUMENSIN, COMPUDOSE, AND SUPPLEMENT PASTURE TREATMENTS ON COMBINED PASTURE AND FEED LOT GAINS

Compudose	Rumensin	Supplement	No. Animals	Average Daily	Control=100%
0	0	0	19	2.29	100
0	0	†	20	2.41	105.2
0	†	†	20	2.45	107
†	0	0	20	2.36	103.1
†	0	†	18	2.47	107.9
†	†	†	19	2.50	109.2

SECTION III

BREEDING AND MANAGEMENT TRIALS

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A COMPARISON IF BEEF CATTLE BREEDING METHODS TO IMPROVE PERFORMANCE

D.G.. Landblom and J.L. Nelson

Artificial insemination has been promoted for the number of years as being one management tool available to cattlemen that desire more rapid genetic advancement. Semen is available from a variety of artificial breeding organizations and private breeders. Superior sires can be selected from a large number of animals on the basis of their expected progeny difference as measured in the National Sire Evaluation Program.

Crossbreeding has been shown to be an effective method for increasing total pounds of calf weaned through the effects of hybrid vigor.

The economics of current beef cattle production leaves very little margin for error, particularly for the young producer. Therefore, management methods must be analyzed to identify those which will be the most profitable.

Crossbreeding, of course, means many things to many people. While a large number of breeds and combinations are available, our interests in this study was to evaluate overall production and economics among the most common breeds in southwestern North Dakota, namely, Hereford and Angus. In 1976 a five year study was designed to compare crossbred and straightbred breeding management systems using both natural service and artificial insemination.

In the trial, Hereford cows from the Dickinson Station herd were randomly divided by age and date of calving into three breeding groups during the period from 1976 to 1980. Group I contained an average 56 cow per year, which were inseminated each season with either Polled or Horned Hereford semen. Following a 25 day artificial breeding period, AI was terminated and Angus clean-up bulls were turned in. Groups II and III were the natural service Hereford and Angus treatments. The number of cows used in Groups II and II ranged from 25-32 head per year.

Heat detection in the AI group was done visually in 1976. In all subsequent years epididectomized bulls were used in addition to observation. To insure a short calving interval, breeding was discontinued after 60 days. The cows were pregnancy tested in September of each year, and all cows identified as open, old or otherwise por producers following performance testing were culled. Cows selected for AI 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 AI 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. When the cows were no longer in standing heat, they were turned in with an Angus clean-up bull.

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 breeding pasture. This crested wheatgrass pasture was sub-divided into uniform pie shaped units around the water supply. With this arrangement the cows has to pass through the breeding facility for and supplemental feed. 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 breeding at 8:00 AM each morning. All groups grazed separate crested wheatgrass pastures until approximately July 1st each year, depending on pasture conditions, and were then moved to native pastures. Minerals were fed free choice in a 2:1 salt-di-calcium phosphate mixture to insure adequate phosphorus intake. During May and early June, a level of 15% magnesium oxide was added to the mineral mixture as a grass tetany preventative.

Breeding and calving summaries for 1980 and the combined period from 1976-1980 are shown in tables 1 and 2. Combined actual and 205 day adjusted weaning weights are summarized in table 3. An economic evaluation of each management system is shown in table 4 for the 1980 calf crop; economics for the combined calf crops has been summarized in table 5.

Summary:

Artificial breeding conception rate registered in this study ranged from a low of 37% to a high of 91% and averaged 48%. Changes in cow handling and facilities resulted in significant increases in AI breeding success, as well as a significant reduction in labor.

Angus X Hereford (BWF) steer calves sired naturally were 10 pounds heavier than the artificially sired Hereford steers and were 28 pounds heavier than the naturally sired straightbred Hereford steers. Comparing the heifers, no

difference existed in weaning weight between the straightbred Hereford females sired artificially and the naturally sired BWF heifers. In contrast, however, the naturally sired Hereford heifers were 16 pounds lighter than the artificially sired females.

Lighter weaning weights among calves sired by clean-up Angus bulls in the AI system was significant. Calves from clean-up bulls were 46 pounds lighter than the other BWF crossbred calves produced in the natural service crossbreeding group.

Genetic improvement among artificially sired calves was significant compared to the naturally sired Hereford calves. However, improvement in the artificial breeding system was not great enough to offset the loss in weaning weight among cows that didn't settle on the first service. Major factors contributing to reduced profitability when breeding artificially are: 1) conception rate; 2) facility, equipment, semen, and flushing feed expenses; and 3) labor.

Crossbreeding naturally, under the conditions of this experiment, has resulted in heavier weaning weights and higher gross and net return per cow.

Table 1. Breeding and Calving Summary, 1980 Calf Crop.

	A.I. System		Natural Service	
	A.I (HxH)	Angus Clean-up (AxH)	Hereford (HxH)	Crossbred (AxH)
Total no. cows	46		24	21
Total no. cows inseminated	46		0	0
No. sold for mgmt. reasons	0		0	0
No. having AI calves	42			
1st service conception rate, %	91			
No. calves from Angus clean-up bull		4		
No. dead calves	2	1	2	0
No. of calves				
Steers	24	2	10	10
Heifers	16	1	12	8

1/ Once a day breeding at 8:00 AM.

Table 2. Five Calf Crop Combined Breeding and Calving Summary 1976-1980.

	A.I. System		Natural Service	
	A.I (HxH)	Angus Clean-up (AxH)	Hereford (HxH)	Crossbred (AxH)
Total no. cows	283		137	125
Total no. cows inseminated	283			
No. sold for mgmt. reasons	36		32	23
No. having AI calves	136			
1st service conception rate, % (range, %)	48(37%-91%			
No. calves having (AxH) calves from Angus clean-up bull		10		
No. dead calves	9	6	13	4
No. and sex of calves obtained				
Steers	71	61	44	49
Heifers	56	44	47	49

Table 3. Combined Actual and 205 Day Adjusted Weaning Weights from Five Calf Crops Born from 1976-1980 in a Three Breeding Management System Comparison.

	A.I. Hereford with Angus Clean-up				Natural Service Hereford		Natural Service Angus	
Systems	No. Hd.	(HxH)	No. Hd.	(AxH)	No. Hd.	(HxH)	No. Hd.	(AxH)
Steers								
Actual weight	71	462	61	426	44	444	49	472
Adjusted weight[1/]		477		478		471		498
Heifers								
Actual weight	56	427	44	392	47	411	49	428
Adjusted weight[1/]		469		470		459		474

[1/] Adjusted according to the guidelines of the North Dakota Beef Cattle Improvement Association.

Table 4. Economic comparison-Systems of breeding, 1980.

	A.I. Hereford with Angus Clean-up				Natural Service Hereford			Natural Service Angus		
Systems	No. Hd.	Avg. Wt. $	(HxH) Value	(AxH) Value	No. Hd	Avg. Wt. $	Value	No. Hd	Avg. Wt. $	Value
Steers @ 85¢/CWT	24	515	10,506		10	512	4,352	13	543	6,000
	2	443		753						
Heifers @ 80¢/CWT	16	475	6,080		12	449	4,310	8	476	3,046
	1	420		336						
Total, $			16,586	1,089			8,662			9,046
Gross return/system, $			17,675				8,662			9,046
No. Cows calves			46				24			21
Avg. return/cow calved			$384.23				$360.23			$430.76
Less breeding expense			-17.00				-11.50			-11.50
			$367.23				$349.43			$419.26
Less est. annual expense/cow[1/]			310.50				310.50			310.50
Net return/cow, $			$56.73				$38.93			$108.76

[1/] Annual expense per cow taken from the North Dakota Farm Management Planning Guide, Section V:II, entitled, Determining Beef-Cow Costs by Billy Rice and Norm Toman.

Table 5. Economic analysis of 5 year combined calf crop when comparing three breeding management systems.

Systems	A.I. Hereford with Angus Clean-up				Natural Service Hereford			Natural Service Angus		
	No. Hd.	Avg. Wt. $	(HxH) Value	(AxH) Value	No. Hd	Avg. Wt. $	(HxH) Value	No. Hd	Avg. Wt. $	(AxH) Value
Steers @ 85¢/CWT	71	462	27,882		44	444	16,606	49	472	19,659
	61	426		22,088						
Heifers @ 80¢/CWT	56	427	19,130		47	411	15,454	49	428	16,778
	44	392		13,798						
Total, $			47,012	35,886			32,060			36,437
Gross return/system, $			82,898							
No. Cows calves			247				104			102
Avg. return/cow calved			$335.62				$308.27			$357.23
Less breeding expense			-17.00				-11.50			-11.50
			$138.62				$296.77			$345.73
Less est. annual expense/cow[1/]			310.50				310.50			310.50
Net return/cow, $			$8.12				$-13.73			$35.23

[1/] Annual estimate expense per cow was taken from the North Dakota Farm Management Planning Guide, Section V:II, entitled, Determining Beef-Cow Costs by Billy Rice and Norm Toman.

RUMENSIN FOR WINTERING PREGNANT BEEF COWS

D.G. Landblom and J.L. Nelson

Rumensin (monensin sodium) improves feed efficiency of growing and finishing cattle under pasture and feedlot conditions. Review of the literature indicates an increase in efficiency ranging from 7% in feedlot conditions to as high as 16% under pasture conditions.

It would be very worthwhile if a similar reduction in winter feed costs be realized for the brood cow herd, since the cost of wintering in North Dakota is one of the largest expenses facing the cow-calf producer. Considerable research has been, and is currently being conducted throughout the United States with Rumensin in cow wintering rations. Eli Lilly & Co., manufacturer of the additive has applied to the Food and Drug Administration for clearance for this purpose. However, its use at this time is strictly for experimental purposes only.

In this trial, conducted in cooperation with Eli Lilly & Co., 52 pregnant Hereford cows were randomized by age, weight and estimated fetal age and allotted into four winter feeding groups yearly. Each winter two lots of 13 cows served as controls and two lots of 13 cows received the Rumensin feed additive. The control cows were fed an all mixed hay (1/3 alfalfa, 1/3 crested wheatgrass, and 1/3 bromegrass) ration at the rate of 27.8 pounds/head/day on an as fed basis, plus a 3/8 inch pelleted barley supplement, fed at the rate of 2 pounds/head/day. The Rumensin fed cows received the same wintering ration with two exceptions, 1) barley supplement contained Rumensin at the 100 mg per pound rate 2) the daily intake of mixed hay was reduced by 7%. Following an initial adjustment period of 5 days the Rumensin level was increased from 100 mg per head per day to 200 mg per head per day for the remainder of the wintering trial.

