Dickinson Experiment Station

Annual Report

1979

Dickinson, North Dakota

Contents

Section I

Crop Production Trials

Report of

Agronomic Investigations

At the

Dickinson Experiment Station

Dickinson, North Dakota

1979

By

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Dickinson Experiment Station
Dickinson, North Dakota

Summary of Weather and Crop Conditions – 1979

A cold, dry spring delayed the beginning of seeding until the second week in May. Tillage for seedbed preparation and destruction of early spring weed growth served also to dry out the surface soil. Scant precipitation during a dry period extending from April 20 to June 18 resulted in uneven germination and unfavorable early crop growth in many plantings. On June 11 maximum temperature was 81° F increasing daily to a maximum of 102°F on June 14. This period of excessively high temperature coming at the end of the extended dry spell was and additional stress visibly affecting crop growth. The remainder of the growing season was cool with adequate but not excessive precipitation.

The season was unfavorable for the development of cereal rusts and leaf spotting disease with only trace amounts occurring.

As usual, wild oats was the most troublesome weed in grain crops, with pigeon grass a close second in many areas.

Widespread infestations of armyworm caused considerable crop damage in many areas.

Dickinson precipitation – 1979 inches.

	1978-79	87 Yr. avg.
September - December	4.58	3.56
January – March	1.48	1.56
April – June	5.25	7.45
July – August	4.43	3.88
Total	15.74	16.45

Dickinson temperature – degrees F.

	Avg. max.	Avg. min.	Avg. mean	69 Yr. avg.
April	46	26	36	42
May	61	35	48	53
June	76	49	63	62
July	82	55	69	69
August	79	51	65	67

Agronomic Procedure

Seeding dates for winter wheat at Beach, September 8, Bowman September 20, Hettinger September 21 and Dickinson, September 22. Winter rye was seeded at Dickinson September 22.

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

Off station spring grain trials were seeded at: Hettinger May 14; Bowman May 15; Killdeer May 16; Beulah May 17; Glen Ullin May 21: Regent May 22; Center May 24 and Beach June1.

At Dickinson, durum wheat was seeded May 2; oats and barely May3; and, wheat May 4.

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.

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

Crop production methods trial was seeded May 21, using the double disk drill for conventional seeding and the Melroe 702 drill for no-till seeding. The no-till treatment was sprayed with Roundup May 23, Stampede on June 8 and Mondak June 15.

The flexible cropping trial was seeded May 18 using the double disk drill for conventional seeding and the Melroe 702 for no till seeding. No till treatment in this trial was sprayed with Roundup May 23 and all treatments sprayed with Stampede June 8. Chemical fallow was sprayed with Bladex at two pounds per acre on May 23, Roundup on June 8 and was tilled on August 3. The total weed infested no-till treatment was abandoned and cut for hay on August 3.

Miscellaneous trials included a late planting of wheat, oats and speltz on May 23, soybeans, fababeans and dry edible beans on May 24, safflower on June 1, and sunflower on May 18.

Table2. Hard red spring wheat variety trial.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Waldron	38.2	59.5	7-5	31
Butte	38.5	60.5	7-4	29
Coteau	43.2	59.5	7-9	31
Olaf	43.2	59.5	7-8	28
Prodax	45.4	58.5	7-7	28
Wared	47.0	60.5	7-10	26
Kitt	41.3	58.5	7-10	26
Sinton	35.8	58.5	7-9	32
Eureka	39.1	59.0	7-8	31
Angus	39.6	60.5	7-9	28
Solar	43.5	61.5	7-11	28
Len	38.0	60.5	7-8	27
James	35.2	59.5	7-6	28
Lew	35.2	60.0	7-8	30
B – 1	41.0	59.0	7-9	26
MN 70170	46.7	61.0	7-9	26
ND 550	37.7	61.0	7-7	28
ND 565	41.3	61.0	7-7	32
ND 566	42.9	61.5	7-7	31
ND 567	32.5	61.5	7-7	30
ND 568	33.0	60.5	7-7	30
ND 569	39.3	58.5	7-7	27
ND 570	35.8	59.0	7-6	31
ND 571	32.2	59.5	7-6	30
ND 572	32.5	60.5	7-7	31
NK 511-4	38.8	61.0	7-7	27
SU 28-1	42.1	60.0	7-8	31
SU 56	30.5	58.0	7-8	29
MT 749	31.9	60.0	7-7	27
MT 7416	28.3	58.5	7-7	27

L.s.d. @ 5% = 3.4 bushels per acre
The c.v. = 8%

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

	Yield in bushels per acre					
Variety	1975	1976	1977	1978	1979	5-Yr. avg.
Waldron	37	41	30	46	38	38
Olaf	42	42	34	50	43	42
Wared	46	52	43	54	47	48
Prodax	48	53	39	55	45	48
Butte	41	41	25	53	39	40
Coteau	42	45	35	51	43	43
Kitt	40	34	30	49	41	39
Sinton		37	26	48	36	
Lew		47	34	47	35	
Len		48	35	45	38	
Angus			25	57	40	
Eureka			28	51	39	
L.s.d. @ 5% =	5.4	5.3	4.1	9.6	3.4	

Table4. Hard Red Spring Wheat – Dickinson and Off – Station Sites – 1979

Yield in Bushel Per Acre

Variety	Dickinson	Beach	Beulah	Bowman	Center	Glen Ullin	Hettinger	Killdeer	Regent	Average 9-Station
Waldron	38	25	32	37	42	50	33	35	37	37
Butte	39	28	31	31	42	48	35	37	36	36
Coteau	43	26	36	37	45	55	34	37	41	39
Len	38	26	33	35	42	48	33	42	37	37
James	35	25	33	36	42	45	35	36	37	36
Solar	44	29	39	36	51	57	40	47	44	43
Olaf	43	29	34	37	42	50	32	40	38	38
Angus	40	23	35	33	45	50	33	42	36	37
Eureka	39	26	33	33	42	49	33	36	37	36
Prodax	45	28	36	33	40	49	34	41	37	38
Wared	47	30	37	34	43	59	38	45	42	42
Lew	35	24	33	34	43	50	32	40	34	36

Lsd @ 5% 3.4 4.6 3.2 2.2 3.4 2.4 3.3 3.7 3.4

Table 5. Hard spring wheat variety trials- Dickinson and off station sites, 1979.

Test Weight Per Bushel

Variety	Dickinson	Beach	Beulah	Bowman	Center	Glen Ullin	Hettinger	Killdeer	Regent	Average 9-Station
Waldron	60	62	55	57	60	60	59	60	55	59
Butte	61	64	58	58	62	62	62	62	63	61
Coteau	60	57	57	57	60	61	58	60	59	59
Len	61	61	56	57	61	61	61	61	61	60
James	60	63	56	58	60	60	61	60	60	60
Solar	62	54	58	57	61	59	59	60	60	59
Olaf	60	57	56	57	60	59	60	60	61	59
Angus	61	62	59	57	61	60	61	62	61	60
Eureka	59	61	56	57	59	60	60	60	58	59
Prodax	59	58	59	57	60	60	58	60	58	59
Wared	61	55	58	55	60	59	56	60	59	58
Lew	60	62	57	58	62	62	60	61	61	60

Table 6. Hard spring wheat variety trials – Dickinson and off station sites, 1979.

Protein Percent at 14% Moisture

Variety	Dickinson	Beach	Beulah	Bowman	Center	Glenn Ullin	Hettinger	Killdeer	Regent	Average 9-Station
Waldron	14.7	16.2	13.8	15.1	13.4	15.4	14.6	14.5	15.6	14.8
Butte	14.7	15.8	12.8	14.7	14	15.5	13.9	13.8	16.6	14.6
Coteau	15.6	16.6	14.7	15.8	13.7	16.2	15	15.1	16.6	15.5
Len	15.2	15.9	14.2	15	14.1	15.5	14.9	14.4	16.9	15.1
James	14.9	16.4	13.9	14.7	13.9	15.7	14.8	14.5	16.8	15.1
Solar	13.2	14.3	12.2	13.3	11.8	13.1	12.8	12.3	14.2	13
Olaf	15	16.1	14.2	15	13.8	15.3	14.8	14.9	16	15
Angus	14	15.9	13.2	14	12.5	14.6	14.2	13.7	16	14.2
Eureka	15	16.4	14.1	15.4	12.6	15.7	14.8	14.4	17	15
Prodax	13.8	15.3	13.9	15.5	13.5	14.5	13	13.5	16.2	14.4
Wared	12.9	15	12.9	14.2	12.2	14	12.9	12.8	15.3	13.6
Lew	13.8	15.5	13.8	14.4	13.9	14.4	13.7	13.6	15.4	14.3

Table 7. Durum wheat variety trials.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Rolette	35.2	60.5	7-7	27
Crosby	38.0	60.5	7-6	29
Botno	34.7	60.0	7-7	28
Rugby	39.6	60.5	7-7	29
Cando	41.8	60.0	7-8	25
Calvin	41.0	60.5	7-7	23
Coulter	40.4	59.5	7-7	30
Edmore	36.3	60.0	7-7	28
Vic	36.0	61.0	7-8	29
D7224	38.2	60.0	7-8	27
DT427	38.0	60.5	7-6	30
D7483	38.2	59.5	7-6	27
D75140	41.0	59.5	7-6	31
D75171	39.0	60.0	7-6	30
D75209	33.3	59.5	7-6	27
D75184	34.1	59.5	7-6	26
D763	34.9	59.5	7-6	27
Ward	39.1	60.5	7-6	28

L.s.d. @ 5% = 4.8 bushels per acre

The c.v. = 13%

Table 8. Long term yield comparison of durum varieties.

	Yield in bushels per acre					
Variety	**1975**	**1976**	**1977**	**1978**	**1979**	**5- Yr. Avg.**
Rolette	38	39	35	40	35	37
Ward	37	31	39	43	39	38
Crosby	37	30	37	40	38	36
Botno	33	31	40	34	35	35
Rugby	38	29	40	42	40	38
Cando	31	33	51	39	42	39
Calvin	37	32	42	37	41	38
Coulter	37	32	44	38	40	38
Edmore		33	37	37	36	
Vic			42	34	36	

Table 9. Durum Wheat Variety Trials – Dickinson and Off-Station Sites – 1979

Yield in Bushels Per Acre

Variety	Dickinson	Beach	Beulah	Bowman	Center	Glen Ullin	Hettinger	Killdeer	Regent	Average 9-Station
Edmore	36	36	34	22	50	54	32	45	37	38
Vic	36	37	33	20	52	51	32	46	37	38
Rolette	35	33	34	19	48	48	30	42	37	36
Cando	42	47	36	23	47	55	31	46	39	41
Lsd @ 5%	4.8	3.4	3.5	2.6	2.5	3.6	1.5	3.1	2.0	

Test Weight Per Bushel

Variety	Dickinson	Beach	Beulah	Bowman	Center	Glen Ullin	Hettinger	Killdeer	Regent	Average 9-Station
Edmore	60	59	58	53	60	61	57	59	61	59
Vic	61	60	58	51	60	61	57	60	62	59
Rolette	61	63	60	53	57	63	63	62	63	61
Cando	60	57	58	53	63	61	61	61	63	60

Winter Wheat

All winter wheat planting, including field plots and nursery plantings at the station, and field plot plantings at Beach, Bowman and Hettinger were severely damaged by winterkilling. All 1979 winter wheat trials were abandoned.

Table 10. Oat variety trials.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Lyon	83.4	36.5	7-4	36
Kelsey	94.8	38.5	7-5	34
Cayuse	90.1	34.0	7-8	28
Otana	98.4	39.5	7-9	33
Harmon	84.5	39.5	7-11	33
Menominee	93.2	39.5	7-9	32
Hudson	95.8	36.5	7-8	31
Lancer	74.9	37.5	7-1	30
Benson	58.2	38.5	7-3	30
Moore	79.8	39.5	7-5	32
Marathon	84.5	37.0	7-12	36
Terra (hulless)	62.3	43.0	7-8	33

L.s.d. @ 5% = 5.1 bushels per acre

The c.v. = 5.9%

Table 11. Long Term yield comparison – Oat Varieties.

	Yield in bushels per acre					
Variety	1975	1976	1977	1978	1979	5-Yr. Ave.
Kelsey	67	120	51	96	95	86
Cayuse	69	101	58	113	90	86
Hudson	72	89	51	92	96	80
Harmon	73	92	45	81	85	75
Lyon		86	39	82	83	
Otana			52	99	98	
Menominee				86	93	
Moore				96	80	
Benson				65	58	
Lancer				60	75	
Terra (hulless)				62	62	

Table 12. Oat Variety Trials – Dickinson And Off-Station Sites – 1979

Yield in Bushels Per Acre

Variety	Dickinson	Beach	Beulah	Bowman	Center	Glen Ullin	Hettinger	Killdeer	Regent	Average 9-Station
Otana	98	91	75	85	96	118	52	97	105	91
Kelsey	95	88	75	84	97	114	50	94	106	89
Menominee	93	88	76	86	96	111	52	96	107	89
Marathon	85	87	74	79	85	97	51	84	97	82
Moore	80	88	71	76	85	98	47	86	97	81
Benson	58	66	54	54	65	81	37	68	82	63
Lancer	75	69	59	56	67	73	39	67	85	66
Lsd @ 5%	5.1	6.9	6.4	5.7	5.1	8.2	3.6	4.7	5.0	

Test Weight Per Bushel

Variety	Dickinson	Beach	Beulah	Bowman	Center	Glen Ullin	Hettinger	Killdeer	Regent	Average 9-Station
Otana	40	43	40	40	39	38	40	40	42	40
Kelsey	39	38	39	39	38	37	35	39	40	38
Menominee	40	38	40	39	39	38	37	40	42	39
Marathon	37	37	37	37	35	34	36	37	38	36
Moore	40	36	40	40	39	37	40	40	41	39
Benson	39	34	39	38	39	38	36	39	39	38
Lancer	38	32	38	37	38	36	34	39	37	37

Table 13. Barley variety trials.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Larker	62.6	48.5	7-7	29
Bonanza	58.5	47.5	7-7	31
Park	56.8	47.5	7-7	30
Glenn	56.1	47.5	7-7	28
Morex	64.3	49.0	7-7	31
Hector (2 row)	71.5	52.5	7-9	28
Klages (2 row)	76.0	51.0	7-10	26
Summit (2 row)	71.5	52.0	7-9	27
ND 1156	56.8	46.0	7-8	28
ND 1707	54.0	49.0	7-7	32
ND 1894	66.0	47.0	7-8	27
ND 2199	69.1	46.5	7-7	29
ND 2654-31 (2 row)	58.8	50.5	7-8	32
ND 2674 (2 row)	59.8	49.5	7-7	31
ND 3962 (2 row)	77.4	50.5	7-7	28

L.s.D. @5% = 5.3 bushels per acre

The c.v.= 15%

Table 14. Long term yield comparison – barely varieties.