Moisture content of the roughage was checked periodically and adjustments in dry matter were made accordingly.

Calving started the last week in February each year and was completed the third week of April each year. Any cows that lost calves or wouldn't claim calves were removed from the study and appropriate adjustments were made for feed consumption.

A free choice mineral supplement consisting of two parts trace mineral salt and one part di-calcium phosphate was available free choice throughout the trial.

The cows were weighed every 28 days and each cow was weighed the day following calving to measure actual body weight gain or loss for the winter gestation period. Calf weights were taken at birth, close of wintering period, and when weaned in mid-October each year.

Summary:

A consistent satisfactory response to Rumensin has been obtained each year on this experiment. Cows wintered with 200 mg Rumensin and 7% less dry matter intake per head per day performed the same as control cows, throughout the 174 day wintering period.

When the data is separated into pre-calving and post-calving intervals, cows fed 200 mg Rumensin daily gained two tenths of a pound faster than control cows; but lost significantly more weight during the post-calving lactation period. Rumensin cows lost -1.73 lbs per head per day compared to -.63 lbs per head per day among the control.

Expressed in terms of dollars and cents, feeding Rumensin and reduced feed intake amounted to a savings in wintering costs of $13.20 per head.

Calf birth weights, liveability, weight per day of age and adjusted weaning weights were unaffected by either wintering method.

Table 1. Three year average weight changes among cows wintered with and without 200 mg Rumensin per head daily.

	200 mg Rumensin	Control
Weight change for entire trial:		
No. head	69	72
Initial wt., lbs	1079	1093
Final wt,, lbs	1039	1084
Gain, lbs	-40	-9
Days Wintered	174	174
ADG, lb	-.23	-.05
Weight change during period before calving:		
Initial wt., lbs	1079	1093
Weight 24 hrs., after calving, lbs	1129	1117
Gain, lbs	50	24
Avg. days wintered before calving	122	122
ADG, lbs	.40	.20
Weight change after calving:		
Weight 24 hrs. after calving	1129	1117
Final wt., lbs	1039	1084
Gain, lbs	-90	.33
Days wintered after calving	52	52
ADG, lbs	-1.73	-.63

Table 2. Three year average as fed and dry matter feed consumption and economics for cows wintered with and without 200 mg Rumensin per head daily.

	200 mg Rumensin	Control
As fed feed summary:		
No. head	69	72
Total feed consumed, lbs	309,273	348,707
Feed 1 head, lbs	4482	4843
Feed 1 head 1 day, lbs	25.7	27.8
Dry matter feed summary		
Total moisture free feed consumed, 1 lbs	255,015	282,686
DM intake 1 head, lbs	177.69	3926
DM intake 1 head 1 day, lbs	21.2	22.6
Wintering Economics w/200 mg Rumensin		
Total feed cost, $	12,261.14	13,744.76
Feed cost 1 head, $	177.69	190.89
Feed cost 1 day, $	1.02	1.09
Cost saving using Rumensin/cow	$13.20	

Table 3. Three year average birth and weaning weight summaries among cows wintered with and without 200 mg Rumensin per head daily.

	200 mg Rumensin		Control	
	Bulls	Heifers	Bulls	Heifers
Calving:				
No. Head	38	32	39	33
Birth Wt. Range, lbs	74-110	52-93	74-105	66-95
Avg. Birth wt., lbs	88	76	81	81
Weaning:				
No. Head	38	32	39	32
Adjusted Wean wt. range, lbs	433-623	389-576	403-618	391-578
Avg. adjusted wean wt., lbs	511	496	505	516

Table 4. Average interval between calving and conception among cows wintered with or without 200 mg Rumensin per head daily.

	200 mg Rumensin	Control
No. Head	26	25
Total interval, days	2290	2151
Avg. interval between calving & conception, days	91.6	86.0

ESTRUS SYNCHRONIZATION AND CALVING EASE AMONG FIRST CALF HEIFERS

D.G. Landblom and J.L. Nelson

Managing heifer replacement so they will calve as two year olds with a minimum of difficulty has been, and continues to be a problem for many cow-calf producers. One solution is to delay breeding and calve them as three year olds. Unfortunately, the economics of modern beef cattle production won't allow such a delay. Several management tools are available which, when combined may be useful in getting heifers that are bred early in the calving season to give birth to live calves with a minimum of difficulty. Artificial insemination is one such tool available to cattlemen. Through its use sires with progeny records that are known to promote easy calving and about average performance can be selected. Estrus synchronization has been shown to be an effective method for shortening the AI breeding season, enabling the livestock producer to concentrate his labor. Prosta glandin F_2 Alpha, a naturally occurring compound in animal systems, was released in 1980 under the direction of veterinarians and is being marketed under the trade name Lutalyse. In addition to AI and estrus synchronization, research at the station has shown that Longhorn bulls can be used to minimize calving difficulty. Using these ideas, a breeding management study for first calf heifers was designed with the following objectives: 1) to evaluate two methods of estrus synchronization; 2) to minimize calving difficulty by using AI and progeny tested sires for first service breeding and the Longhorn breed for clean-up purposes; and 3) to identify and efficient heifer management system.

In this experiment, Hereford and Angus X Hereford heifer calves are being sorted into wintering groups according to the daily gain required to weigh 650-700 pounds or more at the start of the breeding season.

Before breeding in this trial could begin, it was necessary to determine the level of cycling activity among the heifers. In 1979, KaMaR heat detection devices and rectal palpation were both used to identify those heifers that were cycling. K-Markers were put on the heifers 30 days before the predetermined breeding date of June 1st. Each heifer was palpated at the start of the breeding season and scored as being sexually mature or immature. The heifers were then allotted according to wintering level and estrus activity into two breeding groups. Because too many false readings were obtained with the KaMaR devices, in 1980 sterile bulls were placed with the re-allotted heifers 30 days before breeding to measure the level of pre-breeding estrus activity.

The two breeding groups in this study were used to evaluate two different management methods for using the estrus synchronization compound, Lutalyse. A single injection of Lutalyse is being compared with the recommended double injection.

Group one was synchronized using the single injection method. With this method, heifers are inseminated conventionally during the first five days of the breeding season. On the sixth day at 8:00 AM all heifers not inseminated during the first five days of breeding are given 25 mg Lutalyse. After the Lutalyse is administered, AI breeding is continued until 80 hours has elapsed. At that time all remaining undetected heifers were inseminated as a group. Following the group insemination and a five day waiting period, the heifers were exposed to a Longhorn clean-up bull equipped with a chin-ball marker. Group two was synchronized with the double injection method. Using this method, two injections of Lutalyse separated by eleven days are used. None of the heifers were inseminated during the eleven day period between injections. Our abbreviated description of how each group was synchronized is shown in table 1.

Semen from an Angus sire, Shoshone Monitor 17An50, was purchased from Minnesota Valley Breeders Assn. In 1979, and in 1980 semen from an Angus bull, Kadence Shoshone 7An47, was purchased from Select Sires, Plains City, Ohio. These sires have both been recommended by the suppliers as being easy calvers and known to transmit growth performance to their offspring.

Synchronized breeding results accumulated to date are shown in tables 2 and 3.

<u>Summary</u>:

Synchronization results with first calf heifers have been variable in the two years that this trial has been in progress. Pre-breeding estrus activity in 1979 was ver low following a long wintering period, and as expected conception rate was also low. Synchronization the following year was much more successful. Pre-breeding estrus activity is being monitored to better predict unexpected results from synchronization. Estrus activity in 1979 ranged from 10% in the single injection group to 33% in the double injection group, whereas, in the second year of the study 88% of the heifers in both groups were cycling before breeding started. Conception rate following synchronization in 1979

ranged from .5% to 19% in the single and double groups respectively, and in 1980 ranged from 46% to 58% in the single and double injection groups. The level of pre-breeding estrus activity recorded here appears to be a stron indicator of probable success or failure when deciding whether or not to invest in Lutalyse.

Calving difficulty varied with the sire used. The first Angus bull used, 17An50 produced the only calving difficulty experienced, but sired calves that performed very well. Due to the number of difficult births experienced with 17An50 wr switched to another Angus bull 7An47 which is also being promoted for calving ease and performance. No difficulty has been experienced with this bull and performance has been satisfactory.

These data are based on limited numbers and the trial is being continued. Trends are developing. However, drawing firm conclusions from this progress report should be avoided until the trial is completed.

Table 1. Design for estrus synchronization.

Single Injection Method		
	Days of breeding season:	
	1	
	2	
Period I	3	Inseminate normally 1st five days of breeding season.
	4	
	5	
	6	8 AM administer 25 mg Lutalyse to all heifers not inseminated during period I.
Period II		
	7	Continue breeding normally until 80 hrs post injection time.
	8	
	9	At 4 PM (80 hrs after the Lutalyse injection) all heifers not inseminated during periods I and II were inseminated as a group without regard to standing heat.
Double Injection Method		
	Day of breeding season:	
	11 days before start of breeding season	Administer 25 mg Lutalyse
	1	The 2nd injection of Lutalyse is given at 8 AM on the 11th day, which is the start of the breeding season.
	2	Inseminate normally all heifers found in standing heat until 80 hrs post injection time.
	3	
	4	At 4 PM (80 hrs after the 2nd injection of Lutalyse) all heifers not inseminated during the 80 hr period are inseminated as a group without regard to standing heat.

The heifers were placed with a Longhorn clen-up bull after a five day waiting period.

Table 2. Synchronization results and partial economics among Hereford and Angus X Hereford first calf heifers.

	Single Injection		Double Injection	
Synchronization:	1979	1980	1979	1980
No. Head	20	24	21	24
No. cycling before Synchronization	2 (10%)	21(88%)	7 (33%)	21 (88%)
No. showing heat before 80 hrs.	5 (25%)	19 (79%)	4 (19%)	18 (75%)
No. not detected & Insem. at 80 hrs.	15 (75%)	5 (21%)	17 (81%)	6 (25%)
No. conceiving to Synchronization estrus	1 (.5%)	11 (46%)	4 (19%)	14 (58%)
No. open after preg. test	6 (30%)	7 (29%)	3 (14%)	3 (13%)
Economics:				
Semen Costs/straw, $	6	8	6	8
Lutalyse Cost/hd, $	5	5	10	10
Total cost/hd, $	11	13	16	18
Total treatment cost $	220	312	336	432
Cost/cow conceiving at Synchronization estrus, $	220	28.36	84	30.85

Table 3. Calving difficulty, birth weights and adjusted weaning weights among synchronized Hereford and Angus X Hereford first calf heifers.