	Yield in bushels per acre					
Variety	**1975**	**1976**	**1977**	**1978**	**1979**	**5-Yr. avg.**
Larker	50	73	35	54	63	55
Glenn	52	77	34	66	56	57
Park	48	65	33	60	57	53
Hector	61	80	58	72	72	69
Summit			44	76	72	
Morex			-	62	64	
ND 1156			23	62	57	
ND 2674			44	62	60	
ND 1707			-	55	54	
L.s.d. @ 5%	8.2	7.3	6.3	9.3	5.3	

Table 15. Barley Variety Trials – Dickinson and Off-stations Sites – 1979

Yield in Bushels Per Acre

Variety	Dickinson	Beach	Beulah	Bowman	Center	Glen Ullin	Hettinger	Killdeer	Regent	Average 9-Station
Glenn	56	84	51	49	75	60	32	70	62	60
Park	57	61	50	42	70	66	33	69	54	56
Morex	64	85	57	47	72	67	41	74	62	63
Larker	63	49	52	52	68	55	33	70	55	55
Hector	72	78	64	75	77	73	48	70	80	71
Summit	72	85	51	78	82	70	37	83	79	71
Lsd @ 5%	5.3	14.9	2.3	5.5	3.1	4.2	5.3	4.2	4.0	

Test weight per bushel

Variety	Dickinson	Beach	Beulah	Bowman	Center	Glen Ullin	Hettinger	Killdeer	Regent	Average 9-Station
Glenn	48	48	47	51	47	47	46	51	49	48
Park	48	50	47	51	48	48	47	51	51	49
Morex	49	51	48	51	48	48	49	51	51	50
Larker	49	50	48	52	49	48	49	51	51	50
Hector	53	54	50	54	51	52	52	52	51	52
Summit	52	54	51	53	52	51	52	53	53	52

Table 16. Winter rye variety trial.

Variety	Avg. Yield bu/acre	6-Yr. avg.	Test Weight
Cougar	36.0	48	58.0
Puma	29.2	45	57.0
Rymin	30.3	49	56.5
Frontier	28.1	-	57.5

L.s.d. @ 5% = 1.8 bushels per acre

The c.v. = 10.4%

Nursery Trial With Small Grain

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

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

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

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

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

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

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

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

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

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

Seeding dates for wheat, oats and barley was May 14. Flax and durum were seeded May 15 and safflower June 1.

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

Because of a prolonged dry period from the middle of April to the middle of June, the seedbed surface was dry, resulting in some unevenness in germination. Particularly affected was the flax nursery which never developed a satisfactory stand and was abandoned.

Winter wheat nurseries were completely winterkilled during the winter of 1978-79.

Table 17. Uniform regional hard spring wheat.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Marquis	22.1	66.0	7-6	30
Chris	26.1	62.0	7-7	31
Waldron	20.7	61.5	7-4	27
ND550	28.7	62.0	7-8	28
ND565	25.8	62.0	7-7	26
ND567	25.0	63.0	7-4	31
ND569	23.2	61.0	7-4	26
ND570	23.6	63.5	7-4	28
ND571	24.1	62.5	7-3	28
SD2355	30.3	61.5	7-9	32
SD2356	31.1	62.0	7-9	32
MT7648	27.1	61.5	7-8	25
MT7635	19.3	63.0	7-4	26
Era	25.3	62.0	7-10	26
MN7324	28.7	60.0	7-7	26
MN73168	23.1	61.0	7-7	23
MN7222	23.9	62.0	7-5	23
MN7336	27.5	61.0	7-6	24
MN7378	21.5	62.5	7-5	23
RL4314	24.7	60.0	7-8	28
NK5511-4	22.7	61.0	7-6	25
NHS183-74	26.9	61.5	7-3	24
NHS1001-75	27.2	62.0	7-11	25
WA6307	28.7	61.0	7-14	24
WA6510	22.9	62.0	7-9	23
WA6511	26.6	55.5	7-12	24
WSMP122	25.3	61.0	7-12	26
Butte	22.0	63.0	7-5	26

Table 18. Uniform regional durum nursery.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Mindum	21.5	57.0	7-12	33
Rolette	18.8	61.0	7-7	23
Ward	17.8	59.0	7-11	26
Crosby	15.6	59.0	7-11	25
Botno	15.7	61.0	7-9	25
Rugby	19.3	60.0	7-12	23
Cando	19.2	61.0	7-10	25
Calvin	16.4	62.0	7-7	23
Coulter	17.9	60.0	7-10	27
Edmore	19.1	63.0	7-10	25
Vic	21.3	63.5	7-12	28
D7224	19.5	60.5	7-11	25
DT427	14.7	58.0	7-11	25
D7483	14.9	60.0	7-12	24
D75140	17.5	60.5	7-10	25
D75171	19.9	61.5	7-10	25
D75209	15.3	59.0	7-8	23
D763	17.0	62.0	7-11	26
D75184	14.4	59.5	7-8	26
D771	19.0	60.5	7-12	25
D772	16.6	58.5	7-12	21
D773	13.4	61.5	7-9	23
D774	15.2	60.5	7-10	24
D775	16.6	61.0	7-9	22

Table 19. Uniform early oat performance nursery.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Otee	33.1	37.0	7-3	22
IL73-2186	37.7	36.0	7-4	21
IL74-5667	33.6	36.5	7-4	22
IL75-5667	34.8	36.5	7-2	23
IL75-5743	32.2	34.5	7-4	19
IL75-5681	37.8	36.0	7-3	23
Lang	38.8	34.0	7-3	21
Clintford	33.8	36.5	7-3	23
IA-Y341-41	34.3	37.0	7-3	25
IA-Y22-15-9	33.5	36.0	7-4	23
IA B525-2	25.5	36.5	7-2	24
IA-Y286-53	32.2	37.0	7-3	23
Grundy	30.8	39.0	7-2	23
Andrew	32.7	37.0	7-2	23
MO-06637	29.8	35.0	7-3	20
MO-06553	43.8	36.5	7-3	20
MO-06767	27.2	38.5	7-3	22
MO-06528	40.8	36.0	7-4	23
MO-06806	29.3	33.5	7-2	22
Bates	28.5	35.0	7-4	22

Table 20. Uniform midseason Oat performance nursery.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
WIX3086-1	55.2	34.5	7-8	27
WIX2977-1	52.2	37.5	7-7	29
WIX2795-1	49.3	34.5	7-8	29
WIX3420-1	49.1	36.5	7-9	32
Dal	48.2	33.5	7-8	27
Lang	44.7	33.0	7-2	23
IL73-2664	49.7	33.0	7-2	26
IL75-1062	34.5	36.0	7-2	23
IL75-1056	46.4	36.0	7-2	23
IL75-5665	35.0	34.5	7-1	23
MI64-152-47	62.4	37.0	7-9	29
MI69-27-403	55.6	37.0	7-9	28
Orbit	45.7	31.5	7-3	23
OA366	54.1	38.5	7.1	27
OA424-1	52.9	38.5	7-6	37
OA405-5	46.6	32.0	7-6	32
NY6083-21	54.1	32.5	7-8	23
NY5977-6-56	32.5	32.0	7-7	26
Otee	39.5	36.5	7-3	24
SD743199	51.3	38.5	7-2	27
SD740065	33.7	36.0	7-2	27
SD760044	48.7	36.0	7-8	28
CLintland 64	32.0	35.5	7-2	24
MN76161	37.3	35.5	7-2	23
Gopher	48.2	33.5	7-4	27

Table 20. Uniform midseason oat performance nursery continued.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
P7135A1-1-8-4	43.6	38.5	7-2	27
P70408D2-3-3-3-2	30.5	36.0	7-2	25
P70408E1-3-25-2	54.3	37.5	7-8	28

Table 21. Uniform great plains barley performance nursery.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Firlbecks III	48.3	50.5	7-9	26
Primus II	29.8	49.0	7-2	24
Larker	39.1	48.5	7-5	27
Beacon	29.6	44.5	7-4	28
Klondike	45.0	47.0	7-7	28
SD69-1781	39.5	48.5	7-7	28
Morex	42.0	49.0	7-7	27
Br A31-1	43.3	49.0	7-8	27
ND1894	38.1	46.0	7-7	25
Br DS4-1	51.8	46.5	7-7	26
SD71-672	34.3	51.5	7-4	23
SD77-104	37.4	49.0	7-5	25
SD77-119	37.6	48.5	7-4	26
SD77-137	41.5	41.0	7-5	27
SD77-163	39.0	47.0	7-3	25

Table 22. Western dryland spring barley nursery.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Munsing	38.3	52.0	7-9	20
Galt	30.2	45.0	7-9	24
Steptoe	36.3	46.5	7-4	23
ID711767	45.6	47.5	7-11	28
MR547255	45.3	48.0	7-10	26
Hector	53.3	51.0	7-9	28
ID744302	37.1	46.0	7-9	25
ND265431	44.5	50.0	7-9	26
MT547123	50.8	49.5	7-9	26
MT547234	53.3	49.0	7-10	27
MT547354	47.1	50.0	7-10	25
WA895375	47.2	50.0	7-10	24
WA904475	42.6	49.5	7-9	24

Table 23. Western spring barley nursery.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Trebi	32.1	44.5	7-7	24
Steptoe	40.1	45.0	7-2	22
Larker	47.8	47.8	7-6	26
Klages	42.8	46.0	7-9	26
Wa11312	31.3	45.5	7-2	19
ID723633	52.2	49.0	7-9	23
ID731959	35.2	46.5	7-11	20
MT547143	45.1	49.0	7-10	28
OR182	56.7	48.0	7-10	22
OR22113	48.2	49.0	7-10	25
OR741209	41.5	45.0	7-10	21
Morex	52.2	49.0	7-8	27
CA 71223	31.0	42.0	7-8	18
CA71125	43.3	43.0	7-7	19
ID744302	42.1	46.0	7-10	24
MT547123	54.8	49.5	7-9	25
MT547234	53.1	49.0	7-10	24
MT547276	47.7	48.0	7-12	27
OR74206	29.2	43.5	7-12	26
OR74226	36.3	44.0	7-13	21
SK74234	52.3	50.0	7-10	23
UT11399	45.7	46.0	7-9	23
UT65471	47.5	45.5	7-12	24
UT65504	49.3	49.0	7-10	22
WA895375	39.8	47.5	7-11	24

Table 23. Western spring barley nursery continued.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
WA913575	53.3	48.5	7-11	22
WA903775	37.0	46.0	7-11	27
WA904475	48.1	49.0	7-11	25

Table 24. Safflower performance nursery.

Variety	Avg. Yield lbs/acre	Test weight	% Oil
Sidwell	863	40.0	40.5
S 208	983	38.5	40.7
Carmex 353	1102	37.0	40.8
S-400	776	36.0	43.1
S-296	908	35.5	42.7
Partial Hull	822	37.5	39.3
755-1	708	39.5	36.3
76B4220-2,6	700	38.5	38.4
76B4306	970	37.5	35.0
US10	994	38.0	41.2

National Sunflower Performance Trial

The National Sunflower Performance Trial was planted at both the Dickinson Experiment Station and the Hettinger Experiment Station. Thirty-three (33) varieties were included in the Dickinson Trial representing 17 different seed sources and 30 varieties representing 16 seed sources were included in the Hettinger Trial. Seeding and harvest dates were: Dickinson – Seeded May 15, Harvested October 15; Hettinger – Seeded May 25, Harvested October 9. Plots were three rows, 30 inch spacing between rows and 25 feet long replicated four times. Plots were overplanted and thinned back to desired plant per acre stands of 15,500 to 16,500. No chemical weed control was used. Weeds which were troublesome, particularly pigeon grass, were kept in check by cultivating and hand weeding.

Yield rows were bagged with #1250/OT pollen tector bags after flowering was complete to protect against bird damage. Birds were nit troublesome at Dickinson unlike last year, but if precautionary measures had not been taken the Hettinger trial would have been a total loss. Border rows at Hettinger were 90 to 99 damaged by birds.

Overall yields at both locations were quite good despite lack of moisture in the early part of the growing season an some weed problems. Although hand weeded, weeds were hard to keep ahead of and yields may have been reduced slightly. Chemical weed control will be used in the future trials.

Both trials were seeded on summer fallow in 1979. Future trials will be seeded on small grain stubble land so that yields will be more comparable with yields obtained on the farm.

Mr. Robert C. Wagner, Area Agronomist, Cooperative Extension Service Supervised planting care and harvest of both trials, and in the preparation of this report.

Table 25. National Sunflower Performance Trial

Dickinson – 1979

HYBRID/VARIETY	REP 1	REP 11	REP 111	REP 1V	AVE.	TEST WT.	% Oil
	Yeild lbs/acre						
Hybrid 894	1499	1943	2003	1125	1643	31.5	42.1
Hybrid 903	1663	1965	1014	1854	1624	33.0	43.1
IS 7775	1812	1698	1669	1262	1610	33.5	39.2
IS 3107	1385	1672	887	1155	1275	33.5	43.7
Sunhi 304	2205	1587	1377	1357	1632	32.5	41.5
Sunhi 301A	1585	1867	1115	1203	1443	32.5	43.9
DO 704	1760	1760	1141	1293	1489	32.5	42.5
DO 844	1547	1643	1065	1244	1375	32.5	39.8
Cargill 204	2535	1997	1154	1623	1827	32.0	41.7
Cargill 205	1660	1628	1865	1092	1561	35.0	44.7
J 501	1885	1668	2087	1414	1764	32.0	42.5
J 701	1354	1125	673	982	1032	32.5	44.6
Hysun 101	1545	1607	1333	1149	1409	31.5	41.9
Sigco 894A	1836	1688	1408	1721	1663	32.0	43.1
Sigo 241A	2133	1882	1143	1190	1587	31.5	43.7
RBA 300G	1766	1717	1558	1571	1653	32.0	41.9
RBA 400D	1327	1587	1316	1642	1468	32.0	41.2
MF 700	2116	2136	1163	1530	1736	32.0	40.3
MF 800	1409	1683	1659	1359	1528	30.5	42.0
GH 10	1628	1282	1071	1092	1268	29.5	41.8
GH 20	1671	1660	1698	1109	1535	32.5	40.7
Sheyenne 893	1469	1735	1882	1196	1571	31.5	41.7
Sheyenne 898	1772	1946	1374	996	1522	31.5	44.8
Sunbred 254	1836	1798	1064	1499	1549	32.0	42.2
Sunbred 265	1652	1659	1074	1258	1411	32.5	41.5
Cenex 907	1746	1530	1706	1715	1674	31.0	41.5
Cenex 897	1637	2212	1200	1366	1604	30.5	40.6
4 W 1100C	1741	1821	1279	1205	1511	32.5	44.0
4 W 900	1392	2102	1238	1213	1486	33.0	41.4
Cal/West 034	1812	1836	1663	1065	1594	31.5	42.7
Sungro 378	1704	1405	887	1256	1313	33.5	43.7
Sungro 380	1637	1180	958	1076	1213	34.0	43.8
Sungro 372A	1662	1729	1071	1036	1375	31.5	41.5

LSD @ 5% = 352
CV = 16.6%

Overall
Average 1513.4

Table 26. National Sunflower Performance Trial

Hettinger – 1979

HYBRID/VARIETY	REP1	REP11	REP111	REP1V	AVE.	TEST WT.	% OIL
			Yield lbs/acre				
Hybrid 894	1427	2224	2016	2225	1973	35.0	41.2
Hybrid 903	1627	1981	1522	1855	1746	33.0	40.6
IS 7775	1761	1727	2203	1634	1831	33.0	40.0
IS 3107	2132	1514	1554	1898	1774	33.0	43.2
Sunhi S304	1433	1303	1551	2019	1576	34.0	40.0
Sunhi S301A	1537	1562	1929	2024	1763	32.0	41.4
DO 704	1971	1609	1813	2154	1842	31.5	40.4
DO 844	1147	2053	1866	1672	1684	34.0	39.5
Cargill 204	2490	1534	1736	1545	1826	33.0	38.4
Cargill 205	2002	2103	1800	2025	1982	35.0	43.4
J 501	1274	1508	1774	2028	1646	33.5	40.5
J 701	1692	1349	1450	1808	1575	35.0	42.6
Hysun 101	1630	1358	2313	1681	1746	32.0	40.0
Sigco 894A	1513	1842	2257	1858	1868	33.5	39.9
Sigco 241A	1696	1363	1713	2010	1696	34.5	41.6
RBA 300G	1822	1568	1751	1427	1642	32.0	40.0
RBA 400D	1450	1735	1715	1663	1641	33.0	39.0
MF 700	2050	1624	1652	1650	1744	31.0	39.3
MD 800	1438	1352	1647	2135	1643	32.5	40.5
GH 10	1505	1854	1794	1716	1717	32.5	38.7
GH 20	1523	1840	1837	1829	1757	32.0	39.3
Sheyenne 893	2160	1537	2135	1640	1868	32.0	40.7
Sheyenne 898	1869	1494	1803	1632	1700	34.0	41.3
Sunbred 254	1502	1557	1802	1897	1690	34.0	39.3
Sunbred 265	1658	1392	1892	1803	1686	33.0	39.8
Cenex 907	1832	2333	1294	2368	1957	32.0	39.8
Cenex 897	1603	1459	1862	2091	1754	33.5	40.6
4 W 1100 C	1926	1713	2202	1488	1832	33.0	42.9
4 W 900	1367	2041	1936	1468	1703	32.5	39.8
Cal/West 034	1481	1601	1352	1276	1428	31.5	40.5

LSD @ 5% = 276.9
CV = 16%

Overall
Average 1742.9

Bean Production Trial

The Bean Production Trial contained two Navy, two Red Mexican Kidney, one Great Northern, one Pinto, one Black Turtle, two Soybean, and two Fababean varieties. Seeding date was May 24, 1979. Planting rates were adjusted to permit 38-40 lbs. P.L.S./acre for the Pinto, Red Mexican, and Great Northern Beans. Stands were thinned to desired populations as needed. Plots were three rows, 30 inch spacing between rows, and 25 feet long. No chemical weed control was used. Weeds which were troublesome, particularly Pigeon Grass, were kept in check by cultivating and hand weeding.

Overall yields were quite good despite bacterial blight infections in all varieties except for the Fababeans and Evans Soybeans. The Navy and Kidney Beans showed the most severe infections. Test weight averaged over 61 lbs/acre for all varieties.

Two year averages for the four varieties grown in 1979 and 1979 indicate that beans can do fairly well in this area. Extreme care should be taken to obtain blight free seed (certified) if beans are to be produced on a commercial basis.

Mr. Robert Wagner, Area Agronomist, Cooperative Extension Service assisted in the planting, care and harvest of this trial and in the preparation of this report.

Table 27. Bean Production Trial – 1979

					Yield – lbs/acre			
Type & Variety	**R1**	**R2**	**R3**	**R4**	**Average**		**Test & Wt**	**Average 2-yr.**
Upland-Navy bush	1308	1513	1289	1528	1409		64	1358
UI76- Navy vine	1476	1347	829	592	1061		63	1232
Black Turtle-Soup	1463	1538	1566	1282	1462		64	
UI36 Red Mexican Kidney	1585	1761	2076	1618	1760		61	1700
UI37 Red Mexican Kidney	1102	1322	1417	1285	1282		60	
Emerson-Great Northern	1719	1667	1593	1354	1583		58.5	
UI114 Pinto	1694	1824	1553	1813	1721		60.5	1581
Altona Soybean	1446	1366	1159	976	1237		58	
Evans Soybean	810	873	1135	1064	970		56.5	
Diana Fababean	1683	1652	1261	1557	1538		65	
Ackerpearle Fababean	1469	1891	1415	1096	1468		65.5	

Lsd @ 5% = 210.7

CV = 14%

Over-all Average 1408 lbs/acre

Wheat Production on Fallow,
Second Cropping and Continuous Cropping

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

In 1978, wheat on summerfallow averaged 38.5 bushels per acre in this trial compared with 31.4 on second cropping and 30.6 on continuous cropping. High yields on stubble land 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.

Table 28. Wheat production on fallow, recrop and continuous cropping.

Treatment	1976	1977	1978	1979	4-yr. avg.
Fallow	43.0	26.9	38.5	32.4	35.2
Recrop	27.0	11.5	30.2	15.9	21.2
Continuous crop	22.0	5.5	30.6	12.8	17.7

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 and soil water and other environmental conditions were favorable for good germination and growth throughout the growing season.

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

Penetration of the surface soil and satisfactory seed placement was not as difficult with the Melroe 700 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 only the Melroe 701 and the conventional tillage seeding treatments were compared. Initial growth was slower on the minimum tillage treatment. This may ne partly due to lower surface temperatures caused by the reflective and insulating effects of the straw and stubble on the minimum tillage treatment.

Table 29. Minimum tillage and double disking for wheat production on recrop.

	Yield bushels per acre			
Treatment	1977	1978	1979	3-Yr. avg.
Minimum tillage & seeding Melroe 701 drill	12.6	10.3	9.6	10.8
Double disk and Conventional seeding	15.0	28.5	15.9	19.8

Wheat Production On Cornland, Sunflower and Wheat Stubble Compared

Increased interest in sunflower production had resulted in many questions about this crop, one of which is its effect on the crop following it in the rotation. The following table, summarizing yields for 1979, shows production on sunflower stubble-land to be slightly better than wheat after wheat and considerably less than wheat after crop.

Table 30. Wheat yields on double disked cornland, sunflower stubble and wheat stubble compared.

Previous Crop	Yield – bushels per acre Rep 1	Rep 2	Rep 3	Rep 4	Avg.	Test Weight
Corn	34.7	30.8	30.2	32.4	32.0	60.5
Sunflower	20.4	21.9	21.9	24.8	22.2	61.5
Wheat	22.0	16.7	17.0	18.9	18.7	58.5

Speltz, Oats and Wheat Production

Olaf wheat, Hudson oats and Speltz (Emmer) were planted on May 25 in a comparison production trial. All were seeded on summerfallow and fertilized at the recommended rate of 50 pounds per acre of 18-46-0 dry chemical fertilizer. No broadleaf weed control was required on this planting because of late tillage before seeding.

Yields are summarized in table 31.

Table 31. Yields of wheat, oats and speltz – 1979.

Crop	Seeding date	Average yield pounds/acre	Test weight
Olaf wheat	May 4	2592	59.5
Olaf wheat	May 25	1569	59.5
Hudson oats	May 4	3066	36.5
Hudson oats	May 25	2369	37.0
Speltz (Emmer)	May 25	1283	35.0

<u>Cropping Systems Study</u>

This study evaluated 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 during the fallow season. Tillage will be used if necessary.

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 systems will have fertility variable included each year based 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.

<u>1979 Treatments:</u>

To determine what type of fertility treatments to consider for use in 1979, soil samples for analysis of nutrient status and water content were taken on May 1, 1979. Ken Thompson, Soil Scientist with the area Soil Conservation Service office at Dickinson assisted in obtaining these samples. Three sets of soil samples were taken from each cropping system strip at depths of 0”-6”, 6”-12”, 12”-24”, 24”-36”, 36”-48”, 48”-60” inches.

Analysis of the soil samples from appropriate depths for nitrogen, phosphorus and potassium revealed the following:

(1) <u>Follow Strips</u>

Nitrate nitrogen was 133 and 103 pounds per acre 2 feet. Phosphorus tested 19 and 23 pounds per acre (rated as high and medium respectively). Potassium tested 436 and 375 pounds per acre (rated as very high).

(2) <u>Stubble Strips</u> (Used for flexible and no-till cropping systems)

Nitrate nitrogen content was 28, 18 and 20 pounds per acre 2 feet. Phosphorus tested 10, 21 and 19 pounds per acre (all rated medium) and potassium tested 380, 267, and 363 pounds per acre (all rated very high).

Available Water :

Available water determination showed the fallow areas to contain 3.57 and 3.18 (average of 3.38) inches of plant available water to the 4 foot depth. The calculations for available water stubble strips gave values of 2.22, 2.78 and 2.77 (average of 2.59) inches of plant available water per 4 foot depth.

Potential water storage capacity of the fallow areas was an average of 8.72 inches per 4 foot depth. The average value for the stubble strips was 7.59. Thus the fallow area contained about 39% and the stubble areas about 34% of their potential water holding capacity.

After consideration of soil test values and water determinations using guide-lines contained on pages 16-26 of the 1979 Crop Production Guide, fertilizer treatments for a 40 bushel per acre yield goal were used. Twenty pounds of phosphate was used since the test wea medium. No potash was included since it tested very high.

Olaf Hard Red Spring Wheat was used throughout the trial in 1979.

Cropping Systems Study
Field Plan

Alternate Fallow Crop System		Chemical Fallow	Flexible Crop System		No-till System	Chemical Fallow
C B A 92	Black Fallow 93	C B A 94	C B A 95	C B A 96	C B A 97	Chemical Fallow 98
C B A 91	Black Fallow 90	C B A 89	C B A 88	C B A 87	C B A 86	Chemical Fallow 85
C B A 60	Black Fallow 61	C B A 62	C B A 63	C B A 64	C B A 65	Chemical Fallow 66

Alternate fallow crop system:

Plots 61, 90, & 93 were the Black Fallow Plots.

1. No fertilizer.
   # Plots 60B, 91B, 92B

2. 45 pounds of 0-44-0 per acre applied at seeding (supplies 0+20-0).
   # Plots 60C, 91C, 92C

3. 45 pounds of 18-46-0 (Farm rate per acre applies at seeding (supplies 8+20+0).
   # Plots 60A, 91A, 92A

Chemical fallow crop system:

1. No fertilizer.
   # Plots 62A, 89A, 94A

2. 45 pounds of 18-46-0 (Farm rate per acre applied at seeding (8+20+0).
   # Plots 62C, 89C, 94C

3. 45 pounds of 18-46-0 per acre plus 37 pounds of 46-0-0 before seeding (25+20+0).
   # Plots 62B, 89B, 94B

Flexible cropping:

The 2.59 inches of available water contained on stubble ground is borderline as to recropping feasibility. It was decided to be optimistic about growing season precipitation (80% probability of receiving over 6 inches, 50% probability of receiving over 8 inches during May 7 to August 15) and use the following fertilizer treatments to look at a potential yield goal of 40 bushels per acre.

1. 45 pounds of 18-46-0 (Farm rate per acre applied at seeding (8+20+0).
   # Plots 64A, 87A, 96A

2. Same as 1 plus 57 pounds of 82-0-0 injected prior to seedbed preparation (supplies 55+20+0).
   # Plots 63C, 88C, 95C

3. Same as 1 plus 125 pounds of 82-0-0 injected prior to seedbed preparation (110+20+0).
   # Plots 63A, 88A, 95A

4. Same as 1 plus 222 pounds of 46-0-0 broadcast prior to seedbed preparation (110+20+0).
   # Plots 64C, 87C, 96C

5. Same as 1 plus 222 pounds of 46-0-0 topdressed at late tiller stage (110+20+0).
   # Plots 64B, 87B, 96B

6. Same as 1 plus 125 pounds of 82-0-0 injected into wheat stand at late tiller stage (110+20+0).
   # Plots 63B, 88B, 95B

No-till Cropping:

Fertilizer treatments were again geared toward a 40 bushel per acre yield goal.
Treatments used were:

1. 45 pounds of 18-46-0 per acre at seeding time plus 102 pounds of 46-0-0 broadcast before seeding (Supplies 55+20+0).
   # Plots 65C, 86C, 97C

2. As in 1 except 222 pounds of 46-0-0 was used (110+20+0).
   # Plots 65A, 86A, 97A

3. As in 1 except 125 pounds of 82-0-0 injected into stubble prior to seeding (110+20+0).
   # Plots 65B, 86B, 97B

Miscellaneous Information:

Baseline data were obtained in bacteria counts and penetrometer readings to possibly evaluate the effect of 82-0-0 (anhydrous ammonia) on killing micro-organisms and causing the soil to get hard. Bacteria counts ranged from 14 to 21 million per gram of soil.

pH values in the 0-6 inch depth ranged from 5.7 to 6.3, in the 6-12 inch depth the range was 6.0 to 7.0, values got as high as 8.7 in the 48-60 inch depth.

Sulfur content in the 0-6 inch depth ranged from 4.3 to 32.8. The sulfur values in deeper depths also seemed low and may justify consideration of some future work on sulfur response.

Soluble salts are not a problem at the experimental site although modest salt levels (EC_e 1-2) are found below the 3 foot depth.

Organic matter ranged form 2.6 to 3.8 in the 0-6 inch depth.

Zn tests ranged from .7 to 1.3 ppm in the 0-6 inch depth.

Mn tests ranged from 13 to 17 ppm in the 0-6 inch depth.

Cu tests ranged from 1.0 to 1.6 ppm in the 0-6 inch depth.

Texture of the 0-6 inch depth was determined as medium by the feel method.

Bulk density values for calculation of available water were obtained from a study by Bauer and Conlon (North Dakota Research Report No. 51). These values were:

Depth	Bulk Density (gms) (cc)
0-6	1.43
6-12	1.48
12-24	1.55
24-36	1.53
36-48	1.52
48-60	1.51

Dr. Russ Schneider and Mr. Byron Johnson determined 1/3 and 15 bar values on soil samples for calculation of available water supply and potential water holding capacity. The average values of all strips by depth are as follows:

Depth	1/3 Bar	15 Bar	Available Water Holding Capacity
0-6	23.2	11.1	1.04
6-12	24.7	13.0	1.04
12-24	27.9	17.2	1.99
24-36	27.0	15.9	2.04
36-48	26.0	15.2	1.97
48-80	24.0	12.6	2.07

This trial is being conducted jointly by: Dr. E.H. Vasey, Soils Specialist, Dr. Carl Fanning, Soils Specialist, and Mr. Robert C. Wagner, Area Agronomist, Cooperative Extension Service, and Mr. Thomas J. Conlon, Superintendent, Dickinson Experiment Station.

The 82-0-0 (anhydrous ammonia) and the use of a nurse tank was donated by Farmers Union Oil Company of Southheart, North Dakota. The 46-0-0 (urea) was donated by Richard Kappedal of Cominco American, Inc. The 0-44-0 and 18-46-0 was donated by Bob Hanson, Fieldman for Cenex of Dickinson, N.D. and Stan Holzemer, Cenex Area Sales Representative.

Summary:

Except for the observation that the yield data presented in table 32 clearly shows the obvious need for adequate soil water, as seasonal precipitation or as a combination of precipitation and stored soil water, no conclusions are offered. The trial is planned for a minimum of five years to show the ultimate effects of available soil water on crop yields under growing conditions prevailing in the semi-arid climate of southwestern North Dakota. An economic analysis of each crop system is planned when sufficient data have been accumulated.