Management Method		Single Injection				Double Injection		
		1979	1980			1979	1980	
Calving ease:								
No. calving		20	16			20	21	
No. calving unassisted		18	16			17	21	
Calving difficulty								
AI Angus								
Shoshone Monitor								
17An50		1 (5%)				2 (10%)		
Kadence Shoshone								
7An47			0				0	
Station Angus (A94)		1 (5%)				1 (5%)		
Longhorn		0	0			0	0	
Birth Weight:	Bulls	Hfrs	Bulls	Hfrs	Bulls	Hfrs	Bulls	Hfrs
AI Angus								
Shoshone Monitor								
E317An50	72	--			85	72		
Kadence Shoshone								
520 7An47			70	67			62	63
Station Angus (A94)	73	--			67	70		
Longhorn	65	63	66	58	69	60	56	57
Adjusted weaning weight:								
AI Angus								
Shoshone Monitor								
17An50	--				556	589		
Kadence Shoshone								
7An47			519	524			319	564
Station Angus (A94) 520 (2)	520	--			473	544		
Longhorn		404	561					
Longhorn					463	362		382

A COMPARISON OF TWO ESTRUS SYNCHRONIZATION METHODS IN MATURE COWS

D.G. Landblom and J.L. Nelson

Prostaglandin F_2 Alpha (Lutalyse), a naturally occurring compound in animal systems, has been released by the Food and Drug Administration under the direction of veterinarians for synchronization of estrus in beef cattle. Previous research conducted at many universities in the U.S. and at this station clearly shows that estrus cycles can be successfully synchronized in cattle that are cycling normally. Research for FDA clearance was conducted using the double injection method. Each injection costs approximately $5.00 at today's prices, and requires handling the cows twice. More recently it has been proposed that costs and handling could be reduced by using a single injection method. Very little research in the management of using one versus two injections of Lutalyse has been reported at this time. Therefore, this trial is designed to evaluate the management, economics and reproductive success when using a single or double injection system.

Hereford cows ranging in age from 5 to 10 years were randomly assigned according to their post calving interval to either the single or double injection group. Each of the methods has been outlined in detail in table 1.

To reduce sire variability, five different AI bulls were used at random, and were as follows: Kadence Shoshone, 520 (7An47), PS Sasquatch 904 (7An61), Emulous 494 GDAR (7An41), Black Dot Chaparral King 276 (7An52) and PS Franco 064157 (7An56). An average semen cost of $6.00 per straw was incurred, Hereford clean-up bulls were used to complete a 60 day breeding season. The cows were palpated in the fall and any identified as open were sold.

A summary of the first year's results are shown in table 2.

Summary:

Lutalyse (Prostaglandin F_2 Alpha) can be used several different ways to synchronize estrus in beef cattle. This trial has been designed to evaluate two of those methods in an attempt to reduce labor, handling and costs while maintaining equal or better reproductive performance.

A single injection of Lutalyse given once to all cows not detected and inseminated after five days of artificial breeding was compared with administering two injections separated by eleven days. Detailed description of each treatment is available in table 1. Results from one year of data collection are being reported here. Some trends are evident, however, several breedings will be needed before final conclusions can be drawn.

Single injection management required more days of labor, but was much more successful resulting in higher conception rate, reduced labor and handling, and subsequently lower per head costs. Synchronized conception rate ranged from 52% in the double group of 75% in the single injection group. The number of cows cycling after the 80 hr. synchronized breeding was 6 times greater in the double injection group and synchronized conception rate among them very low. This aspect accounts for most of the variation in reproductive success between these two management methods.

Economics favored the single injection group by a wide margin. Costs per synchronized cow conceiving ranged from $13.66 in the single group to $30.76 in the double injection group.

Table 1. Design for estrus synchronization.

Single Injection Method		
	Days of breeding season:	
	1	
	2	
Period I	3 4	Inseminate normally 1st five days of breeding season.
	5	
	6	8 AM administer 25 mg Lutalyse to all heifers not inseminated during period I.
Period II		
	7 8	Continue breeding normally until 80 hrs post injection time.
	9	At 4 PM (80 hrs after the Lutalyse injection) all heifers not inseminated during periods I and II were inseminated as a group without regard to standing heat.
Double Injection Method		
	Day of breeding season:	
	11 days before start of breeding season	Administer 25 mg Lutalyse
	1	The 2nd injection of Lutalyse is given at 8 AM on the 11th day, which is the start of the breeding season.
	2 3	Inseminate normally all heifers found in standing heat until 80 hrs post injection time.
	4	At 4 PM (80 hrs after the 2nd injection of Lutalyse) all heifers not inseminated during the 80 hr period are inseminated as a group without regard to standing heat.

The heifers were placed with a Longhorn clen-up bull after a five day waiting period.

Table 2. Synchronization, Adjusted weaning weights and partial economics among cows comparing two methods of estrus synchronization.

Management Method	Single Injection		Double Injection	
Synchronization:				
No. Head	24		25	
No. Inseminated 1st 5 day	8 (32%)		--	
No. In heat before 80 hrs.	15 (94%)		19 (76%)	
No. not detected & Insem. at 80 hrs.	1 (6%)		6 (24%)	
No. Conceiving at synchron. after 80 hrs	1 (100%)		2 (33%)	
No. conceiving at synchron. estrus	18 (75%)		13 (52%)	
No. Open after preg. Test	4 (17%)		3 (12%)	
Days of labor required	8		5	
Adjusted Weaning Weight:				
	Bulls	Hfrs	Bulls	Hfrs
No. Synchron. Calves weaned	8	8	7	6
205 days Adj. weight, lbs	485	525	539	488
No. calves by clean-up bull weaned	1	1	3	6
205 day adj. weight, lbs	437	470	520	484
Partial Economics of Synchron:				
Cost 1 straw, $	6		6	
Cost 1 cow for Lutalyse, $	5		10	
Total, $	11		16	
Cost/synchron. cow conceiving	11		16	
	.75=14.66		.52=30.76	

SECTION IV

Calf Diarrhea Studies

This research is conducted cooperatively by D.G. Landblom, Dickinson Station and I.A. Schipper, D. Alstad, T.P. Freemand, P. Kotta, L. Ludeman, K. Fischer and D. Krough, Department of Veterinary Science, North Dakota State University.

Calf Diarrhea Investigations

I.A. Schipper, D. Landblom, D. Alstad, T.P. Freeman,
P. Kotta, L. Ludemann, K. Fischer, and D. Krough

Investigations have continued on a cooperative basis for the third year in the cause and prevention of calf diarrhea.

Vaccination of Cows with E. coli Bacterins

Thirty-four cows were vaccinated two times with a commercially available E. coli vaccine. Of the calves delivered from these cows, three had clinical diarrhea (8.9%) while four calves of 38 controlled cows exhibited clinical diarrhea (10.5%). E. coli bacteria were isolated from all diarrheic calves in both experimental and control groups.

In comparison, calves of herds, other than the Dickinson Experiment Station, demonstrated that of 1,295 vaccinated cows there were 61 cases of clinical diarrhea (4.7%) with 4.6% of the calves of controlled cows exhibiting clinical diarrhea.

Infectious Agents Associated with Clinical Diarrhea

There were 14 clinical diarrhea cases studied, 12 of which were positive for E. coli bacteria, one of which has a K99 serotype E. coli. Ten of the calves had either the rotavirus or the coronavirus or both. All of the 10 calves positive for the rotavirus and coronavirus were positive for E. coli bacteria. No presently recognized pathogenic agent was detected in two of the calves exhibiting clinical diarrhea.

Feces of calves not exhibiting clinical diarrhea were examined (controls). Of 118 specimens, 92 positive E. coli bacteria, nine of which had K99 serotypes.

Twenty-six cows vaccinated with the rota-corona attenuated virus vaccine and 26 were used as controls (not vaccinated). The coronavirus was isolated from three of the calves from vaccinated cows and three of the controlled calves. The rotsvirus was isolated from one control calf and two of the calves from vaccinated cows.

In comparison, examination of 68 calf fecal specimens, 16 (23.5%) were positive for coronavirus and 10 (14.7%) were positive for rotavirus. Ten of the calves exhibited clinical diarrhea.

Calf Serum Immuglobulin G (IgG) Levels

Calf serum (80 samples) were examined for IgG levels. Blood serum samples were collected at approximately 36 hours post-birth. Eight calves of this group exhibited clinical diarrhea. The IgG serum levels of these calves ranged from 3,000 to 8,000 mg/d1 with a mean average of 3,650 mg.d1. The IgG levels of the calves not exhibiting clinical diarrhea was 740 to 14,800 mg/d1 with a mean average of 5,850 mg/d1.

Antibiotic Resistance

Seventy-four E. coli isolated from calf feces were examined for drug susceptibility. The drugs tested were ampicillin, chloromycetin, cephalothins, erythromycin, furadantin, kanamycin, gentamicin, neomycin, penicillin, oxytetracycline, and triple sulfa.

Ninety-six percent was susceptible to chloromycetin and furadantin. The greatest drug resistance was demonstrated fro penicillin, oxytetracycline, neomycin, and triple sulfa

SECTION V

SWINE RESEARCH

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ARTIFICIAL INSEMINATION OF GILTS

J.L. Nelson and D.G. Landblom

Past research at this station has indicated that two inseminations at 12 and 24 hours after the detection of standing heat has resulted in better conception rates than one insemination given 12 hours following the onset of standing heat. Recent research studies indicate that ovulation in the gilt occurs at approximately 18-20 hours after hte onset of standing heat. In an effort tp reduce the cost of insemination and ovulation, thereby eliminating one insemination. This trial was designed to compare the economics and reproductive performance of one insemination at 19-20 hours post detection of standing heat compared to one insemination at 24 hours post detection or the current recommendation for two inseminations spaced 12 hours apart.

In January 1980, thirty crossbred gilts were randomly allotted into three breeding groups. All gilts were handled as uniformly as possible, the only difference being the actual time of insemination. Live boars were used to detect standing heat twice a day at 7:30 AM and again at 4:00 PM. Any gilt that would stand for the boar ws marked, removed from the herd and placed in individual pens inside a barn where the actual insemination too place. In order to reduce variability with the frozen semen, a special three breed mixed semen collection was prepared by international Boar Semen. In 1980, the mixed semen was collected from the boars Five Star Primer 93004. A Duroc; Compatable 950013, a Landrace; and Express 97005, a Spot. The actual cost of the frozen semen amounted to $11.10 per ampule not including freight, liquid nitrogen, equipment or time value.

All gilts included in this project were checked on a daily basis for return to estrus. Those returning were bred naturally to a registered Yorkshire boar (DES 15-17). The gilts were farrowed during the month of May.

In January 1981, the trial just described was repeated using the same methods except the mixed semen collection was from three different boars housed at International Boar Semen Eldora, Iowa. Semen used in 1981 was from the following boars: No. 970010 Complete (Spot), 930010 Balancer (Duroc) and 950019 Bokedal (Landrace).

Method of semen handling and insemination technique followed that recommended by International Boar Semen.

Results of both years trial are shown in the following tables.

Table 1. Comparison of Single or Double Inseminations in the A.I. Trial with Gilts, 1980.

	Single @ 20 hours Post Det.	Single @ 24 hours Post Det.	Double @ 12 & 24 hrs. Post Det.
No. Of Gilts inseminated	10	10	8
No. Of Gilts farrowing	7	6	4
% Conception	70%	60%	50%
Total pigs born	42	52	26
Avg. pig/litter farrowed	6	8.6	6.5
No. pigs farrowed/gilt insem.	4.2	5.2	3.25
Insemination cost/pig born	$2.64	$2.13	$3.41

Table 2. 1981 Results of Timed Insemination of Gilts.

	Single @ 20 hours	Single @ 24 hours	Double @ 12 & 24 hrs/.
No. Of Gilts inseminated	9	9	9
No. Of Gilts farrowing	2	3	1
% of A.I. conception	22.2%	33.3%	11.1%
Total pigs born	10	12	6
Avg. pig/litter farrowed	5	4	6
No. pigs farrowed/gilt insem.	1.1	1.3	.66
Insemination cost/pig born @ $17.33 per tube of semen	$15.60	$13.00	$26.00

Discussion:

The weather in 1981 was relatively mild with little snow. The gilts were cycling in a normal manner, and actual insemination was done in a careful, uniform manner, except for time of actual insemination. The use of a detection boar made detection and insemination rather easy because his presence provides aa good stimulus.

Results of the 1981 trial were very disappointing, with conception ranging from 11 to 13% only. There did not appear to be any trend or advantage for any of the insemination times used. Gilts not settled to A.I., later conceived to natural breeding with normal litters produced.

Summary:

While technique and semen used appeared to be normal, poor conception in 1981 would suggest low semen quality. Because of poor conception and small litter size, we could not recommend this method of breeding gilts. We hope to continue this study.

FOUR FEEDING SYSTEMS FOR GROWING-FINISHING SWINE

D,G, Landblom, J.L. Nelson, and T.J. Conlon

AGNET computer service which provides the capability of formulating least cost swine rations is available to North Dakota producers through their county extension 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 at least cost computer formulated rations with three other feeding options.

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

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

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 manufacturers directions.

c) Grower-finisher rations formulated using home-grown grains and a commercially prepared protein concentrate.

d) Grower-finisher ration recommended by the Diockinson 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 Fed During the Summer, 1980.

	Grower Ration Types				
	GTA Developer Complete Pelleted	AGNET	Dickinson Basic	GTA Commercial Supplement	
Ingredients	40-70 lbs	50-80 lbs	40-120 lbs	40-70	70-125
Oats-lbs	-	-	285	-	-
Barley-lbs	-	752	572	825	875
Soybean Oil Meal-lbs	-	140	120	-	-
Alfalfa-lbs	-	74	-	-	-
Limestone-lbs	-	6	11	-	-
DiCalcium Phosphate-lbs	-	12	6	-	-
Trace Minerals Salt-lbs	-	6	5	-	-
d1 Methionine-lbs	-	0.8	-	-	-
GTA Vita Pack-lbs	-	9.2	-	-	-
GTA Six in One Supplement-lbs	-	-	-	175	125
B-Vitamin Complex-lbs	-	-	1	-	-
Vitamin A-gms	-	-	30	-	-
Vitamin D-gms	-	-	14	-	-
Zinc Sulfate-gms	-	-	180	-	-
cost/1000# including processing	1,000	1,000	1,000	1,000	1,000
@ $10/ton	$84.40	$75.77	$67.03	$73.27	$68.62

Table 2. Finishing Ration Composition Fed During the Summer, 1980.

	Finisher Ration Types			
	GTA Developer Complete Pelleted	AGNET	Dickinson Basic	GTA Commercial Supplement
	70 lbs Market	80 lbs Market	120 lbs Market	125 lb Market
Oats	-	-	285	-
Barley	-	800	613	912.5
Soybean Oil Meal	-	70	80	-
Alfalfa	-	98	-	-
DiCalcium	-	6	6	-
Limestone	-	10	10	-
Trace Minerals Salt	-	6	5	-
B-Vitamin Complex	-	-	1	-
Vitamin A-gms	-	-	30	-
Vitamin D-gms	-	-	14	-
Zinc Sulfate-gms	-	-	180	-
GTA Six in One	-	-	-	75
GTA Swine Mineral-10	-	-	-	10
GTA Hi Vita	-	-	-	2.5
cost/1000# including processing	1,000	1,000	1,000	1,000
@ $10/ton	$68.00	$70.48	$64.52	$6.74

Table 3. Performance of Pigs Fed Four Ration Types During Summer of 1980.

Performance	GTA Commercial Pellet		AGNET Ration		Dickinson Basic		GTA Commercial Supplement	
Lot no.	2	7	5	8	3	6	1	4
No. head	7	6[1/]	7	7	6[2/]	7	7	7
Days fed	103	103	103	103	103	103	103	103
Avg. finished weight	224.1	215.8	214.9	193.1	216.3	196.4	191.7	205.6
Avg. starting weight	43.4	45.0	42.3	43.4	42.8	43.1	43.4	41.0
Avg. daily gain	1.75	1.65	1.67	1.45	1.68	1.48	1.43	1.59
Two lot combined Average	1.75 lbs/day		1.56 lbs/day		1.58 lbs/day		1.51 lbs/day	
Feed Data								
Total lbs/head	579	495	641	527	555	480	622	666
lbs/head/day	5.6	4.8	6.2	5.1	5.4	4.7	6.04	6.47
lbs of feed/lb gain	3.2	2.9	3.7	3.5	3.20	3.13	4.19	4.05
Feed Cost's Developer, $	-	-	-	-	-	-	10.55	10.60
Grower, $	12.06	12.06	10.72	10.74	21.17	19.17	11.52	11.28
Finisher, $	29.63	23.97	35.22	27.14	15.45	12.54	20.74	23.84
Total Feed Cost Per Pig	$41.69	$36.03	$45.94	$37.88	$36.62	$30.71	$42.81	$45.72
Avg. Feed Cost Per CWT Gain	$23.07	$21.09	$26.62	$25.30	$21.11	$20.68	$28.87	$27.78

1/ One gilt removed after 51 days on trial due to arthristic condition.

2/ One barrow died on Aug. 9th after 39 days on trial.

Table 4. Performance of Pigs Fed Four Ration Types During the Summer of 1980.

	GTA Commercial Pellet		AGNET Ration		Dickinson Basic		GTA Commercial Supplement	
Economics								
Lot no.	2	7	5	8	3	6	1	4
Gross return @ 35¢/lb	$78.44	$75.53	$75.22	$67.59	$75.71	$68.74	$67.10	$71.96
Feeder Pig Cost, $	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00
Feed Cost/hd, $	$41.69	$36.03	$45.94	$37.88	$36.62	$31.71	$42.81	$45.72
Net return/pig, $	6.75	9.50	-.72	-0.29	9.09	7.03	-5.71	-3.76
Avg. net return both lots	$8.13		$-0.51		$8.06		$-4.74	

Table 5. Three Year Summary of Four Systems for Swine.

	GTA Commercial Pellet		AGNET Ration		Dickinson Basic Ration		GTA Commercial Supplement	
	Barrows	Gilts	Barrows	Gilts	Barrows	Gilts	Barrows	Gilts
Avg. Daily Gain								
1978	1.72	1.55	1.61	1.35	1.45	1.53	1.43	1.37
1979	1.52	1.65	1.45	1.58	1.40	1.45	1.43	---
1980	1.75	1.66	1.67	1.45	1.68	1.48	1.43	1.59
3 yr. avg.	1.66	1.62	1.58	1.46	1.51	1.49	1.43	1.48
Feed Consumption Per Pig Per Day								
1978	5.7	5.5	6.2	5.8	5.9	5.7	5.6	5.9
1979	4.5	5.3	5.6	6.1	5.3	4.9	5.5	---
1980	5.6	4.8	6.2	5.1	5.4	4.7	6.0	6.5
3 yr. avg.	5.3	5.2	6.0	5.7	5.5	5.1	5.7	6.2
Feed Efficiency Feed/lb of Gain								
1978	3.31	3.55	3.85	4.29	4.06	3.74	4.08	4.13
1979	2.97	3.21	4.03	3.83	3.76	3.51	3.84	---
1980	3.20	2.90	3.70	3.50	3.20	3.13	4.19	4.05
3 yr. avg.	3.16	3.22	3.86	3.87	3.67	3.46	4.04	4.09

Table 6. Three Year Economic Summary of Four Feeding Systems for Swine.

	GTA Commercial Pellet		AGNET Ration		Dickinson Basic Ration		GTA Commercial Supplement	
	Barrows	Gilts	Barrows	Gilts	Barrows	Gilts	Barrows	Gilts
Net Return/Pig								
1978	19.84	15.33	21.87	17.13	16.26	22.70	18.63	14.98
1979	10.48	10.27	3.78	7.87	9.31	13.83	7.73	---
1980	6.75	9.50	-0.72	-0.29	9.09	7.03	-5.71	-3.76
3 yr. avg.	$12.36	$11.70	$8.31	$8.24	$11.55	$14.52	$6.88	$5.61

Discussion:

Pigs on trial in 1980 were not bothered by tail biting like they were in 1979, in the commercial supplement pens. One barrow died of acute pneumonia and one gilt was removed from the trial due to arthritic lameness. The alfalfa used in the AGNET formulated rations was pelleted and was not locally grown.

Summary:

The performance of all pigs on trial in 1980 was very satisfactory, with pigs fed the commercial pelleted ration averaging about one-fifth of a pound faster daily gains. The commercial supplemented ration returned the poorest feed efficiency, requiring slightly over four pounds of feed to produce a pound of gain. Perhaps the supplement over estimates the feeding value of barley, since feed efficiency was poor in all 3 years.

The least cost AGNET ration tended to over evaluate the feeding value of alfalfa, especially in the finishing phase. Producers should keep this in mind when formulating rations with the aid of the AGNET computer.