Table 32. **Crop system production trial – 1979.**

Yield in Bushels per Acre

Treatment -1978	**Fertilizer Applied 1979**	**Rep 1**	**Rep 2**	**Rep 3**	**Average**	**Test Weight**
Black Fallow1/	Soil Test-45 lbs. 0-44-0 at seeding	31.4	31.4	33.0	31.9	61.0
Black Fallow	None-Check	33.0	31.4	29.9	31.4	60.5
Black Fallow	Farm Rate – 45lbs. 18-46-0 at seeding	32.2	27.5	29.9	29.9	61.0
Chemical Fallow 2/	Farm Rate-45lbs. 18-46-0 at seeding	28.3	29.1	29.1	28.8	59.5
Chemical Fallow	Soil test-37lbs. 46-0-0 Broadcast in Spring Plus 45lbs. 18-46-0 at seeding	26.7	26.7	28.3	27.2	60.0
Chemical Fallow	None -Check	23.6	23.6	28.3	25.2	57.0
Cropped to Wheat 3/	57lbs. 82-0-0 injected in Spring plus 45lbs. 18-46-0 at seeding	15.7	20.4	15.7	17.3	55.0
Cropped to Wheat	45lbs. 18-46-0 at seeding plus 125lbs. 82-0-0 injected late tiller, early joint	12.6	13.4	14.1	13.4	53.5
Cropped to Wheat	125lbs. 82-0-0 injected in Spring plus 45lbs. 18-46-0 at seeding	13.4	13.4	15.7	14.2	54.0

1/ Conventional fallow crop system. 2/ Chemical fallow crop system. 3/ Flexible crop system.

Table 32. Crop systems production trial – 1979 continued.

Treatment – 1978	Fertilizer Applied 1979	Rep 1	Rep 2	Rep 3	Average	Test Weight
		Yield in Bushels per Acre				
Cropped To Wheat 3/	222lbs. 46-0-0 broadcast in Spring plus 45lbs. 18-46-0 at seeding	13.4	14.9	15.7	14.7	51.0
Cropped To Wheat	45# 18-46-0 at seeding plus 222# 46-0-0 topdress at late tiller, early joint	11.9	12.6	14.9	13.1	56.0
Cropped to Wheat	Farm Rate – 45# 18-46-0 at seeding	13.4	14.9	14.9	14.4	55.0
Cropped To Wheat 4/	102# 46-0-0 broadcast in Spring plus 45# 18-46-0 at seeding					
Cropped To Wheat	125# 82-0-0 injected in Spring plus 45# 18-46-0 at seeding					
Cropped to Wheat	222# 46-0-0 broadcast in Spring plus 45# 18-46-0 at seeding					

3/ Flexible crop system. 4/ No-till crop system.

Section II

Livestock Feeding Trials

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

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 that steers fed similar rations. Other research in which taste panels, shear 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 were always present. However, the coarse texture commonly reported was not a problem. These closely tied to the slaughter cow market and without changes in the grading system, feeding bulls to slaughter weights will never become popular.

Feeding bulls to backgrounded 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 calves in which castration has been delayed until the end of the backgrounding phase, with steers handled in a conventional manner.

Hereford X Angus (BWF) steers and bulls averaging 500 pounds were randomly allotted 12 head per treatment.

The steer calves were implanted at the beginning of the trial with 36mg. 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 on-half inched 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 chemical which is undesirable.

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

Roughages used in this study were chopped in a tub grinder through a ¾ inch screen and were blended with grain and minerals in a portable mixing wagon. The complete mixed rations were self-fed in straight walled feeders of station design. In 1978 the ration consisted of chopped mixed hay, oats, salt and minerals. In 1979 the AGNET computer system was used to formulate the ration which consisted of chopped hay and straw, oats, barley, salt and minerals. That rations and the number of days they were fed are shown in table 1.

Feeding data from this trial has been summarized in tables 2 and 3.

<u>Summary:</u>

In 1979 there was no differences measured for rate of gain, feed efficiency or net return between the late castrated bulls and steers.

The two year average net return favors the late castrated bulls because in 1978 they were more efficient, averaged six dollars cheaper per hundredweight to buy and returned $.55 more per hundredweight when sold as backgrounded steers.

Table 1. Ration percentages and the number of days each ration was fed in 1978 and 1979.

1978	Warm-up	1st change	2nd change
No. days fed	20	90	30
Oats	40	50	75
Mixed hay	57.5	47.5	23.5
Di-calcium phosphate	.5	.5	.5
Salt	2	2	2

1979 (AGENT)	Warm-up	1st	2nd	3rd	4th
No. days fed	12	7	93	15	15
Oats	30	40	50	50	50
Barley	-	5	5	20	30
Chopped mixed hay	67.5	25	15	15	19.3
Chopped oat straw	-	29.5	29.5	14.3	-
Di-calcium phosphate	.5	-	-	-	-
Limestone	-	.23	.23	.4	.4
Salt	2	.27	.27	.3	.3

Table 2. Weights, gains, feed costs and returns, bull feeding phase I, 1978.

		BWF Steers		BWF Bulls 1/
No. head		12		12
Days on feed		140		140
Starting wt., ibs.		502		515
Final wt., lbs.		743		753
Gain, lbs.		241		238
ADF, Ibs.		1.72		1.70
Feed summary:				
Feed cost/lb., $		.0426		.0426
Feed/hd/day, lbs.		21.7		20.2
Feed/lb. gain, lbs.		12.6		11.9
Implant cost/hd., $		.60		-
Feed cost/hd., $		129.41		120.47
Economics:				
Selling wt., lbs.		743		753
Gross return/hd., $	@ 53.70	399.17	@ 54.25	408.68
Feed + implant cost/hd., $		130.01		120.47
Feeder calf value, $	@ 46	230.92	@ 40	206.90
Net return, $		+38.27		+82.21

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

Table 3. Weights, gains, feed summary and economics 1979 and 2-year averages.

	BWF steers				BWF bulls [1/]			
	1979		2-yr avg.		1979		2-yr avg.	
No. head		12		24		11[2/]		23
Days fed		142		141		142		141
Initial wt., ibs.		509		506		516		516
Final wt., lbs.		804		774		801		777
Gain, lbs.		295		268		285		261
ADG, lbs.		2.08		1.90		2.01		1.85
Feed summary:								
Feed cost/lbs., $		.0310		.0368		.0310		.0368
Feed/hd/day, lbs.		19.1		20.4		19.1		19.7
Feed/lb. gain, lbs.		9.2		10.9		9.5		10.7
Implant cost/hd., $		.60		.60		-		-
Feed cost/hd., $		84.17		106.79		83.86		102.17
Returns:								
Selling price/cwt., $		85.75		69.96		80.31		66.72
Gross return/hd., $		654.56		526.86		617.59		513.14
Expenses:								
Feed cost/hd., $		84.17		106.79		83.86		102.17
Feeder calf cost, $	@ 87	442.83	@ 66.50	336.87	@ 79	407.64	@ 59.46	306.82
Implant cost, $		.60		.60		-		-
Net return, $		126.96		82.60		126.09		104.15

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

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

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 portable mixing wagon and consisting of mixed hay, oats, barley, salt and minerals were used. The AGNET computer system was used in 1979 to formulate least cost rations for this study.

Ration changes and the days they were fed are shown in Table 4.

Animal weight, gain, feed summary, carcass data and net returns are shown in tables 5 and 6.

Summary:

Results of this study have been variable. In 1978 the late castration treatment was very detrimental in terms of daily gain, feed efficiency, and net return. However in 1979 there was a trend in favor of the steers but the difference were not large, as shown in table 6. Further research is planned.

The two year average feed data and net returns are shown in table 6.

Table 4. Rations percentages and the number of days each ration was fed in 1978-1979.

	Warm-Up	Ration changes 1st	2nd	3rd
1978				
No. days fed	20	90	30	95
Oats	40	50	75	50
Barley	-	-	-	25
Mixed hay	57.5	47.5	22.5	22.5
Minerals	.5	.5	.5	.5
Salt	2	2	2	2

1979 AGNET	Warm-up	Ration changes 1st	2nd	3rd	4th	5th	6th
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
Chopped mixed hay	67.5	25	15	15	19.3	19.3	17.5
Chopped 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

Table 5. Weights, gains, feed summary, carcass data and returns, bull feeding phas II, 1978.

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

[1/] One steer died of bloat.

Table 6. Weights, gains, feed summary, carcass data and returns among steer, bulls and late castrated bulls, 1979.

	BWF Steers		Late castrated BWF Bulls		BWF Bulls	
	1979	2-yr.	1979	2-yr.	1979	2-yr.
No. head	6	11[1/]	6	12	6	12
Days on feed	273	254	273	254	173	204
Starting wt., lbs.	502	502	518	517	620	581
Final wt., lbs.	1096	1092	1076	1053	1098	1130
Gain, lbs.	594	590	558	536	478	549
ADG, lbs.	2.18	2.32	2.04	2.11	2.76	2.69
<u>Feed summary:</u>						
Feed cost/lb., $	.0331	.03835	.03299	.0383	.03198	.03779
Feed cost/cwt. Gain, $	33.43	37.96	34.64	40.21	29.11	34.39
Feed/hd/day, lbs.	22.04	22.8	21.6	22.18	25.3	24.6
Feed/lb. gain, lbs.	10.1	9.9	10.5	10.5	9.1	9.1
Implant cost/hd., $	1.20	1.20	-	-	-	-
Feed cost/hd., $	199.27	220.44	194.25	213.84	139.13	191.32
<u>Carcass Data:</u>						
Hot carcass wt., ibs.	615	648	613	604	607	641
USDA Grade: Choice	4 @ .93	4	3 @ .93	4	-	-
Good	2 @ .90	7	3 @ .90	5	4 @ .98	7
Stag	-	-	-	3	-	3
Standard	-	-	-	-	2 @ .92	2
Dressing, %	56	57	57	58	55	57
Loin eye area, sq. in.	10.7	11.6	10.9	11.6	12.3	13.3
Fat thickness, in.	.53	.46	.48	.43	.18	.28
<u>Economics:</u>						
Gross return/hd., $	566.19	520.87	560.39	533.39	590.78	548.58
<u>Expenses:</u>						
Implant cost, $	1.20	1.20	-	-	-	-
Feed cost/hd., $	199.27	220.44	194.25	213.84	139.13	191.32
Feeder calf cost- Steers $87, bulls $79, & $68	436.74	333.83	409.22	323.06	421.60	335.23
Net profit or loss, $	-71.02	-33.40	-43.08	-3.51	+30.05	+22.03

[1/] one steer died of bloat.

Production of Hamburger Beef

J.L. Nelson and D.G. Landblom

The fast food trade in the United States continues to grow at a tremendous rate. Approximately 40 per cent of the beef consumed today is in the form of hamburger, with projection indicating that by 1980, consumption of hamburger will amount to 60 per cent of all beef consumed.

According to predictions, the current cattle cycle should dictate profitable returns for the next few years. More cows will be held to rebuild the national herd with fewer cull cows available for slaughter. Therefore, other classes of cattle will be slaughtered for the hamburger trade. Young bulls, dairy steers and exotic crossbreeds seem to be a logical choice since they grow rapidly, have a high ratio of lean to fat, and can be profitably fed to the grade desired by the fast food trade.

The purpose of this trial is to evaluate feed efficiency, carcass type, quality and overall economics of rapid gaining “exotic” crossbred steers and conventional “British” breed crossbred bulls fed for the production of hamburger beef.

In 1977-78, a pilot trial compared Simmental crossbred steers and Hereford X Angus bulls as a source of this type of beef. In 1978-79, the trial was expanded to include high percentage Charolais calves in addition to the Simmental cross and the Herford-Angus bulls. In 1978-79, the calves went on trial with an average starting weight of about 600 pounds. All calves were vaccinated for blackleg, malignant edema, hemorrhagic septicemia and enterotoxemia types C and D. The steers were implanted with 36 mg. of Ralgro, while the bulls were not implanted.

The calves were self-fed complete mixed rations composed of chopped mixed hay, straw, oats, barley, salt and minerals. The ration started at 30% oats and 70% tame hay, but as the calves grew, the level of oats was increased, barley was added and the roughage reduced so that by the end of March, the calves were consuming 50% oats, 30% barley and 20% hay plus minerals.

The cattle were sold after 173 days on feed on a grade and weight basis at the Williston Packing Plant. Average slaughter weight at home varied from 1016 pounds for the Charolais steers to 1175 pounds for the Simmental cross steers.

Discussion:

The cattle fed in this trial gained from 2.6 pounds for the Charolais cross to 2.9 pounds for the Simmental cross. The Charolais calves were purchased from the local livestock market, the Hereford X Angus bulls were raised on the Experiment Station and the Simmental crossbred calves came from the Dennis Johnson ranch at Watford City, North Dakota.

Using a flat 68 cents per pound of feeder calf weight, net returns favored the Charolais calves by $20 over the Angus X Herford Bulls, and by $27 over the Simmental calves.

Considering that the cattle went to market at around 14 months of age, it appears that all three types were very efficient producers of hamburger beef. All groups were high yielding, with good loin eye areas and very little (less than .2” back fat) trim.

Summary:

Three types of beef cattle were fed primarily for use in the hamburger trade. These included Angus X Hereford crossbred bulls, Charolais cross steers and high percentage Simmental cross steers. The Simmental cross calves gained the fastest followed by the Angus X Hereford bull and the Charolais cross. Feed efficiency also favored the Simmental cross, followed by the Charolais cross and Angus X Hereford bulls. The Charolais cross steers graded the highest having one choice, four good and one standard. The Angus X Hereford bulls had four good and two standard while the Simmental cross calves had only two good and four standard.

Returns based on the formula carcass value – (feed cost + purchase price) tended to favor the Charolais cross cattle by $20 over the Angus X Hereford calves and by $27 over the Simmental cross calves.

While all cattle could have remained on feed until they weighed 1300-1400 pounds, they appeared to have enough condition to make excellent hamburger beef.

All groups in this study were profit makers at the weight sold.

Table 7. Rations fed in hamburger beef study.

	Nov 28- Dec9	Dec 9- Dec17	Dec 17- Mar 20	Mar 20- Apr 3	Apr 4- May 20
Oats, %	30	40	50	50	50
Barley, %	-	5	5	20	20
Tame hay, %	67.5	25	15	15	19.3
Straw, %	-	29.5	29.5	14.3	-
Limestone, %	-	.23	.23	.4	.4
Trace mineral salt, %	.2	.27	.27	.3	.3
Di-calcium phosphate, %	.5	-	-	-	-

Table 8. Weights, grains, feed summary, carcass data and returns in the hamburger beef production trial.

	Bulls	Steers	
	BWF	Charolais cross Simmental	
No. head	6	6	6
Days on feed	173	173	173
Starting wt., lbs.	620	563	666
Final wt., lbs.	1098	1017	1175
Gain, lbs.	478	453	509
ADG, lbs.	2.76	2.62	2.94
<u>Feed summary:</u>			
Feed cost/cwt gain, $	29.11	27.10	25.33
Feed/hd/day, lbs.	25.3	22.2	23.5
Feed/lb. gain, lbs.	9.1	8.5	7.98
Feed cost/head, $	139.13	122.78	128.94
<u>Carcass summary:</u>			
Hot carcass wt., lbs.	607	567	645
USDA grade – Choice, $	-	1 @ 105	-
Good, $	4 @ 98	4 @ 98	4 @ 98
Standard, $	2 @ 92	1 @ 92	4 @ 92
Dressing per cent	55	55	54
Loin eye area, sq. in.	12.3	12.2	13.6
Adjusted fat thickness, in.	.18	.13	.12
Avg. carcass value, $	590.78	556.78	605.92
<u>Returns:</u>			
Cost of feeders @ 68cents / lb.			
Gross return, $	590.78	556.78	605.92
Implant cost, $/hd.	-	1.25	1.25
Feed cost/hd., $	139.13	122.78	128.94
Feeder calf cost @ 68 cents/lb.	421.60	382.84	452.88
Net return/hd., $	30.05	49.91	22.85

Least Cost Computer Rations

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

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

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

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

The trial was designed to see how the program worked in actual practice; and, to see what modifications would be needed, if any, in order for the programs to fit North Dakota conditions. Working in cooperation with the Stark-Billings County Extension Agent, the program was run according to recommended procedure, just as would be done for any individual area livestock producer, and a computer formulated ration was developed. For comparison, an oats-barley-tame hay ration that has been fed successfully at the Station for several years was used as the control. In this trial, 24 Angus X Hereford heifer calves from the Station herd were divided into four uniform lots, with two lots receiving the “computer” ration and two lots receiving the control ration. The trials were started in late November or early December of each year. All of the heifers were implanted with Synovex H and vaccinated for enterotoxemia, black-leg, malignant edema, and hemorrhagic septicemia at the beginning of the trial. All feeds available and their costs as they were put into the computer are shown in Table 9, and each feed change as well as the number of days each formulation was fed is shown in table 10. Weights, gains, carcass results and feeding economics are summarized in table 11.