The basic barley-oat-soybean oil meal ration recommended by the Dickinson Experiment Station performed very satisfactory and consistently during all 3 years of this trial, with the highest net returns of any ration fed.

Depending on time, labor and machinery available, swine producers can probably use any of the ration types to good advantage.

SECTION VI

RANGE, PASTURE AND FORAGE RESEARCH

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ND3902: Alfalfa Adaptation Trial. H. Goetz

Summary:

This trial was started in the spring of 1979 with plot seedings at the Dickinson and Streeter Experiment Stations. In May of 1980 additional seedings were made at the Hettinger Experiment Station and the Dickinson Experiment Station Ranch Headquarters, both were unsuccessful due to drought. In the spring of 1981 plots were reseeded at the Hettinger and Streeter Experiment Stations, both, showing good stand establishment and will be harvested starting in the 1982 season. The 1979 seeding at the Dickinson Experiment Station is the only location currently reporting harvest data.

The trial at Dickinson includes 21 varieties of alfalfa and the trials at Streeter and Hettinger have 20 varieties (Ladak was not included in the latter two, due to lack of seed). Varieties from previous trials (Ladak 65, Ladak, Vernal, Thor, Travois, and Kane) were included as a basis for comparison of the newer varieties to the "stand by" varieties of the area.

Plot size at all locations was 25 feet by 10 feet (7.6 x 3 meters). Four replications were harvested at Dickinson by clipping five, quarter meter square frames within each plot. The samples were dried to 65° centigrade and dry weight yield determined.

Production was 1000-1800 pounds (1120 to 2000 kg/ha) more per acre than in 1980 (table 2), in which production was very low due to drought. This years production ranged from 1195 lbs lbs/A (1338kgha) for the variety Ramsey to a high in the variety Anik of 1978 lbs/A (2215 kg/ha). Fifteen of the varieties produced more than 1400 per acre (1568 kg/ha). Anik, the highest producer in 1981 was the lowest in 1980 harvest and seemed to be non-existant the summer of the seeding.

The least significant difference in forage production at the .05 level was 337 pounds (377 kg). Anik produced significantly more forage than the lowest eighteen varieties. There was no significant difference in production between Anik, D-111, Baker, Kane, and Rangelander when considering the highest producing varieties, but there was no significant difference between the varieties from Ramsey up to Polar I (table 1).

A hard spring frost seemed to set back many of the alfalfa varieties, except Anik, and caused premature leaf and stem breakage thereby decreasing forage yields. This many explain why Anik yielded the highest amount of forage. Varietal yield will continue to be monitored at the Dickinson Experiment Station and yield data on the same varieites will start being collected at the Hettinger and Streeter Experiment Stations.

Table 1. Alfalfa production for 1981*.

Variety	Yield lbs/S	(Kg/ha)	
Anik	1978	(2215)	a
D-111	1747	(1956)	ab
Baker	1662	(1891)	abc
Kane	1655	(1853)	abc
Rangelander	1642	(1839)	abc
Vernal	1572	(1760)	bcd
Norseman	1556	(1742)	bcd
Thor	1554	(1740)	bcd
Polar I	1519	(1701)	bcde
WL-524	1518	(1700)	bcde
WL-520	1485	(1663)	bcde
Vernal	1466	(1641)	bcde
Iriquois	1422	(1592)	bcde
Ladak 65	1422	(1592)	bcde
Agate	1401	(1569)	cde
Ladak 65	1392	(1559)	cde
Nugget	1391	(1557)	cde
Ladak	1364	(1527)	cde
Trek	1362	(1525)	cde
Ladak	1338	(1498)	cde
Spreador II	1289	(1443)	de
Travois	1277	(1430)	de
Ranger	1239	(1387)	de
Ramsey	1195	(1338)	e

* Means followed by the same letter are not significantly different at the .05 level according to Duncans multiple range test.

ND3902: Bromegrass Trial. Harold Goetz

Summary:

In 1979 eleven varieties of smooth brome (Bromus intemus), a widely used forage grass in North Dakota, and one section of meadow brome (Bromus biebersteinii), were seeded at the Dickinson Experiment Station to determine their suitability to western North Dakota.

These varieties were seeded in plots 25 feet by 10 feet (7.6 x 3 meters) and replicated four times. The varieties and their seed source are listed in table 1. The plots were seeded with a cone seeder developed by the ARS Research Station in Mandan, North Dakota. Row skips occurred in the plots due to seed feeding problems with the drill. These row skips did not affect harvestings as the frames were places such that the same number of rows were harvested in each frame.

In 1981, three, quarter meter square frames, were clipped in each plot to determine yields. The clippings were dried to 65° centigrade and dry weight yield determined.

December 21, 20221981 yields were considerably higher than those of the previous year, by approximately 1000 pounds. Production ranged form a high of 2975 pounds per acre (3332 kg/ha) in Lancaster smooth brome to 2038 pounds per acre (2282 kb/ha) in Mandan 404 smooth brome, with most varieties producing in the range 2000-2400 pounds per acre (2464-2688 kg/ha). When considering low winter moisture (1980-1981) and dry spring condition this years yields were quite respectable, but still below their potential. Yield of the varieties will continue to be monitored.

Table 1. Bromegrass varieties and seed sources.

Variety	Seed Source
Rebound	South Dakota State University
Lincoln	University of Nebraska
Beacon	Land O Lakes, Webster City, Ia.
Blair	N. Amer. Plant Breeders
Baylor	N. Amer. Plant Breeders
Barton	Land O Lakes, Webster City, Ia.
Lyon	University of Nebraska
Lancaster*	University of Nebraska
Fox	University of Minnesota
Manchar	Lincoln Oak Nursery, Bismark, ND
Mandan 404	SEA-ARS, Mandan, ND
Meadow Brome	Plant Materials Center-Pullman, Wash.

* Lancaster smooth brome seed is no longer available.

Table 2. Bromegrass yields.

	1080 yield*		1981 yield	
Variety	lbs/A	(kg/ha)	lbs/A	(kg/ha)
Rebound	1557	(1745)	2433	(2725)
Lincoln	1483	(1662)	2380	(2665)
Beacon	1473	(1650)	2364	(2648)
Blair	1443	(1617)	2456	(2751)
Baylor	1441	(1615)	2557	(2864)
Barton	1441	(1615)	2306	(2583)
Lyon	1411	(1581)	2692	(3015)
Lancaster*	1395	(1563)	2975	(3332)
Fox	1372	(1537)	2358	(2641)
Manchar	1337	(1498)	2356	(2639)
Mandan 404	1290	(1445)	2038	(2282)
Meadow	1275	(1429)	2194	(2457)
	1410	(1580)	2425	(2716)

* means were not significantly different at the .95 level.

H-1908: Techniques for Reestablishing Selected Native Species. H. Goetz

In the spring of 1979 a study was undertaken to determine the best methods of resseding selected warm and cool season native grass species as solid stand or in mixtures. All plots in the spring of 2979 were seeded into fallowed ground. The following species were seeded alone in solid stand or in mixtures. All plots in the spring of 1979 were seeded into fallowed ground. The following species were seeded alone in solid stands. 1) Western wheatgrass (Agropyron cristatum), 2) green needlegrass (Stipa viridula), 3) (blue grama (Bouteloua gracilis), and 4) side-oats grama (Bouteloua curtipendula). The mixture included the above four species as follows: 1) warm season-cool season grasses in alternate rows, 2) warm season-cool season four species mix, and 3) warm season grasses seeded first year and cool season grasses interseeded the next year.

In addition to the above plots, the seven treatments were also seeded into oat stubble and fallow ground in the late fall of 1979 and again in the spring of 1980. Early spring-summer drought destroyed these plots. Data was collected only on the plots seeded in the spring of 1979.

Data collected for 1980 and 1981 included forage production (table 1) and species composition (table 2). Forage production was determined by clipping five, quarter square frames, per plot. Species composition was determined from basal cover data from point frames placed perpendicular by the seeded row, fifty times in each plot.

Forage production for each seeding treatment for 1981 showed an increase when compared to the corresponding 1980 production (table 1). 1981 yields ranged from 1335 pounds peer acre (1495 lb/ha) for solid seeded blue grama to 2353 pounds per acre (2635 kb/ha) for western wheatgrass. Of the seven treatments, all but green needlegrass showed moderate to good stand establishment by 1981. Visual observations of the green needlegrass stands sllowed deterioration to the point where little or no green needlegrass was present and theresore no data was collected on these plots in 1981.

Percent composition showed an increase in the percent coverage of the seeded species (table 2), showing definite stand improvement over that observed in 1980. Percent composition of forbs and weedy grasses fluctuated with the seeding treatment. In all treatments the percentage of litter increased over that of 1980, with a resulting decrease in the amount of bare ground. This again, would indicate a trend towards improved stand establishment. Seeding of the four species mix, appears to be the most promising method of reestablishing native grass species when compared to the alternate row of interseeding methods, however, more data is needed before solid recommendations of seeding methods cna be made.

Work will continue in this area of native reestablishment with future plots being located at the Dickinson Experiment Station Ranch Headquarters.

Table 1. Forage production on native re-established trial.

	1980			
Treatments	lbs/A	(kg/ha)	lbs/Ac	(kg/ha)
Western wheatgrass	986	(1104)	2353	(2635)
Green needlegrass	170	(190)	N.H.*	
Blue grama	584	(654)	1325	(1484)
Side-oats grama	584	(1015)	1865	(2008)
Four species mix	907	(1015)	2143	(2400)
Alternate row	636	(712)	2005	(2245)
Interseeded	775	(868)	1881	(2106)

* Not harvested due to poor stand.

Table 2. Percent composition on the re-establishment trial.