Table 9. Feeds and costs entered in computer for the least cost ration formulation.

Ingredient	Cost/cwt. $
Barley	3.12
Corn	4.28
Oats	3.43
Spring Wheat	4.41
Soybean oil meal (44%)	10.90
Mid-bloom alfalfa	2.25
Brome-alfalfa hay	1.75
Di-calcium phosphate	14.00
Salt	3.60
Oat straw	.90
Limestone	3.95
Commercial	6.00

Table 10. Least cost and control ration changes as they were fed in 1978.

A. Least cost ration:

Changes:	Starter	1st	2nd	3rd	4th	5th
Days fed	2	10	8	92	14	78
Oats	300	250	350	500	500	500
Barley	-	110	110	110	200	300
Mixed Hay	675	395	295	143	150	193
Oat Straw	-	240	240	240	143	-
Limestone	-	3.8	3.8	3.8	4	4
Di-calcium phosphate	5	-	-	-	-	-
Salt	20	2.7	2.7	2.7	3	3

B. Control ration:

Changes:	Starter	1st	2nd	3rd
Days fed	2	12	98	92
Oats	300	400	500	750
Mixed hay	675	575	475	225
Di-calcium phosphate	5	5	5	5
Trace mineral salt	20	20	20	20

Table 11. Weights, gains and feed costs: 3 year average.

	Home-grown		Least cost	
	1979	3-yr. avg.	1979	3-yr. avg.
No. head	11 1/		11 2/	
Days on feed	204	191	204	191
Initial wt., lbs.	463	479	460	477
Final wt., lbs.	966	927	972	922
Gain, lbs.	503	448	512	445
ADG, lbs.	2.46	2.35	2.50	2.33
Feed/lb. of gain, lbs.	8.64	9.35	8.58	9.04
Feed cost/head, $	156.68	164.91	142.74	149.56
Feed cost/cwt gain, $	31.40	37.14	27.80	34.18
	1979	2-yr. avg.	1979	2-yr. avg.
Hot carcass wt., lbs.	3/	526	3/	524.8
Dressing %		57.6		58.6
USDA grade		8 Cho		11 Cho
		14 Gd		12 Gd
Carcass value		366.16		372.77
Return over feed		197.13		219.80

1/ one heifer died of brisket edema

2/ one heifer died of calf diptheria.

3/ carcass data not available in 1979 because identification numbers were not transferred to the carcasses during slaughter.

Summary:

Results of this trial indicate that the AGNET computer system available to North Dakota cattlemen through the Cooperative Extension Service can be successfully used to formulate back grounding and finishing rations at the least possible cost.

The computer formulations required approximately one-third pound less feed per pound of gain, which resulted in a three year average total feed cost per head that was $15.35 lower then the control ration.

Unfortunately, only two years carcass data is available because the animal identification numbers were not transferred to the carcass during slaughter in 1979. Carcass data collected during the first two years of this study favors the computer formulations which yielded 27 per cent more choice carcasses and a net return over feed of $22.67 per head more than was received for the control group.

No Feedlot Gain Advantage For HEI-GRO

J.L. Nelson and D.G. Landblom

Introduction:

A relatively new non-chemical growth stimulant known as the Hei-Gro device is being marketed to livestock feeders by Agrophysics Inc., of San Francisco, California. This device, composed of injection molded nylon, looks somewhat like a miniature Christmas tree. It is inserted deep into a feedlot heifer's vagina and deposited where it is supposed to stimulate natural body mechanisms to produce faster growth. According to company literature and advertisements, when the device is used as recommended, it should produce additional returns of from seven to nine dollars per head. It is also reported to give faster growth, better feed conversion, reduced "bulling", 99 per cent retention, simpler feeding procedures and show no effects of breed or season. Since the device contains no hormones or drugs, there are no problems with the Food and Drug Administration and there are no marketing restrictions.

A trial was conducted in 1976 and repeated in 1977 at the Dickinson Experiment Station to evaluate the response to heifers to the Hei-Gro device.

Angus-Hereford heifer calves weighing approximately 485 pounds were fed from weaning to slaughter with one half of the heifers carrying the Hei-Gro device and the other half serving as controls. All heifers in the trial were implanted in the ear with a single Synovex-H implant at the beginning of the trial in early December of both years. One half the heifers from each treatment group were fed either a conventional or a computer formulated mixed ration.

The heifers were housed in unpaved lots that were located a minimum of 50 feet from either steers or bulls. Each lot included a pole shed, automatic waterer and self feeder designed for feeding mixed rations composed of chopped hay and grain. All heifers were vaccinated for type C and D enterotoxemia and given booster shots for blackleg, malignant edema and hemorrhagic septicemia at the beginning of the feeding period. Ration changes involving increased levels of grain were made gradually to keep the heifers on feed. The cattle were weighed initially and every 28 days throughout the trial, and were marketed on a grade and weight basis. The first year they were sold in West Fargo, North Dakota, a 300 mile haul from Dickinson. In 1978, they were sold in Williston, North Dakota, a distance of 130 miles from Dickinson. In 1978, the heifers were palpated midway through the feeding period and again just prior to slaughter to determine the retention of the devices.

All heifers were carefully observed daily and any heifer showing evidence of a vaginal prolapse was treated using standard veterinary procedures. At market, individual carcass measurements were collected on all heifers, including hot carcass weight, loin eye size, fat thickness, marbling and U.S.D.A. grade.

Rations fed during the trial were prepared using a tub grinder to process the hay portion and a grinder-mixer to grind the grain. Both portions were then blended in a mixer wagon before being placed in the self feeders. The rations as fed during the trial are shown in table 12.

Discussion:

Data on live weight gains, hot carcass weight and carcass value was subjected to statistical analysis using the General Linear Model capabilities of the Statistical Analysis System in the computer at North Dakota State University. This analysis indicated no significant differences at the 95 per cent probability level for the parameters tested.

Although we did not observe any problems associated with the Hei-Gro device the first year, during the second year, three of twelve heifers lost their devices by April 17th and had to be re-deviced. Of the three heifers re-vised, two heifers required stitches to prevent a vaginal prolapse prior to slaughter. The cost of the Synovex-H implant averaged 90 cents per heifer. Although the Hei-Gro devices were provided courtesy of Agrophysics, Inc., they would normally retail at around $1.75 per device.

The data recovered in this trial failed to show any advantage for using the Hei-Gro device. This is similar to work, completed at South Dakota State University by Goodman et al. (1978), which also indicated no statistically significant increase in daily gain when using the device. Other work citied in "Beef Digest", 1978, from Kansas State University, Manhattan, Kansas; Ridgetown College of Agricultural Technology, Ontario, Canada; and the University of Guelph in Ontariao, Canada, shows no significant difference in gains for heifers carrying the device.

Summary:

Two feeding trials at the Dickinson Experiment Station failed to show any advantage in gain, hot carcass weight or carcass value for crossbred heifers deviced with the vaginal insert called Hei-Gro when compared with control heifers.

Table 12. Rations as fed during the Hei-Gro trial.

Ingredients	Conventional start	Conventional finish	Computer start	Computer finish
	Pounds		pounds	
1977-78 trial:				
Barley	-	-	191	602
Oats	500	750	-	-
HRS wheat	-	-	502	166
Oat straw	-	-	199	223
Tame hay	475	225	-	-
Di calcium phosphate	5	5	-	-
Trace mineral salt	20	20	2	2.24
Soybean oil meal	-	-	49	-
Limestone	-	-	7 6.4	
Alfalfa	-	-	50	-
	1000	1000	1000	1000
1977-78 trial:				
Barley	-	-	232	256
Oats	500	750	-	-
Wheat	-	-	367	500
Soybean Oil meal	-	-	57	-
Alfalfa	-	-	50	50
Wheat straw	-	-	283	85
Hay	475	225	-	100
Di calcium phosphate	5	5	-	-
Salt	-	-	2.5	2.5
Limestone	-	-	8.5	6.5
	1000	1000	1000	1000

Results:

Results of the two years of feeding are shown in table 13.

Table 13. Weights, gains, feed costs, carcass data and returns.

	Hei-Gro			Control		
	1976-	1977-	2-yr. Avg.	1976-	1977-	2-yr. Avg.
Number head	12	12	24	12	11[1/]	23
Avg. initial wt., lbs.	488	488	488	488	482	485
Final wt., lbs.	908	880	894	918	907	912
Avg. gain, lbs.	420	392	406	430	425	428
Days fed	195	174	184	195	174	184
ADF, lbs.	2.16	2.25	2.21	2.21	2.47	2.34
Feed efficiency	10.06	9.48	9.77	9.38	8.40	8.89
Avg. feed cost/hd., $	179.17	148.30	163.74	171.36	143.92	157.64
Avg. feed cost/hd/day, $	0.92	0.85	0.88	0.88	0.83	0.86
Feed cost/cwt gain, $	42.61	37.84	40.22	39.81	33.94	36.88
Net return, $	140.40	271.76	206.08	149.91	273.78	211.84
Avg. hot carcass wt., lbs.	540	506	523	543	513	528
Avg. dressing %	59.4	57.5	58.4	59.1	56.6	57.8
USDA grade: Choice	8@60.75	2@90.75	10 Ch	8@60.75	1@90.75	9 Ch
Good	4@56.25	9@80.00	13 Gd	4@56.25	9@80.00	13 Gd
Standard		1@77.00	1 St		1@77.00	1 St
Avg. carcass value, $	319.56	420.06	369.81	321.28	417.70	369.49

[1/] one heifer died of bloat not related to trial.

References:

Beef Digest, Vol. 4 No. 3. Pp 30-32. September 1978.

Goodman, J.P., A.L. Slyter, and L.B. Embry. 1978. Heifer growth stimulant outperforms uterine device. Crops and Soils Magazine. Vol. 31. No. 3. December 1978.

Commercial And Home-Grown Feeds
Compared For Pre-Conditioning and Backgrounding

J.L. Nelson and D.G. Landblom

More than one feeding option is available to cattlemen who prefer to grow out their calves to backgrounded weights of approximately 700 pounds after weaning. Commercial pelleted rations have become very popular due to their convenience and ease of handling. They also feature bagged or bulk methods of handling and several medications if desired. As an alternative to the commercial complete rations the backgrounder can rely on his own home-grown hay and grain. Research conducted at this station has shown that complete mixed self-fed rations consisting of home-grown feeds will promote satisfactory and economical gains. Although both methods are widely accepted by North Dakota feeders, this station has been asked to evaluate which system will yield the greatest net return.

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

Commercial feeds used in this trial were selected at random from all of those available in the Dickinson area.

In 1977-78 straightbred Hereford steer calves averaging 425 pounds were randomly allotted into two groups and were fed a pre-conditioning ration for 28 days. The commercial group was self-fed a pelleted pre-conditioning ration according to the manufacturer's directions. Long had and pellets were both available on day one only. The home-grown group was self-fed a ration consisting of 20% oats and 80% mixed hay at the beginning of the trial. It was changed by gradually increasing the percentage of oats so that by the end of the 28 day period the calves were eating a ration of 40% oats and 60% hay. Following the 28 day pre-conditioning the calves were changed to the respective grower rations. The commercial backgrounding ration was purchased delivered in bulk form and was self-fed in a creep feeder of station design. No additional feed was recommended. The home-grown ration which was also self-fed was increased from 40% to 50% oats and 50% mixed hay and was unchanged for the remainder of the trial.

In 1978-79 straightbred Angus steer calves that averaged 382 pounds were randomized and allotted into two groups and were fed either a commercial or home-grown preconditioning ration for 25 days. At the close of the pre-conditioning phase the two groups were re-allotted into three treatment groups to form the following backgrounding comparisons. 1) Preconditioned and backgrounded on home-grown feeds, 2) preconditioned on commercial feed and backgrounded on home-grown feeds, 3) pre-conditioned 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% in 37 days where it remained until the end of the trial.

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

The Hereford steers were sold at Stockman's Livestock Exchange on March 30th, 1978 and the Angus steers were sold on March 29th, 1979.

Tables 14 through 18 summarize both the preconditioning and backgrounding phases of this trial for 1977-78 and 1978-79 feeding periods.

<u>Summary:</u>

Two years of research have been completed comparing commercial and home-grown preconditioning and backgrounding rations.

Feeding a commercial pelleted ration resulted in better rate of gain and feed efficiency in both the backgrounding and preconditioning rations, during the two year period averaged 2.5 cents more per pound than the home-grown rations.

In the 1977-87 feeding season net returns were $60.79 more for the home-grown ration. In 1978-79 combining the commercial preconditioner with the home-grown backgrounding ration resulted in the highest net return of $145.57. Where home-grown

feeds were fed entirely the net return was $140.15. Feeding the commercial ration exclusively resulted in the lowest net return of $75.67.

Table 14. Home-grown vs. commercial preconditioning feed summary

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

[1/] one steer died of bloat on November 16, 1977.

[2/] commercial – pre- conditioner medicated with Chlortetracycline and Sulfamethazine.

[3/] home-grown ration: 29% rolled oats, 70% chopped hay, 0.5% di-calcium phosphate, 1% salt.

Table 15. Summary of home-grown vs. commercial backgrounding 1977-78.

		Commercial Cattle Grower ration [4/]		Grower ration using home-grown feeds
No. head		7		5[1/]
Days of feed		119		119
Starting wt., lbs.		486		473
Final wt., lbs.		756		698
Gain, lbs.		270[2/]		225
ADG, lbs.		2.27		1.89
Feed summary:				
Cost/lb. feed. Cents		6.28		4.12[3/]
Feed/lb. gain. Lbs.		9.22		10.5
Feed cost/lbs. gain, cents		57.9		43.3
$ Returns:				
Gross return/hd., $		361.00		351.02
Background feed cost/hd.,$		156.33		97.43
Calf cost, $	37 cents x 486#	179.82	37 cents x473#	175.01
Net return/hd., $		24.85		78.56

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

[2/] weight gains were significantly better among those steers receiving the commercial cattle grower ration ($P<.05$).

[3/] ingredient cost: oats $1.55/bu.; mixed hay $45/ton; di-calcium phosphate $.144/lb; trace mineral salt $.038/lb; mixing and grinding $10/ton.

[4/] commercial cattle grower: medicated with chlortetracycline.

Table 16. Economics of pre-conditioning and backgrounding 1977-78.