Species	Seeding Treatment: Four spp. mix		Alt. Row		Interseeded		Western Wht. Grass		Blue grama		Side-oats grama		Green needlegrass	
	80	81	80	81	80	81	80	81	80	81	80	81	80	81
Side-oats grama	1.2	4.2	1.2	3.1	2.5	6.6	-	-	TR	.2	2.7	13.2	.1	-
Western wheatgrass	.3	2.3	.1	2.1	-	.3	1.5	8.1	-	-	-	TR	TR	-
Green needlegrass	TR	.3	-	-	-	-	-	-	-	-	-	-	-	-
Blue grama	.2	.5	.2	1.3	.4	.9	-	-	2.0	6.4	-	-	.1	-
Weedy grasses*	3.0	2.2	-	4.4	2.4	8.3	2.1	.6	2.4	4.7	1.1	3.3	3.5	-
Forbs	.1	.2	.2	.5	.4	1.0	.1	-	.3	.3	.3	.8	.6	-
Litter	15.0	57.3	17.0	57.6	14.5	36.5	10.5	53.7	13.7	51.3	12.2	44.0	17.4	-
Bare ground	80.0	32.8	79.0	31.0	79.6	46.4	85.7	37.6	81.2	37.1	83.4	38.7	77.4	-
Total for seeded species	1.7	7.3	1.5	6.5	2.9	7.8	1.5	8.1	2.0	6.6	2.7	13.2	.2	-

* Weedy grasses-pigeon grass and barnyard grass

TR Trace less than .05%

ND1906: Three Pasture Grazing System. D.E. Williams and L. Manske

Summary:

This trial compares animal performance on both a fertilized and unfertilized three pasture grazing system. The three pasture grazing rotation consists of: crested wheatgrass for spring and early summer, native range for mid to late summer, and Russian wildrye for fall. The fertilized pastures are given an annual spring broadcase application of 150 pounds of ammonium nitrate (33-0-0) per acre. Eight cow/calf pairs grazed each of the pastures with the size of all pastures being varied to compensate for the differences in forage production.

Forage production for 1981 (table 3) increased substantially over that of the previous year and came close to the high production of 1978. In the fertilized Russian wildrye pasture, production was highest in 1981 (3071 pounds/A vs. 2727 pounds/A in 1978). Fertilizer increased the production on crested wheatgrass, native ragen, and Russian wildrye by 57, 31, and 90 percent, respectively. This increase in production allowed for 32% increase in the length of grazing on the fertilized system for a total grazing period of 164 days vs. 124 days on the unfertilized system.

Forage utilization (table 2) was higher on native range in past years, 59 and 69 percent for unfertilized and fertilized native respectively. Fertilized crested wheatgrass pasture was utilized 67% and the unfertilized pasture 61%. The Russian wildrye pastures were utilized 92 and 90% for the unfertilized and fertilized pastures.

Average daily gain (ADG) for calves (table 2) showed little difference between the fertilized and unfertilized pastures. The tame grass pasture did seem to show higher ADG when compared tot he native pastures. Average daily gain on the native fertilized and unfertilized pasture was 1.5 and 1.8 pounds respectively, whereas the crested wheatgrass and Russian wildrye showed average daily gains of 2.1 pounds for the calves. Cows showed gain throughout the 1981 grazing season (table 2). The ADG for cows was higher on the fertilized tame grass pasture than the unfertilized (one pound vs. .3 pound). The bulls showed a loss of .1 pound per day on the unfertilized crested wheatgrass and maintained weight on the fertilized crested wheatgrass and native pastures. The bulls were removed from the trial after grazing on native pastures had ended.

The four year average (table 3) of calf ADG shows trends similar to those in 1981. Difference in ADG for calves in the unfertilized and fertilized native pastures is larger (1.8 ADG vs. 1.4 ADG). This is mainly due to the fact that the calves stayed longer on the fertilized native with gains being poorer while grazing during the later part of the season.

Average gain per acre (table 2) for the fertilized and unfertilized tame grass and native pastures reveals much as far as difference in calf productivity between these two systems. Calf gains, for 1981, were nearly double when comparing fertilized and unfertilized crested wheatgrass and native pastures. Calf gains for the Russian wildrye pasture were higher in the fertilized pasture than the unfertilized, but not to the extent seen in the fertilized crested and native pastures. This is mainly due to the extended grazing of the Russian wildrye into a period in poorer result due to less nutritious forage available.

When considering the difference in grain per acre of calves (for 1981) on the fertilized system vs. unfertilized system, the additional calf gain produced from the fertilized system paid for the cost of the fertilizer.

The cost of fertilizer in 1981 was $13.35 per acre. Assuming that calves are selling for 60 cents/pound the fertilized system would have to produce an average of 22 more pounds of calf per acre than the unfertilized system to break even. Calf gains for the fertilized system for 1981 averaged 68 pounds per acre. This amounted to 27 pounds more than those produced on the unfertilized system. The net gain per acre was 5 pounds or return of $3/acre. The four year average calf gains were 23 pounds per acre higher on the unfertilized system. Assuming a four year average cost of fertilizer of $11.55 per acre and the selling of 60 cent calves, 19 pounds more calf gains per acre would have to be produced to break even. The four year average gain per acre was 4 pounds or a return of $3 per acre. When considering the extra cow gains on the fertilized system, fertilizer application becomes more cost efficient.

Table 1. Forage production and utilization during the grazing periods-Grazing Systems Trial 1978-1981.

	Pastures size acres	Year	Period grazed	Days in period	Forage produced lbs/acre	Forage utilized lbs/acre	Forage left on ground lbs/acre	Period utilization
Crested wheatgrass	16	1978	5/22-6/19	28	2030	1068	962	53
(ufertilized)		1979	5/22-6/22	31	1675	1174	501	70
		1980	6/23-7/7	14	663	263	400	40
		1981	5/21-6/23	33	1649	1014	635	61
Crested wheatgrass	8	1978	5/15-7/10	56	5060	3426[1/]	1634	68
(fertilized)		1979	5/22-6/22	31	2243	1713	530	76
		1980	6/23-7/7	14	1198	688	510	57
		1981	5/15-6/16	33	3589	1742	847	67
Native grass	18	1978	6/19-8/14	56	1954	1141	813	58
(unfertilized)		1979	6/22-7/20	28	1195	290	905	24
		1980	7/7-7/23	16	825	120	705	14
		1981	6/24-7/28	35	1906	1122	784	59
Native grass	12	1978	6/19-8/14	56	1954	1141	813	58
(fertilized)		1979	6/22-7/20	28	1195	290	905	24
		1980	7/7-7/23	16	825	120	705	14
		1981	6/17-8/4	49	2505	1731	776	69
Russian wildrye	16	1978	8/14-9/29	46	1760	1320	440	75
(unfertilized)		1979	7/20-8/23	34	1280	1033	247	81
		1980	7/23-8/12	20	414	381	33	92
		1981	7/29-9/22	56	1612	1483	129	92
Russian wildrye	16	1978	9/15-11/9	55	2727	1963	764	72
(fertilized)		1979	7/20-8/30	41	1754	1386	368	79
		1980	7/23-8/12	20	602	530	72	88
		1981	8/5-10/26	82	3071	2764	307	90

Table 2. Average forage production and utilization-Grazing Systems Trial (1978-1981).

Pasture	Size (acres)	Days of grazing	Forage production (lbs/A)	Forage utilization (lbs/A)	Left on ground	Percent utilization
Crested wheatgrass (unfertilized)	16	26	1504	880	624	58
Crested wheatgrass (fertilized)	8	33	2772	1892	880	68
Native grass (unfertilized)	18	34	1470	668	802	45
Native grass (fertilized)	12	40	2404	1456	948	60
Russian wildrye (unfertilized)	16	39	1266	1054	212	83
Russian wildrye (fertilized)	16	49	2038	1661	377	82

Table 3. Weights and gains of cows and one bull-Grazing Systems Trial 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	990	1044	55	2.0	34
			(0)					
Crested wheatgrass (unfertilized)	5/15-7/10	56	(10)	958	1066	108	1.9	135
	6/12-7/10	(28)	(1)	(885)	(1000)	(115)	(4.1)	(14)
Native grass (unfertilized)	6/19-8/14	56	10	1044	1069	25	0.4	14
		(56)	(1)	(1115)	(1145)	(30)	(0.5)	(2)
Native grass (fertilized)	7/10-9/15	67	10	1066	1008	-58	-0.9	-5
	(7/10-8/7)	(28)	(1)	(1000)	(1040)	(40)	(1.4)	(3)
Russian wildrye (unfertilized)	8/14-9/29	1 46	10	1070	1084	14	0.3	9
Russian wildrye (fertilized)	9/15-11/9	55	10	1008	1092	84	1.5	52

1/ ( ) indicates data pertaining to bulls,

Table 4. Weights and gains of cows and one bull-Grazing Systems Trial 1979.

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)	5/22-6/22	31	10	970	1038	67	2.2	42
			(1)	(1190)	(1110)	(-80)	(-2.5)	(-5)
Crested wheatgrass (unfertilized)	5/22-6/22	31	10	976	1064	88	2.8	110
			(1)	(1135)	(1110)	(-25)	(-0.8)	(-3)
Native grass (unfertilized)	6/22-7/20	28	10	1038	1080	42	1.5	23
			(1)	(1110)	(1135)	(25)	(1.9)	(2)
Native grass (fertilized)	6/22-7/20	28	10	1064	1084	19	0.7	16
			(1)	(1110)	(1130)	(20)	(0.7)	(2)
Russian wildrye (unfertilized)	7/20-8/23	34	10	1080	1098	18	0.5	11
			(1)	(1135)	(1160)	(25)	(0.7)	(1.5)
Russian wildrye (fertilized)	7/20-8/30	41	10	1084	1124	41	1.0	26
			(1)	(1130)	(1140)	(10)	(0.2)	(0.8)

1/ ( ) indicates data pertaining to bulls,

Table 5. Weights and gains of cows and one bull-Grazing Systems Trial 1980.

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)	6/23-/7/7	14	7	1127	1108	-19	-1.4	-8.3
Crested wheatgrass (unfertilized)	6/23-7/7	14	7	1089	1075	-14	-1.0	-12.2
Native grass (unfertilized)	7/7-7/23	16	7	1108	1108	0	0	0
			(1)	(1050)	(1095)	(45)	(2.8)	(2.5)
Native grass (fertilized)	7/7/-7/23	16	7	1075	1065	-10	-6	-5.8
			(1)	(1095)	(1105)	(10)	(.6)	(.6)
Russian wildrye (unfertilized)	7/23-8/12	20	7	1108	1141	33	1.6	14
			(1)	(1095)	(1160)	(65)	(3.2)	(4)
Russian wildrye (fertilized)	7/23-8/12	20	7	1065	1134	69	3.5	30
			(1)	(1105)	(1155)	(50)	(2.5)	(3)

1/ ( ) indicates data pertaining to bulls,

Table 6. Weights and gains of cows and one bull-Grazing Systems Trial.

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)	5/21-6/23	33	8	1138	1148	10	.3	5
			(1)	(1045)	(1040)	(-5)	(-.1)	(-.3)
Crested wheatgrass (unfertilized)	5/15-6/16	33	8	1010	1042	32	1.0	32
			(1)	(1190)	(1190)	(0)	(0)	(0)
Native grass (unfertilized)	6/24-7/28	35	8	1148	1161	13	.4	6
			(1)	(1040)	(1040)	(0)	(0)	(0)
Native grass (fertilized)	6/17-8/14	49	8	1042	1044	2	.1	1.3
			(1)	(1190)	(1190)	(0)	(0)	(0)
Russian wildrye (unfertilized)	7/29-9/22	56	8	1161	1180	19	.3	19
			(0)	(0)	(0)	(0)	(0)	(0)
Russian wildrye (fertilized)	8/5-10/26	82	8	1044	1127	83	1.0	41
			(0)	(0)	(0)	(0)	(0)	(0)

1/ ( ) indicates data pertaining to bulls,

Table 7. Weights and gains of calves-Grazing Systems Trial 1978-1981.

	Year	No. of calves	Avg. Initial wt/calf lbs	Avg. final wt. Calf lbs	Avg. gain/hd lbs	Avg. daily gain/hd lbs	Avg. gain/hd
Crested wheatgrass	1978	10	180	228	48	1.7	30
(ufertilized)	1979	10	160	218	58	1.9	36
	1980	7	256	288	31	2.2	14
	1981	8	155	224	69	2.1	34
Crested wheatgrass	1978	10	152	255	103	1.8	129
(fertilized)	1979	10	171	252	81	2.6	101
	1980	7	261	286	25	1.8	22
	1981	8	148	221	73	2.2	73
Native grass	1978	10	228	328	100	1.8	56
(unfertilized)	1979	10	218	275	57	2.0	32
	1980	7	288	320	32	2.0	12
	1981	8	224	286	62	1.8	27
Native grass	1978	10	255	342	87	1.3	73
(fertilized)	1979	10	252	291	39	1.4	32
	1980	7	286	313	26	1.6	15
	1981	8	221	296	75	1.5	50
Russian wildrye	1978	10 1/	328	410	82	1.8	51
(unfertilized)	1979	10	275	352	77	2.3	48
	1980	7	320	365	45	2.2	20
	1981	8	286	412	126	2.2	63
Russian wildrye	1978	10	342	426	84	1.5	52
(fertilized)	1979	10	291	368	77	1.9	48
	1980	7	313	369	56	2.8	24
	1981	8	296	459	163	2.0	81

1/ one calf died 9/24/78.

Table 8. Four year average weights and gains of cows, calves, and one bull, Grazing Systems Trial 1978-1981.

	Class of cattle	Avg. initial weight (lbs)	Avg. final weight (lbs)	Avg. gain/hd (lbs)	Avg. daily gain/hd (lbs)	Avg. gain/A (lbs)
Crested wheatgrass	Calf	188	239	51	1.9	28
(ufertilized)	Cow	1056	1084	28	.8	18
	Bull	1117	1075	-42	-1.3	-2.6
Crested wheatgrass	Calf	183	253	70	2.1	81
(fertilized)	Cow	1008	1062	54	1.2	66
	Bull	1070	1100	30	1.1	3.7
Native grass	Calf	239	302	63	1.8	32
(unfertilized)	Cow	1084	1104	20	.6	11
	Bull	1079	1104	25	1.0	1.6
Native grass	Calf	253	310	57	1.4	42
(fertilized)	Cow	1062	1050	-12	-.2	1.6
	Bull	1099	1116	17	.7	1.4
Russian wildrye	Calf	302	385	83	2.1	45
(unfertilized)	Cow	1105	1126	21	.7	13
	Bull	1115	1160	45	1.9	2.7
Russian wildrye	Calf	310	405	95	2.0	51
(fertilized)	Cow	1050	1119	69	1.7	37
	Bull	1117	1141	30	1.3	1.9

ND1917 Interseeded Pasture Grazing Trial. D.E. Williams, and L. Manske

Summary:

The interseeded pasture grazing trial compares animal performance on native range that has received various interseeding treatments, with fertilized and unfertilized native range. The initial interseeding treatments on native range include 1) Travois alfalfa, 2) Russian wildrye, and an interseeded control (a pasture through which the interseeder was run, but nothing was seeded). The Russian wildrye interseeded pasture, after repeated attempts, never became established and is serving as a replacement interseeded control pasture. The fertility treatment, on native range, involves range, involves an annual spring broadcase application of 150 pounds of ammonium nitrate (33-0-0) per acre.

In 1981 eight cow/calf pairs and one bull grazed on each of the interseeded pastures, with the size of the pastures being varied to compensate for the different production levels of the pastures. The fertilized native pasture provided the most amount of grazing (49 days-table 1). The following amount of grazing was provided by the other pastures (table 1). 1) unfertilized native-35 days, 2) interseeded control-35 days, and 3) interseeded alfalfa-28 days.

Forage production for 1981 was very close to the production obtained in 1978, showing that native range has recovered from reduced production due to drought experienced in 1979 and 1980. However, this year's production showed a marked increase in fringed sage in the interseeded alfalfa and interseeded control pastures. This increase is due mainly to consecutive drought of two growing seasons in combination with disturbance from interseeding that gave a competitive advantage to the spread of fringed sage. Much of this year's production, in these two pastures which showed a fringed sage bloom, was in plants of undesirable grazing quality for cattle thereby reducing available forage production for cattle. The native fertilized and unfertilized pasture did not show such a marked increase in fringed sage.

Forage production for 1981 was highest in the fertilized pasture (2507 lbs/A). Production (table 1), the other three pastures was close, being as follows: 1) interseeded control-2716 lbs/A, 2) interseeded alfalfa-2028 lbs/A, and 3) unfertilized-1906 lbs/A. Forage utilization, for this year's season, ranged from 54% (interseeded control) to 69% (fertilized native) and was generally the highest of the four years for all pastures. Overal forage production was good when one considers the effects of the past two seasons of drought. A severe spring frost seemed to set back this year's alfalfa production (in the interseeded alfalfa pasture). Alfalfa comprised 19% of the total of the interseeded alfalfa pasture (389 lbs/A out of a total of 2028 lbs/A).

Calf gains (ADG-average daily gain) ranged 1.5 pounds (fertilized native) to 1.9 pounds (interseeded alfalfa pasture), with ADG for the interseeded control and unfertilized native pastures being intermediate at 1.7 and 1.8 pounds respectively (table 2). The low 1.5 ADG for the fertilized native pasture was properly due to the fact that cattle were on this pasture longer than the others and the nutritive quality was poorer near the end of the season, thus causing poorer gain and lowering the overall gain for the period. Average daily gain for calves is quite comparable to the gains in the previous years of the study.

When considering average gain of calves per acre (table 2) the fertilized native is highest (50 pounds/acre) with the interseeded alfalfa pasture second with 42 pounds per acre. There is little or no difference in pounds of calf per acre between the interseeded alfalfa pasture and the fertilized native pasture (42 pounds vs. 50 pounds) for the 1981 season. This spread (table 3), was much larger the first year (1978), with the interseeded alfalfa pasture giving higher calf gains per acre than the fertilized native pasture (113 pounds vs. 73 pounds). From this one can see that the benefit derived from interseeding alfalfa over fertilized may be short lived. Next year's data will more fully show if such a trend does exist. One must remember that two successive drought years (1979-1980) night have decreased the benefit derived from interseeding alfalfa, and the lifetime of this improvement practice might be longer under normal conditions.

The cows and the bull lost weight on the two interseeded pastures (table 2) during the 1981 season. Average daily loss (ADL for cows ranged from -.6 pounds (interseeded control) to -1.5 pounds (interseeded alfalfa). The bulls showed a much higher ADL on the above mentioned pastures (-3.1 pounds to -2.3 pounds). On the fertilized and unfertilized native pastures, bulls held their initial weights whereas the cows showed an ADG of .1 to .4 pounds. The difference in cow and bull gains or losses between the fertilized, unfertilized native and the interseeded native is due mainly to the fringed sage bloom. There simply was not enough grazeable forage" available for cow or bull to maintain or gain weight. This was not seen in calf gains because there was enough forage available to meet their minimal needs and their nutritional needs were being met more through lactation than in the forage.

Then considering the four year average of weights and gains of cattle (table 4) trends similar to those discussed for 1981 show up. Calf gains are highest for the interseeded alfalfa pasture (55 pounds/A) with the fertilized native next

(45 pounds/A). Calf gains on the interseeded control and unfertilized native are similar, 38 pounds/A vs. 32 pounds/A. The gain loss picture for cows and bulls is variable but generally gains are shown.

In 1981, the fertilized native pasture produced enough calf gains per acre, over that on the unfertilized native to break even on the cost of fertilizer. The alfalfa interseeded native pasture produced 15 pounds more calf per acre than the unfertilized assuming 60¢/pound calves, this would be a net gain of $9.00 per acre. The cost of interseeding was recovered in the increased gains from the first year of grazing the interseeded alfalfa pasture. Even thou the benefit of interseeding alfalfa may be short lived, it produces higher dollar returns simply because it is done once, and not every year as in the fertilizer application. Yearly application of fertilizer, on native range, is more or less a break even situation, depending on the weather conditions for that year.

Table 1. Forage production and utilization during the grazing periods-Interseeded Pasture Grazing Trial 1978-1980.

	Year	Pastures size acres	Period grazed	Days in period	Forage produced lbs/acre	Forage utilized lbs/acre	Forage left on ground lbs/acre	Period utilization
Unfertilized	1978		6/19-8/14	56	1954	1141	813	58
native	1979	18	6/22-7/20	28	1195	289	905	24
	1980		7/07-7/23	16	825	120	705	14
	1981		6/24-7/28	35	1906	1122	784	59
Fertilized	1978		7/10-9/15	67	3943	2270	1673	58
native	1979	12	6/22-7/20	28	1846	1135	711	61
	1980		7/07-7/23	16	1319	684	635	52
	1981		6/17-8/04	49	2507	1738	776	69
Intereseeded	1978		6/19-8/14	60	2064	1256	808	61
control	1979	15	6/22-7/20	28	1401	474	927	34
	1980		7/07-7/23	16	950	88	762	9
	1981		6/24-7/28	35	2176	1187	989	54
Interseeded	1978		6/19-8/07	49	2290	1272	1018	56
Travois	1979	10	6/22-7/20	28	1074	647	427	60
alfalfa	1980		7/07-7/16	9	766	256	510	33
	1981		6/24-7/21	28	2028	1330	698	65

Table 2. Average forage production and utilization-grazing interseeded pasture trial (1978-1981).

Pasture	Pasture Size (acres)	Year	Days of grazing	Forage produced (lbs/A)	utilizated (lbs/A)	Forage left on ground	Percent utilization
Native (unfertilized)	16	78-81	34	1470	668	802	45
Native (fertilized)	8	78-81	40	2404	1455	949	60
Native (interseeded) alfalfa-Travois	18	78-81	28	1539	876	663	57
Native (interseeded control)	12	78-81	35	1648	751	897	45

Table 3. Weights and gains of cows and one bull-Interseeded Pasture Grazing Trial 1978.