		Commercial pelleted Ration		Home-Grown Ration
Pre-conditioning:				
Feed/lb. gain, lbs.		6.32		6.53
Feed cost/lb., cents		5.75		3.74
Feed cost/hd., $		22.56		12.25
Backgrounding:				
Feed/lb. gain, lbs.		9.22		10.5
Feed cost/lb., cents		6.28		4.12
Feed cost/hd., $		156.33		97.43
Returns:				
Gross return/hd., $		361.00		351.02
Expenses:				
Pre-conditioning feed cost/hd., $		22.56		12.25
Backgrounding feed cost/hd., $		156.33		97.43
Feeder calf cost, $	@ 39centsx428#	166.92	39 cents x424#	165.36
Net return, $		15.19		75.98

Table 17. Home-grown vs. commercial pre-conditioning rations 1979-79.

Treatments:	Home-grown	Commercial
No. head	7	13
Days fed	25	25
Initial wt., lbs.	383	381
Final wt., lbs.	435	433
Gain, lbs.	52	52
ADG, lbs.	2.08	2.08
Feed summary:		
Feed consumed/hd., lbs.	312.5	285
Feed consumed/hd/day, lbs.	12.5	11.4
Feed/lb. gain, lbs.	6.0	5.48
Feed cost/hd., $	8.08	17.70
Feed cost/cwt gain, $	15.05	34.08

Table 18. Home-grown vs. commercial backgrounding rations, 1978-79.

Treatments:	Home-grown pre-cond + Backgrounding	Commercial pre-cond+home-grown backgrounding	Commercial pre-cond + backgrounding
No. head	6	6	6
Days fed	128	128	128
Initial wt., lbs.	438	440	428
Final wt., lbs.	669	688	722
Gain, lbs.	231	248	294[1/]
ADG, lbs.	1.80	1.94	2.29
Feed summary:			
Feed consumed/hd, lbs.	2148	2126	2661
Feed cost/lb., $	.03483	.03492	.06472
Feed/lb gain, lbs.	9.30	8.56	9.05
Feed cost/hd., $	74.79	74.26	172.24
Feed cost/cwt gain, $	32.40	29.91	58.72
Returns:			
Selling price/cwt, $	79.85	79.00	79.25
Gross/hd., $	511.04	524.03	552.11
Expenses:			
Backgrounding feed, $	74.79	74.26	172.24
Feeder calf cost @ $76.50, $	335.07	336.60	327.42
Net return, $	101.18	113.17	52.45

[1/] gains significantly better where the commercial backgrounding ration was fed (P<.05).

Table 19. Economics of pre-conditioning and backgrounding, 1978-79.

Treatments:	Home-grown	Commercial And home-grown	Commercial
Pre-conditioning:			
Gain, lbs.	52	-	52
Feed/lb gain, lbs.	6.0	-	5.48
Feed cost/lb., $	.02586	-	.06210
Feed cost/hd., $	8.08	-	17.70
Backgrounding:			
Gain, lbs.	231	248	294
Feed/lb gain, lbs.	9.30	8.56	9.05
Feed cost/lb., $	.03483[1/]	.03492[1/]	.06472
Feed cost/hd., $	74.79	74.26	172.24
Returns:			
Selling price/cwt, $	79.85	79.00	79.25
Gross/hd., $	511.04	524.03	552.11
Expenses			
Pre-conditioning feed/hd, $	8.08	17.70	17.70
Backgrounding feed/hd, $	74.79	74.26	172.24
Feeder calf cost @$75.20/cwr, $	288.02	286.50	286.50
Net return, $	140.15	145.57	75.67

[1/] ingredient costs: oats $.90/bu., hay $50/ton, minerals $.13/lb., salt $.0471/lb., grinding $15/ton.

Feeding Trials with Rumensin, Ralgro, and Rumensin-Ralgro Combination

Feeding trials with steers, comparing Rumensin [R] (monensin sodium), Ralgro (zeranol), Rumensin and Ralgro combined, and an untreated control were begun in November, 1976 and repeated in 1977 and 1978.

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

In 1977-78, Hereford steers were fed for 317 days on a high roughage ration of oats, barley, 20% custom made supplement and chopped tam hay. The grain was fed in meal form, and top dressed daily with the supplement which carried the Rumensin. Hay was again self fed. In the 1977-78 feeding period concentrate was fed according to the following schedule:

Period fed:	Pounds per head per day		
	Oats	Barley	Supplement
December 13 - December 18	2		1
December 19 – January 9	3		1
January 10 – February 20	4		1
February 21 – January 17	4		.66
June 18 – June 27	4		1
June 28 – July 9	4	2	1
July 10 – August 1	4	3	1
August 2 – August 11	4	4	1
August 12 – October 25	6	4	1

For lots receiving Rumensin, the supplement was mixed to carry 150 mg Rumensin per pound of supplement which was fed at one pound per head per day for the first 70 days, from December 13, 1977 to February 20, 1978. The supplement was then mixed to carry 300 mg per pound and fed at the rate of two-thirds pound per head per day to provide 200 mg Rumensin, for the 117 days from February 21 to June 17, 1978. This same supplement was then fed at one pound per head per day, to provide 300 mg Rumensin from June 18 October 25, 1978 a period of 130 days.

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

The 1978-79 trial was conducted similar to the 1976-77 trial except Hereford steers were fed instead of crossbreds. Again, the oats portion of the ration served as carrier for Rumensin with steers receiving 150 mg Rumensin from December 1, 1978 to February 13, 1979, a period of 74 days. The level of Rumensin was increased to 200 mg per head and fed from February 13 to April 18, a period of 64 days. For the last 181 days on feed, the steers received 300 mg of Rumensin per head per day. Again, chopped hay and minerals were self fed.

The steers were weighed on a 28 day schedule throughout the trial. They were slaughtered at Flavorland Dressed Beef in West Fargo, North Dakota in 1977, and at Williston Packing Company, Williston, North Dakota in both 1978 and 1979. In 1978, the steers killed at Williston had a one day stand at the plant due to a breakdown on the kill floor. Carcass information on every steer has been gathered and summarized.

Those steers receiving Ralgro were implanted in the ear according to the manufacturer's directions. The steers were implanted twice in 1976-77 and 1977-78, and were implanted three times in 1978-79.

<u>Summary:</u>

During the three years this trial has been in progress, steers fed the Rumensin have shown improved feed efficiency of from 6 to 12% in two out of three years. The combination of Rumensin and the Ralgro implant showed an improved feed efficiency of 13.7% over controls in 1977-78.

There was no statistical difference, based on average daily gain, between any of the treatments tested. On these high roughage diets, the steers required from 320-330 days on feed to reach desirable market weights. Even then, only in 1976-77 were the steers carrying enough finish to grade a majority of choice carcasses. From the dollar and cents standpoint, based on data collected during the past three years, not definite advantage was shown for any of the treatment lots with the high roughage rations used.

Table 20. Weights and gains – Rumensin, Ralgro, combination trial.

	Control	Rumensin	Rumensin & Ralgro	Ralgro
1976-77 Data on:				
Final wt., lbs.	1020	1035	1025	1052
Starting wt., lbs.	412	412	412	414
333 day gain, lbs.	608	623	613	638
Avg. daily gain, lbs.	1.82	1.87	1.84	1.91
1977-78 Data on:				
Final wt., lbs.	1075	1072	1082	1071
Starting wt., lbs.	488	497	482	493
317 day gain, lbs.	587	575	600	578
Avg. daily gain, lbs.	1.85	1.81	1.90	1.82
1978-79 Data on:				
Final wt., lbs.	1098	1042	1108	1118
Starting wt., lbs.	482	482	482	482
319 day gain, lbs.	616	560	626	636
Avg. daily gain, lbs.	1.93	1.73	1.96	1.99
3-Year Average Data on:				
Feedlot gain/hd., lbs.	604	586	613	617
ADG/hd/day, lbs.	1.90	1.86	1.94	1.94

Table 21. Feed costs and returns – Rumensin, Ralgro, combination trial.

Three year combined results:	Control	Rumensin	Combination	Ralgro
Average carcass return/hd., $	442.24	428.50	437.32	439.02
Avg. feed cost/hd., $	215.27	204.05	209.19	217.75
Avg. net return, $	226.96	224.45	219.57	221.27
Calculated carcass return – All USDA choice, $	451.91	443.84	453.41	455.64
Avg. feed cost/hd., $	215.27	204.05	209.19	217.75
Avg. net return, $	236.64	239.79	244.22	237.89

Table 22. Carcass data – Rumensin, Ralgro, combination trial.

	Control	Rumensin	Combination	Ralgro
1976-77 Data on:				
Hot carcass wt., lbs.	574	588	573	580
Avg. dressing percent	56	57	56	55
USDA grade:				
Choice @ $63.50	6	3	3	5
Good @ $58.00	-	3	3	1
Actual carcass vaule (avg.), $	364.17	357.82	347.96	362.89
Calculated carcass value				
Based on choice grade, $	364.17	373.67	363.85	368.30
1977-78 Data on:				
Hot carcass wt., lbs.	568	574	578	565
Avg. dressing percent	52	54	53	52
USDA grade:				
Choice @ $81.00	4	3	4	--
Good @ $78.00	1	2	2	4
Standard @ $78.00	1	1	--	2
Actual carcass value (avg.), $	454.02	456.39	463.00	440.83
Calculated carcass value				
Based on choice grade, $	531.89	492.77	527.80	540.84

Table 23. Daily feed consumption – Rumensin, Ralgro, combination trial.

	Control	Rumensin	Combination	Ralgro
1976-77 Data on:				
Oats, lbs.	4.2	4.2	4.2	4.2
Barley, lbs.	1.6	1.6	1.6	1.6
Tame hay, lbs.	13.8	11.9	12.7	13.8
Total lbs.	19.6	17.8	18.5	19.6
Pounds feed/lb. gain	10.74	9.49	10.07	10.22
Percent feed saving	--	11.6	6.2	4.8
1977-78 data on:				
Oats, lbs.	4.4	4.4	4.4	4.4
Barley, lbs.	1.4	1.4	1.4	1.4
Supplement, lbs.	0.9	0.9	0.9	0.9
Tame hay, lbs.	15.7	15.4	15.2	15.3
Total lbs.	22.3	22.0	21.8	21.9
Pounds feed/lb. gain	12.03	12.13	11.50	12.02
Percent feed saving	--	--	4.4	--
1978-79 Data on:				
Oats, lbs.	3.9	3.9	3.9	3.9
Barley, lbs.	2.5	2.5	2.5	2.5
Tame hay, lbs.	13.9	10.9	11.6	14.6
Total lbs.	20.3	17.3	18.0	21.0
Pounds feed/lb. gain	10.5	9.85	9.06	10.8
Percent feed saving	--	6.2	13.7	--

Table 24. Feed costs and returns – Rumensin, Ralgro, combination trial.

Feed and costs:	Control	Rumensin	Combination	Ralgro
1976-77 Data on:				
Oats @ $1.55/bu.	411.23	411.23	411.23	411.23
Barley @ $2.42/bu.	158.21	158.21	158.21	158.21
Hay @ $40/ton	551.30	477.00	508.40	550.10
Processing @ $10/ton	137.82	119.25	127.10	137.52
Rumensin @ 5cents/gm.	--	18.60	18.60	--
Ralgro @ 60cents/implant	--	--	7.20	7.20
Total cost/lot, $	1258.56	1184.29	1230.74	1264.26
Return/lot, $	2185.02	2146.97	2087.77	2177.34
Net return less feed, $	926.46	962.68	857.03	913.08
Net return/head, $	154.41	160.45	142.84	152.18
Calculated net based on Equal grade of choice, $	154.41	176.28	158.72	157.59
1977-78 Data on:				
Oats @ $1.55/bu.	401.91	401.91	401.91	401.91
Barley @ $1.85/bu.	100.02	100.02	100.02	100.02
Supplement @ $124/ton	106.89	106.89	106.89	106.89
Hay @ $45/ton	670.21	657.56	649.13	653.29
Processing @ $10/ton	203.45	200.64	198.76	199.68
Rumensin @ 5cents/gm.	--	21.87	21.87	--
Ralgro @ 60cents/implant	--	--	7.50	7.50
Total cost/lot, $	1482.48	1488.89	1486.08	1469.29
Return/lot, $	2724.12	2738.34	2778.03	2644.98
Net return less feed, $	1241.64	1249.45	1291.95	1175.69
Net return/head, $	206.94	208.24	215.32	195.95
Calculated net based on Equal grade of choice, $	212.60	216.93	220.90	212.90
1978-79 Data on:				
Oats @ 90cents/bu.	211.09	211.09	211.09	211.09
Barley @ $1.30/bu.	131.54	131.54	131.54	131.54
Hay @ $45/ton	596.81	467.89	498.60	630.11
Processing @ $10/ton	194.46	165.80	172.63	201.86
Rumensin @ 5cents/gm.	--	23.46	23.46	--
Ralgro @ 63cents/implant	--	--	11.34	11.34
Total cost/lot, $	1133.90	999.78	1084.66	1185.94
Return/lot, $	3051.09	2827.71	3005.92	3080.06
Net return less feed, $	1917.19	1827.93	1957.26	1894.12
Net return/head, $	319.53	304.66	326.21	315.69
Calculated net based on Equal grade of choice, $	342.91	326.14	353.02	343.18

Effects of Supplemental Feeding Of Cows And Calves On Late Fall Pasture

J.L. Nelson and T.J. Conlon

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

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

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

Phase I of this work seeks to determine:

1. The effect of short term creep feeding of calves on late fall pasture.

2. The effect of supplemental feeding of cows on late fall pasture.

3. Economic advantages or disadvantages of these management systems.

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

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

Group on served as the control and received no supplemental feed other than a salt-di-calcium phosphate mineral mixture.

Group two was the creep feeding treatment. Calves has access to a wooden creep feeder located withing 150 feet of their winter source. The creep feed was composed of 60% dry rolled barley, 35% oats and 5% liquid molasses. Salt and di-calcium phosphate were available on the free choice salad.

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

Weights of all cows and claves were taken at the start and close of Phase I, a 39 day period that lasted from August 30th to October 8th, in 1979.

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

Results of Phase 1 are shown in the following tables.

Phase I Summary:

In 1979, due to dry summer conditions, the cows and calves started grazing the fall pastures about a month earlier than in 1978. The grazing period in 1979 lasted 39 days, from August 30^{th} to October 8^{th}. This year, both the control and the creep fed cow groups lost weight during the trial, while those supplemented with 6 pounds of oats gained 8.6 pounds per head or .2 pound per day. This would indicate that the pastures were probably limiting on energy during the latter part of trial. A look at calf gain will show that calves nursing cows supplemented with oats were 14 pounds heavier than control calves and 8 pounds heavier than calves creep fed. This calf gain is in contrast to data gained in 1979, a year with more abundant forage.

From the economic point of view, the cost of supplementing the cows amounts to $8.11 per calf while the calves creep fed averaged 4.6 pounds of feed per day at a cost of $6.13 per calf/.

While there may not be a big dollar advantage to feeding cows on creep feeding calves, the carryover of these practices is s shown in Phase II

Table 25. Gains, feed consumption and economics of cow and calf supplementation on late fall pastures.