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	56	10	1044	1069	25	.4	14
	(6/19-8/14)	(56)	(1)	(1115)	(1145)	(30)	(.5)	(2)
Fertilized native	7/10-9/15	67	10	1066	1008	-58	-.9	-5
	(7/10-8/07)	(67)	(1)	(1000)	(1040)	(40)	(1.4)	(3)
Interseeded control	6/19-8/14	60	10	1018	1049	31	.5	21
	(6/19-8/14)	60	(1)	(1215)	(1200)	(-15)	(-.2)	(-1)
Interseeded Travois alfalfa	6/19-8/07	49	10	1034	1106	72	1.5	72
	(6/19-8/07	(49)	(1)	(1145)	(1175)	(30)	(.6)	(3)

* ( ) indicates data pertaining to bulls,

Table 4. Weights and gains of cows and one bull-Interseeded Pasture Grazing Trial 1979.

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
Native (unfertilized)	6/20-7/20	28	10	1038	1080	42	1.5	23
			(1)	(1110)	(1135)	(25)	(.9)	(2)
Native (fertilized)	6/20-7/29	28	10	1064	1084	19	.7	16
			(1)	(1110)	(1130)	(20)	(.7)	(2)
Interseeded) Travois Alfalfa	6/20-7/20	28	10	1158	1220	62	2.2	62
			(1)**	(1350)				
Interseeded Control	6/20-7/20	28	10	1120	1180	60	2.2	40
			(1)	(1455)	(1435)	(-20)	(.-7)	(-1)

1/ ( ) indicates data pertaining to bulls.

** The bull was not weighed when removed from the pasture.

Table 5. Weights and gains of cows and one bull-Interseeded Pasture Grazing Trial 1980.

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
Native (unfertilized)	7/7-7/23	16	7	1108	1108	0	0	0
			(1)	(1050)	(1095)	(45)	(2.8)	(2.5)
Native (fertilized)	7/7-7/23	16	7	1075	1065	-10	-.6	-6
			(1)	(1110)	(1130)	(20)	(.7)	(2)
Interseeded Control	7/7-7/23	16	7	1175	1164	-11	-.7	-5.3
			(1)	(1320)	(1440)	(120)	(7.5)	(8)
Interseeded Travois Alfalfa	7/7-7/16	9	7	1102	1054	-49	-5.5	34
			(1)	(1050)	(1000)	(-50)	(.-5.6)	(-5)

* ( ) indicates data pertaining to bulls.

Table 5. Weights and gains of cows and one bull-Interseeded Pasture Grazing Trial 1980.

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
Native (unfertilized)	6/24-7/28	35	8	1148	1161	13	.4	6
			(1)	(1040)	(1040)	(0)	(0)	(0)
Native (fertilized)	6/17-8/4	49	8	1042	1044	2	.1	1.3
			(1)	(1190)	(1190)	(0)	(0)	(0)
Interseeded Control	6/24-7/28	35	8	1188	1168	-20	-.6	-11
			(1)	(1940)	(1830)	(-110)	(-3.1)	(-7)
Interseeded Travois Alfalfa	6/24-7/21	28	8	1163	1120	-43	-1.5	-34
			(1)	(1750)	(1685)	(-65)	(.-2.3)	(-6)

* ( ) indicates data pertaining to bulls.

Table 7. Weights and gains of calves-Interseeded Pasture Grazing Trial 1978-1981.

	Year	No. of calves	Avg. Initial wt/calf lbs	Avg. final wt. Calf lbs	Avg. gain/hd lbs	Avg. daily gain/hd lbs	Avg. gain/hd
Unfertilized	1978	10	228	328	100	1.8	56
native	1979	10	218	275	57	2.0	32
	1980	7	288	320	32	2.0	12
	1981	8	224	286	62	1.8	27
Fertilized	1978	10	255	342	87	1.3	73
native	1979	10	252	291	39	1.4	32
	1980	7	286	313	26	1.6	15
	1981	8	221	296	75	1.5	50
Interseeded	1978	10*	228	332	104	1.7	69
control	1979	10	242	274	31	1.1	31
	1980	7	280	321	41	2.5	19
	1981	8	212	272	60	1.7	32
Interseeded	1978	10	227	340	113	2.3	113
Travois alfalfa	1979	10	266	326	60	2.2	60
	1980	7	278	287	9	1.0	6
	1981	8	204	257	53	1.9	42

* 7/17 one calf was replaced due to sickness.

Table 8. Four year average weights and gains of cows, calves, and one bull, interseeded pasture grazing Trial 1978-1981.

Pasture	Class of cattle	Avg. initial weight (lbs)	Avg. final weight (lbs)	Avg. gain/hd (lbs)	Avg. daily gain/hd (lbs)	Avg. gain/A (lbs)
Native	Calf	239	302	63	1.8	32
(unfertilized)	Cow	1084	1104	20	.6	11
	Bull	1079	1104	25	1.0	1.6
Native	Calf	253	310	57	1.4	42
(fertilized)	Cow	1062	1050	-12	-.2	1.6
	Bull	1099	1116	17	.7	1.4
Native	Calf	244	302	58	1.8	55
(interseeded	Cow	1114	1125	11	-.8	16
alfalfa-Travois)	Bull	1315	1287	-28	-2.4	-.3
Native	Calf	240	300	60	1.7	38
(interseeded control)	Cow	1125	1140	15	.3	11
	Bull	1482	1476	6	-.9	-.2

Short Duration Grazing System

D.R. Kirby and M.D. Parman

Presently there is a great interest in grazing systems for the Northern Great Plains. Two main purposes for using grazing systems are 1) to improve or maintain range forage productivity and/or 2) to increase carrying capacity of the rangeland. This should lead to an increase in sustained forage and livestock productivity and profitability from rangeland. To date, rangeland grazing systems have not adequately maximized these benefits. This has resulted in further research for more effective grazing systems.

A successful grazing system is one that will result in more uniform utilization of all plants available on the range and control the frequency and intensity of grazing on the more desirable forage plants. Short duration grazing (SDG) appears to have the potential for combining the above grazing system features. SDG systems use: 1) multiple pastures, 3 to 60, 2) 1 to 15 day grazing period depending on the number of pastures, 3) 30 to 60 day rest period, again dependent on the number of pastures, and 4) a heavier stocking rate when compared with recommended season-long stocking rate.

Short grazing periods eliminate animals grazing regrowth of preferred plants. Relatively short rest periods allow plant regrowth but not maturation. As a result of short grazing and rest periods, animals are not forced to graze as much low quality forage, so animal nutrition is enhanced. Concentrating livestock on small pastures tends to disperse the herd, resulting in improved grazing distribution. Heavier stocking rates may be necessary to optimize livestock performance under SDG to eliminate excessive accumulation of mature, less nutritious, forage.

This grazing trial utilizes one full section of native rangeland divided into: one 320 acre season long (SL) pasture and, eight 40 acre short duration pastures (figure 1). On June 25, 20 cow-calf pairs and I bull were allocated to the SL pasture and 35 cow-calf pairs and 1 bull allocated to the SDG system. Cattle were rotated every 5 days on the SDG system as pastures received 35 days rest between grazings. Drought, causing low forage production, forced removal of livestock from both systems on September 3.

Soil Conservation Service Range Site Guides for this vegetation zone state that these sites should be producing 1400 2000 lbs/acre air dry forage. Less than half of the potential production was realized this year because of low rainfall. In this first year, forage production should have been, and was, similar between systems.

Utilization was quite similar between systems through the SDG system carried a heavier stocking rate of 15 additional cow-calf pairs. Fifty five percent utilization of forage occurred on the SDG system and 51% on the SL system.

Livestock performance did not reflect the dry conditions and associated low forage production. However, the length of the grazing season was shortened to 70 days on both systems. Average gain per head and daily gain were slightly higher, for cows grazing on the SL pasture (table 2). The average gain per acre for cows was the same between systems reflecting the higher stocking rate on the SDG system. Calf average gain per head and daily gain were similar between systems though average gain per acre was higher on the SDG system again reflecting the higher stocking rate (table 2).

Despite a significantly higher stocking rate on the SDG system, forage utilization and livestock performance were similar between grazing systems, forage utilization for SDG and SL grazing systems were 55 and 51%, respectively. Cow and calf average daily gains were slightly lower on the SDG system 0.4 and 2.2 lbs compared to the SL system 0.7 and 2.3 lbs, but gains per acre favored the SDG system.

Table 1. Forage production and utilization by range sites on two rangeland grazing systems, 1981.

System	Site	Forage produced lb/acre	Forage utilized lbs/acre	Percent utilization
	Silty	665	364	43
	Shallow	672	416	62
Short	Clayey	721	361	50
duration	Clay loam	689	381	55
	Sandy	642	413	64
	Average	678	387	55
	Silty	728	323	44
	Shallow	958	544	57
Season-	Clayey	550	229	42
long	Clay loam	470	281	60
	Sandy	691	344	50
	Average	679	344	51

Table 2. Livestock performance on season-long and short duration grazing systems, 1981.

Days grazed 70 Class		System	Avg. initial wt. lbs	Avg. final wt. lbs	Avg. gain/hd lbs	ADG gain lbs	Avg. gain/A lbs
	32 head*	SD	1024	1055	31	0.4	3
Cows							
	20 head	SL	1080	1129	49	0.7	3
	32 head*	SD	235	391	156	2.2	16
Calves							
	20 head	SL	240	399	159	2.3	10

* Three cow-calf pairs removed during trial due to 2 calf deaths and oone catching puemonia.

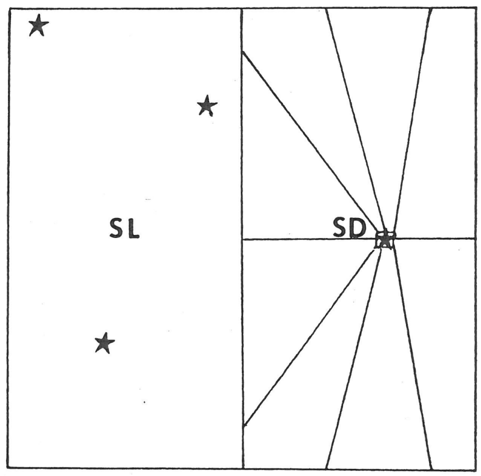

Figure 1. Diagram of Section 16, Dickinson Experiment Station showing grazing systems and pasture divisions, and water locations.