	Cows				Calves	
	Supplemented		Control		Creep fed	
Year	1978	1979	1978	1979	1978	1979
Final wt., lbs.	Oct 31	Oct 8	Oct 31	Oct 8	Oct 31	Oct 8
Cows	1124	1113	1140	1130	1124	1138
Calves	478	450	474	440	463	436
Starting wt., lbs.	Sept 21	Aug 30	Sept 21	Aug 30	Sept 21	Aug 30
Cows	1054	1104	1024	1133	1063	1144
Calves	394	370	379	374	377	364
Weight gain, lbs						
Cows	70	9	116	-3	61	-6
Calves	86	80	95	66	86	72
Days of trial	40	39	40	39	40	39
ADG, lbs.						
Cows	1.74	.22	2.90	-.08	1.52	-.17
Calves	2.15	2.07	2.37	1.68	2.15	1.84
Feed per head, lbs						
Oats	240	245	--	--	43	55
Barley	--	--	--	--	78	118
Molasses	--	--	--	--	9	7
Total lbs.	240	245			130	180
Costs of feed, $[1/]						
Oats	135.00	137.70	--	--	24.18	30.82
Barley	--	--	--	--	45.79	64.02
Molasses	--	--	--	--	10.50	9.73
Processing	24.00	24.48	--	--	13.02	18.00
Total, $	159.00	162.18			93.49	122.56
Cost/calf, $	7.95	8.11			4.67	6.13

[1/] costs calculated in 1978 on 90cents/bu. Oats, $1.30/bu. Barley, 6cents/lbs. molasses and 1979 at 90cents/bu. Oats, $1.40/bu. Barley, 7cents/lb. molasses and $10/ton processing.

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

Phase II started immediately after weaning when calves were allotted to feedlot pens. Calves were separated by sex, but remained in the same groups as they had been in on pasture. The steers were all fed and handled alike to evaluate any carry-over effects of late fall pasture supplementation on weaning stress, weight gains, and disease frequency. The steers 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% molasses.

The heifer calves were used to evaluate two feeding management systems in dry lot after weaning. Heifers from control cow and cows supplemented with oats on pasture were exposed to self feeders containing a mixed ration of 20% oats, 77.5% chopped hay; 0.5% di-calcium phosphate and 2% salt. Those heifer calves that had been creep fed on pasture were continued on the same creep ration in dry lot. In addition, these heifers were also self-fed chopped mixed hay in separate feeder. The creep ration fed after weaning was 60% barley; 35% oats and 5% molasses.

Results of both steer and heifer feeding are shown in the following tables.

Phase II Summary:

In 1979, as in 1978, calves with access to a creep feeder during Phase I continued to gain the most during critical period following weaning. Heifer calves creep fed on pasture and then exposed to the same creep ration plus free choice chopped hay following weaning were able to maintain weight gains of 2.69 pounds per head per day. This was 0.71 pound per head per day faster then the control heifers. Except for one case of coccidiosis, none of the trial heifer calves required any medication in 1979.

The steer calves in 1979 were well fed the same mixed ration but again, those calves exposed to a creep feeder prior to weaning were able to make the most gains during Phase II. The creep fed steers gained one-half a pound more per day than did either the control or the cow supplemented calves. They consumed 2.6 pounds more feed per day than did the control calves. As with the heifer calves, in 1979 no treatments were given to any group during the 23 days this trial was conducted.

It appears after two years work, that the use of creep feeders during the late fall grazing period will result in minimum stress and maximum gains during the critical post weaning period. Minimal disease problems in this study have not shown any advantage for any of the treatments so far.

Table 26. Gains and economics for heifer calves fed two ration types.

	Calves Creep fed		Control calves		Cows supplemented	
	1978	1979	1978	1979	1978	1979
No. heifers	10	8	10	9	10	9
Final wt., lbs.	474	484	489	476	482	474
Starting wt., lbs.	420	423	468	431	452	436
Gain, lbs.	54	61	21	45	30	38
Days fed	21	23	21	23	21	23
Avg. daily gain, lbs.	2.57	2.69	1.0	1.98	1.42	1.69
Economics:						
Total feed/hd., lbs.	312	298	299	283	295	281
Avg. feed/cwt., $	3.11	3.27	2.54	2.77	2.54	2.78
Feed/hd/day, lbs.	15	13	14	12	14	12
Creep feed	(10.2)	(10.7)	--	--	--	--
Chopped hay	(4.8)	(2.2)	--	--	--	--
Feed cost/cwt gain, $	18.10	15.99	36.14	17.42	25.12	20.56
Feed cost/hd., $	9.71	9.75	7.62	7.84	7.50	7.81

Table 27. Gains and economics for steers fed a complete mixed ration.

	Calves Creep fed		Control calves		Cows supplemented	
	1978	1979	1978	1979	1978	1979
No. steers	10	11	10	11	10	11
Final wt., lbs.	551	509	505	501	534	517
Starting wt., lbs.	506	445	480	447	504	462
Gain, lbs.	45	64	25	54	30	55
Days fed	21	23	21	23	21	23
Avg. daily gain, lbs.	2.1	2.80	1.2	2.35	1.4	2.39
Economics:						
Total feed/hd., lbs.	340	394	302	334	301	380
Feed cost/cwt., $	2.56	3.12	2.80	3.10	2.78	3.06
Feed/hd/day, lbs.	16	17	14	14	14	17
Feed cost/cwt gain, $	19.33	19.20	33.58	18.85	28.02	21.20
Feed cost/hd., $	8.70	12.29	8.48	10.36	8.39	11.66

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

J.L. Nelson and D.G. Landblom

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

Past experience for numerous trials conducted as 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 an cost.

On November 2, 1977 Hereford and Hereford x Longhorn crossbred calves from the station herd were weighed, weaned and sorted within breed and sex into six equal feeding groups. Three groups were assigned to be fed the commercial ration, and three groups served as controls and were fed the “home grown” ration. Based on recommendations of the commercial feed distributor the trial was designed to run for not less then 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 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 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 trial was weighed back to give and accurate 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 trial with treatment made where necessary. All calves were observed daily and those showing signs of lung congestion, heavy nasal discharge or slowness were checked for temperature. Those running a high fever were treated with a combination of penicillin (combiotic) sulfamethazine (Spanbolet) bolus according to label directions.

<u>Summary:</u>

Both commercial and home-grown complete mixed pre-conditioning rations promoted rapid and efficient gains. In this short term feeding study both rations were money makers. Rate and efficiency of gains were greater for calves fed the commercial ration, with the feed costs for this ration being double the cost of home grown feed.

Net returns for calves sold at the end of pre-conditioning rations for those fed the commercial ration in two out of three year. The reason for this advantage is inconsistent. In 1977 and 1978 there was no difference in calf condition at sale time. In 1978 calves fed the commercial ration gained faster and had a 23 pound advantage at sale time. In 1979, weight differences were very small, but calves fed the commercial ration looked better and sold better, returning $4.25 more per hundredweight.

The commercial feed was medicated with A-S700 (chlortetracycline/sulfamethazine) as an aid in preventing shipping fever related health problems. Very few problems were encountered with either feed type during the first two years, but in 1979 calves on both medicated and unmedicated ration required treatment for lung congestion.

No freight charges have been figured into the results for either the purchased calves or the feed because destination costs are so variable. When these costs are also deducted form the gross return, net returns may not be much different. The commercial feed is more convenient, and maybe the best choice when only a small number of calves are to ne pre-conditioned, or where only poor quality calf feeds are available.

Table 28. Calf pre-conditioning trial results – 1977.

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

[1/] one steer died of bloat on November 16, 1977.
[2/] commercial – pre-conditioning Chow Sm-AB (G) medicated – chlortetracycline and sulfamethazine.
[3/] home grown rations: 29% rolled oats, 70% chopped hay, 0.5% di-calcium phosphate, 1% salt.

Table 29. Calf pre-conditioning trial results – 1978.

	Home Grown	Commercial feed	Home grown	Commercial feed	Home grown	Commercial feed
No. head	8	8	7	13	9	9
Days fed	25	25	25	25	27	27
Initial wt., lbs.	436	434	383	381	440	437
Final wt., lbs.	478	501	435	433	465	484
Gain, lbs.	42	67	52	52	25	47
ADG, lbs.	1.68	2.68	2.08	2.08	0.92	1.73
Feed Summary:						
Feed consumed/lot, lbs.	2304	3180	2195	3700	3346	2495
Cost/lb. feed, cents	2.57	6.30	2.57	6.30	2.57	6.30
Feed/hd/day, lbs.	11.5	15.9	12.5	11.4	13.8	10.3
Feed cost/hd., $	7.42	24.90	8.08	17.70	9.59	17.04
Feed/lb gain, lbs.	6.84	5.93	6.0	5.5	15	5.95
Cost/lb gain, cents	17.6	37.1	15.5	34.0	38.0	36.5
Marketing summary:						
Selling wt., lbs.	478	501				
% shrink	2.2	1.53				
Selling price, $	76.50	76.50				
Gross return/str., $	365.76	382.98				
Feed and calf cost, $ @ $76-cwt	338.78	354.74				
Net return, $	26.98	28.24				

Table 30. Calf pre-conditioning trial results-1979.

	Home Grown	Commercial feed	Home Grown	Commercial feed	Commercial feed
No. head	5	5	6	5[1/]	6[2/]
Days fed	20	20	20	20	20
Initial wt., lbs.	417	412	348	349	351
Final wt., lbs.	468[3/]	465[3/]	422	423	412
Gain, lbs.	51	53	74	74	61
ADG, lbs	2.55	2.65	3.7	3.7	3.1
Feed summary:					
Feed consumed/lot, lbs.	1239	1400	1396	1430	1455
Cots/lb. feed, $	3.72	7.8	3.72	7.8	7.8
Feed/hd/day, lbs.	12.4	14.0	11.6	12.9	12.1
Feed cost/hd., $	9.22	21.84	8.66	20.09	18.90
Feed/lb gain, lbs.	4.86	5.28	3.1	3.5	3.9
Cost/lb gain, cents	18.0	41.2	11.7	27.1	30.9
Marketing summary:					
Selling wt., lbs.	468	465			
% shrink	2.3	4.9			
Selling price, $	83.50	87.75			
Gross return/str, $	390.78	408.03			
Feed and calf cost, $ @ $90/cwt	384.52	392.64			
Net return, $	6.26	15.39			

[1/] removed on calf with coccidiosis and treated two calves for lung congestion.
[2/] treated two calves for lung congestion and one calf was treated for bloat.
[3/] weight at time of sale.

Section III

Livestock Breeding and Management Trials

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Winter Feeding of Replacement Heifers for Breeding Success

J,L. Nelson and D.G. Landblom

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

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

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

Starting on February 9th, 1977, 84 days before breeding was to begin, all lots were fed chopped mixed brome, crested and alfalfa hay. In addition, depending on initial weight and rate of gain required, one lot received two pounds, one lot four pounds and one lot six pounds of a mixture of 50% oats and 50% wheat. One lot was not fed any grain. The 1978 feeding period started on December 1st, 1977 and ran for a period of 151 days. Instead of individually feeding grain as was done in 1977, self fed complete mixed rations were used that contained oats and wheat at 0, 20, 30 and 40 percent. In 1979 the heifers were fed for 149 days on complete mixed rations. Initially the ration contained 0, 20, 40 and 60 percent grain as in 1978. However, the extended cold winter required ration adjustments to obtain the desired rate of gain. The rations as they were fed in 1979 are shown in Table1.

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

Summary:

Results of this study indicate that by sorting heifers into uniform weight groups they can be more successfully managed and fed according to their nutritional requirements. Because of the uniformity of groups the feeder has more flexibility and can more readily respond to the energy needs of each weight group as changes in weather occur.

Following wintering in 1978 all heifers were placed on crested wheatgrass pasture without supplemental grain feeding. First service conception rates were substantially reduced among heifers wintered to gain more than 1.25 pounds per day. These results agree with other research which has shown that a lowered plane of nutrition during breeding will produce first service conception rates.

Table 1. Average ration composition fed during winter 1979.

Projected Gain	1 lb	1.25 lb	1.50 lb	1.75 lb
Oats, %	30	39	53	63
Chopped hay, %	68	58.5	43.5	35.5
Di-calcium phosphate, %	.4	.5	.5	.5
Trace mineral salt, %	1.4	2.0	1.9	1.9

Table 2. Weights, gains, feed summary and conception rates among heifers wintered at four levels of gain.

Projected gain per day		1 lb.		1.25 lb.		1.50 lb.		1.75 lb.	
			3- yr.		3-yr.		3-yr.		3-yr.
Weight summary:		1979	avg.	1979	avg.	1979	avg.	1979	avg.
Days fed		149	116	149	116	149	116	149	116
Initial wt., lbs.		575	571	536	529	494	496	453	464
Final wt., lbs.		727	683	726	686	734	675	707	659
Gain, lbs.		152	112	190	157	240	179	254	195
ADG, lbs.		1.02	.97	1.28	1.35	1.61	1.54	1.70	1.68
Feed summary:									
Feed/hd/day, lbs.		19.3	16.4	17.04	15.5	17.7	16.3	15.6	14.6
Feed/lb gain, lbs.		18.9	17.0	13.3	11.5	11.0	10.6	9.2	8.73
Feed cost/hd, $		97.79	59.40	87.65	59.23	92.44	64.28	82.01	62.37
Feed cost/day, $		.66	.51	.59	.51	.62	.55	.55	.54
Conception Rate summary:									
1977	1st service, %	50		50		60		60	
	2nd service, %	17		20		0		10	
	Open, %	33		30		40		30	
1978	1st service, %	40		50		30		0	
	2ns service, %	30		20		20		70	
	Open, %	30		30		50		30	
1979	(Preg. -test)[1/]								
	1st service, %	36		36		60		10	
	2nd service, %	55		55		40		90	
	Open, %	9		9		0		0	

[1/] conception rated shown here are palpation estimates and are subject to change when actual calving dates are available.

Rumensin for Wintering Beef Cows

J.L. Nelson, D.G. Landblom and E.E. Dinusson

Rumensin (monensin sodium) improves feed efficiency of feedlot cattle, and according to numerous reports reduces the cost of feeding from 7 to 12 percent.

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

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

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

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

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

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

It was observed during the trial that although there was plenty of bunk space for all cows to eat at the same time, some would refuse to eat the supplemental “ cow cake”.

Table 3. Weights and gains for cows and calves in the beef cow wintering trial using Rumensin – 1977-78.

	80% Hay & 20% Straw		60% Hay & 40% Straw	
	With Rumensin	without Rumensin	with Rumensin	without Rumensin
No. cows starting	15	15	15	15
No. cows finishing	13	12	12	12
Avg. weight, Dec. 12, 1977	1047	1033	1012	1029
Avg. weight, Apr. 27, 1978	1088	1051	1051	1074
Winter gain/lbs.	41	18	39	45
Post calving wt/day, lbs.	1057	1030	981	1010
Cow weight change-				
Dec. 12 – post calving, lbs.	+10	-3	-31	-19
Calf birth weight, lbs.				
Heifers – avg.	5-76	8.76	4-78	7-75
Bulls – avg.	8-80	4-81	8.74	5-80
Adjusted weaning wt., lbs.				
Heifers – avg.	5-485	8-492	4-485	7-498
Bulls – avg.	8-498	4-495	7-493	5-519

Table 4. Rations fed and daily consumption – beef cow wintering trial using Rumensin – 1977-78.

	80% Hay & 20% Straw		60% Hay & 40% Straw	
	With Rumensin	without Rumensin	With Rumensin	without Rumensin
No. days fed	136	136	136	136
Ration fed/avg. lbs./day:				
Tame hay	23.99	23.4	17.5	17.7
Wheat straw	5.94	5.79	11.5	11.6
Supplement	1.78	1.78	1.78	1.79
Salt	.09	.09	.09	.08
Di-calcium phosphate	.05	.04	.05	.04
Avg. daily consumption	31.85	31.09	30.92	31.21
Plus barley @ 2lbs/day				
Starting on March 10	2.00	2.00	2.00	2.00

This experiment was modified because of problems encountered during the first winter, and repeated during the winter of 1978-79. The number of cows were reduced per lot, straw was removed and an all hay ration was fed; the large cow cake wafer was replaced with a 3/8" pellet and dirt mounds were added to each lot. Mud problems encountered along the bunkline during spring thawing were eliminated by removing dirt and replacing it with a one and one-half foot layer of scoria.

In this years' trial, 52 Hereford cows were randomized by age and estimated fetal age and allotted into duplicate treatment groups. 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 brome grass) ration at the rate of 31 pounds per head per day on an as fed basis, plud a 3/8" pelleted barley supplement, which was fed at the rate of one pound per head per day for the first 28 days. After the 28 day adjustment period the supplement was increased to two pounds per head per day for the remainder of the trial. The Rumensin fed cows were fed exactly the same with two exceptions, 1) the barley supplement contained 100 mg per pound of Rumensin, and 2) the daily intake of mixed hay was reduced by 5.6 percent. Following an initial adjustment period of 28 days the Rumensin level was increased from 100 mg per head to 200 mg per head for the remainder of the trial.

Moisture content of the roughage was checked weekly and adjustments in dry meter intake were made accordingly.

Calving started on February 26th and was completed on April 23rd. An additional two pounds of barley per head was fed beginning the first of May. Free choice mineral supplement consisting of two parts trace mineral salt and one part di-calcium phosphate was available throughout the trial.

The cows were weighed every 28 days and each cow was individually weighed the day following calving. Calf weights were taken at birth, the end of the winter feeding period on May 16, and at weaning on October 8, 1979.

The results of the straw-hay combinations fed in 1977-78 are shown in tables 3 and 4, and the all hay comparisons are shown in tables 5, 6 and 7.

Table 5. Weights and gains – cow wintering with and without Rumensin – winter 1978-79.

	200 mg Rumensin	Control
No. head	22	23
Initial wt., lbs.	1023	1059
Final weight, lbs.	1060	1111
Gain, lbs.	37	52
184 day avg. gain, lbs.	.20	.28
<u>Weight changes by period:</u>		
<u>Pre-calving</u>		
Initial wt., lbs.	1023	1059
112 day pre-calving wt., lbs.	1169	1189
Gain, lbs.	145	130
ADG, 112 days, lbs.	1.30	1.16
<u>Calving</u>		
Initial wt., lbs.	1169	1189
55 day calving wt. change, lbs.	1072	1120
Gain, lbs.	-97	-69
ADG, lbs.	-1.7	-1.2
<u>Post calving</u>		
Initial wt., lbs.	1072	1120
16 day post calving Wt. change, lbs.	1060	1111
Gain, lbs.	-12	-9
ADG, lbs.	-.75	-.56

<u>Summary:</u>

In the first experiment no advantage was measured for cows fed Rumensin because of problems that were encountered. Approximately one-fifth of the cows in each treatment group were removed from the trial due to abortions and/or dead calves. In addition, daily observation of the cows revealed that some cows refused to eat the supplemental cow cake containing Rumensin which would account for the lack of response to the additive. The large size and hardness of the pellet when fed to mature cows not accustomed to eating cake.

In the second experiment conducted during the winter of 1978-79 a positive response to Rumensin was obtained. Cows received from the trial due to abortions and/or dead calves. In addition, daily observation of the cows revealed that some cows refused to eat the supplemental cow cake containing Rumensin which would account for the lack of response to the additive. The reason for their refusal is believed to have been due to the large size and hardness of the pellet when fed to mature cows not accustomed to eating cake.

In the second experiment conducted during the winter of 1978-79 a positive response to Rumensin was obtained. Cows receiving Rumensin were fed 5.6 percent less dry matter per day and no difference in average daily gains were experienced. Weight gains prior to calving were greatest among cows fed Rumensin; however, weight loss following calving was greatest among cows receiving less dry matter and Rumensin.

Feeding Rumensin during the 184 day wintering period form November 15, 1978 to May 16, 1979 amounted to a saving of 321 pounds of feed per cow which resulted in a saving of $10.39 per head.

No difference in calf birth weight or livability was measured between treatments.

Table 6. Feed consumption and economics – cow wintering with and without Rumensin – winter 1978-79.

	Control	Rumensin
No. head	23	22
Total feed fed, lbs.	131415	118645
Total feed cost, $	4306.47	3890.37
Total feed fed/hd., lbs.	5713.7	5392.9
Feed cost/hd., $	187.23	176.84
As fed daily consumption/ Hd., lbs.	31	29.3
Dry matter daily consumption/ Hd., lbs.	24.7	23.3
Feed cost/hd/day., $	1.02	.96

Table 7. Calving and weaning data among cows wintered with and without Rumensin – winter 1978-79.

	Control		Rumensin	
	Bulls	Heifers	Bulls	Heifers
No. head	15	8	11	11
Birth wt. range, lbs.	74-105	66-85	72-88	69-90
Avg. birth wt., lbs.	83	73	80	77
Adjusted weaning weight:				
No. head	15	8	11	11
Weight	105	499	515	512

Liquid Non-Protein Nitrogen Supplement For Wintering Pregnant Beef Cows

J.L. Nelson and D.G. Landblom

North Dakota livestock producers may feel a need to supplement their beef cows when they are wintered on low quality gestation rations. Some may choose to use liquid non-protein nitrogen supplements due to their ease of feeding and lower cost advantage. However, there is rather limited information available on the use of “liquid” supplements under typical North Dakota conditions.

At the request of one of the beef breed associations, a trial on the use of liquid supplement in winter feeding of the brood cow herd was designed. The trial seeks to determine: the handling characteristics of liquid supplement under very low temperatures typical of North Dakota, the daily consumption under free-choice “lick tank” feeding; the cost per cow for the winter feeding period; the effects of supplemental feeding on cow weight and condition; and its effects on calf birth weight and weaning weights.

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

The feeding in 1978-79 was essentially the same as in 1977-78. Bother herds were bunk fed a chopped mixed ration composed of 60% tame hay and 40% wheat straw for 74 days from December 1st, 1978 until February 13th, 1979. This 60-40% ration was fed at approximately 24 pounds per head per day. On February 13th, the straw was removed from the ration, and chopped hay was fed at approximately 26 pounds per head per day. Starting on March 18th, four pounds of ground barley was fed in addition to the hay. The trial was closed on May 8th when the cows and calves were weighed and turned on pasture. During the trial, all cows had access to a salt and mineral feeder containing trace mineral loose salt plus a calcium-phosphorous supplement recommended by the company manufacturing the liquid supplement.

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

Results are shown in the following tables.

Table 8. Cow weights and calf birth and weaning weights, liquid supplement trial.

	Supplement	No Supplement
No. cows starting	27	28
No. cows finishing	25	26
Avg. cow weight, Dec. 1st	1112	1132
Avg. cow weight, May 8th	1067	1044
Avg. weight loss/hd., lbs.	45	88
Avg. wt. off grass, Sept., lbs.	1156	1135
Avg. summer gain, lbs.	90	92
No. calves born	25	26
Avg. birth weight:		
Steers, lbs.	11/79	12/81
Heifers, lbs.	14/76	14/74
Avg. adjusted weaning weight:		
205 day – Steers, lbs.	477	473
Heifers, lbs.	496	487

Table 9. Winter ration fed and costs – liquid supplement trial, 1978.

	Supplement		No Supplement	
	Pounds	cost	pounds	cost
Mixed roughage:				
Straw	20,269	202.69	20,701	207.01
Hay	33,796	844.90	35,616	890.40
Tame hay	65,888	1,647.20	70,631	1,765.78
Ground barley	5,066	137.20	5,794	156.92
Hi-low minerals	65	10.53	50	8.10
Trace mineral salt	145	6.82	235	11.04
Liquid supplement	10,756	775.51	--	--
Processing/ton (3/4 of feed)	47 ton= 705.00		50 tons= 750.00	
Total feed cost/lot		4,329.85		3,789.25
Avg. wintering cost/cow		173.19		145.74
Winter cost/cow/day		1.10		0.92

Table 10. Feed summary – Supplement fed lot, 1979.

	Mix Hay+straw	Hay	Barley	Liquid Supplement	Minerals	Salt
Total pounds	54,065	65,888	5,066	10,756	65	145
Days fed	74	84	51	158	158	158
Cow days	1850	2100	1275	3950	3950	3950
Avg/hd/day, lbs.	29.2	31.4	3.97	2.72	.016	.037

Table 11. Feed summary – no supplement fed lot, 1979.

	Mix Hay+straw	Hay	Barley	Minerals	Salt
Total pounds	56,317	70,631	5,794	50	235
Days fed	74	84	51	158	158
Cow days	1924	2184	1326	4108	4108
Avg/hd/day, lbs.	29.3	32.3	4.37	.012	.057

Summary:

During the winter of 1978-79, gestating cows not receiving liquid supplement lost 43 pounds more weight than those with access to the supplement. However, there was no difference in calf birth weight or mortality. Consumption of liquid supplement averaged 2.72 pounds per head for the 158 day winter period. This level of consumption increased the cost of wintering the cows by $27.45 per cow. This is similar to results obtained during the winter of 1977-78 where cost of wintering cows for 160 days amounted to $19.72 more for the supplemented than for control cows.

We were unable to show any advantage to warrant the use of liquid supplements for beef cows for the additional dollars spent.

A Comparison of Beef Cattle Breeding Methods to Improve Performance

D.G. Landblom and J.L. Nelson

Artificial insemination is a management method that is available to livestock producers through various artificial breeding organizations. Superior sired can be selected from a large number of animals on the basis of weaning and yearling performance as well as progeny records. Crossbreeding has also been shown to be an effective method of increasing total pounds of calf weaned through the effects of hybrid vigor and resulting improved performance. At a time when stockmen are faced with an ever increasing price-cost squeeze they must use every management tool at their disposal to produce more pounds of beef at the lowest possible cost. In 1976 a long range study was designed to evaluate crossbreeding and straight 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 of calving into three breeding groups. In group I approximately 60 cows were inseminated artificially with either Polled or Horned Hereford semen. Following a 25 day AI breeding season, purebred Angus bulls were introduced as clean-up bulls. In group II purebred Horned and Polled Herford bulls were used naturally on 30 Hereford cows, and in group III purebred Angus bulls ere used on 30 Hereford cows.

Heat detection in the AI group was done visually in 1976. In all subsequent years epididectomized bulls were uses 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 poor producers following performance testing were culled. Cows selected for AI breeding in 1976 received two pounds dry rolled oats 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 and 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 had to pass through the breeding facility for water and supplemental feed. Eight pounds of a mixture of equal parts of grain and shopped hay was fed per head per day. This, and the provision for adequate bunk space eliminated competition for grain between older and younger cows. Twice a day breeding was discontinued in favor of once a day early morning breeding. All groups were grazed on separate crested wheatgrass pastures until approximately July 1st of each year, depending on pasture condition, and were then moved to native pasture. Minerals were fed free choice in a 2:1 salt – di-calcium phosphate mixture to insure adequate phosphorus intake. Also, during the early spring on crested pasture a level of 15% magnesium oxide was added to the mineral mixture as a grass tetany preventive.

A summary of the results to date are shown in tables 12, 13, 14 and 15.

<u>Summary:</u>

First service conception rate in the AI group was 56% in 1979, which is consistent with the 57% conception rate obtained in 1978. The long term four calf crop average amounts to 39%.

Changes in facilities resulted in considerably less stress among the cows, as well at the cowboys, and once a day breeding resulted in less cow handling and labor requirements.

Economics of the three management systems favored the natural service crossbreeding system. Net return per cow calved was $8.90 higher for the natural service crossbreeding system when compared to the AI system, and $20.57 more than the natural service straightbred Hereford system.

Table 12. Breeding and calving summary, 1979 calf crop.

	A.I. System		Natural Service	
	A.I. (HxH)	Angus clean-up (AxH)	Hereford (HxH)	Crossbred (AxH)
Total no. cows	51		26	26
Total no. cows inseminated	50			
No. sold for mgmt.. reasons	1		3	9
Np. Having AI calves	28			
1st service conception				
Rate, %	56			
No. calves from Angus				
Clean-up bull		21		
No, dead calves	0	1	1	1
No. of calves:				
Steers	17	11	12	5
Heifers	11	9	10	11

1/ once a day breeding at 8:00 a.m.

Table 13. 4 Year breeding management systems summary, 1976-79.

	A.I. System		Natural Service	
	(HXH)	Angus Clean-up (AXH)	Hereford (HXH)	Crossbred (AXH)
Total no, cows	233		112	111
Total no. cows inseminated	230			
No. sold for mgmt.. reasons	36		32	23
No. having A.I. calves	90			
1st service conception				
% rate,%	39			
No. cows having (AXH) calves				
From Angus clean-up bull		103		
No. dead calves		5	11	4
No. and sex of calves obtained:				
Steers	47	59	34	36
Heifers	40	43	35	41

Table 14. Actual and adjusted weaning weights, 1976-79.

		A.I. system (HXH)	A.I. system (AXH)	Natural Service Hereford (HXH)	Natural service crossbred (AxH)	Natural service crossbred (HxH)
1976-77						
Steers -	actual	454	411	417	448	420
	Adjusted	472	473	450	475	458
Heifers –	actual	391	383	366	424	347
	Adjusted	445	465	437	465	482
1978						
Steers –	actual	407	385	383	419	
	Adjusted	453	474	449	493	
Heifers -	actual	386	353	368	367	
	Adjusted	441	440	422	424	
1979						
Steers -	actual	472	464	462	479	
	Adjusted	483	519	479		
Heifers -	actual	455	410	429	444	
	Adjusted	494	512	496	489	

Table 15. Economic comparison – three breeding management systems, 1979.

	A.I with Angus clean- up No. Hd.	Avg Wt.	(HXH) $value	(AXH) $value	Nat. Service Hereford No. hd.	Avg Wt.	$ value	Nat. Service Crossbred No. hd.	Avg Wt.	$ value
Steers	17	472	7623		12	462	5267	5	479	2275
@ 95 cents	11	464		4848						
Heifers	11	455	4505		10	429	3861	11	444	4396
@ 90 cents	9	410		3321						
Total, $			12128	8169			9128			6671
Gross return, $			20,297				9128			6671
Total no. cows calved			49[1/]				23[1/]			16[1/]
Avg. return/cow Calved, $			414.22				396.86			416.93
Less breeding, expense, $			-17.19				-11.50			-11.00
Net return, $[2/]			397.03				386.36			405.93

[1/] one calf died in each management group

[2/] indicates net return per cow calved; income from cows culled from each management system is not included

First Calf Heifer Management for Ease Of Calving Using Texas Longhorn or Angus Bulls

D.G. Landblom and J. L. Nelson

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

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

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

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

In 1976, the trial was repeated with another 40 Hereford heifers. The Longhorn and Angus bulls were turned in with the heifers on May 3rd and remained with them until July 1st, a period of 59 days. After July 1st, Polled Hereford bulls were with the heifers until the first of August. All heifers were pregnancy tested on September 14, 1976 by a local veterinarian.

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

In 1978, the trial was again repeated with 38 Herford heifers because it was discovered that the Longhorn bull used in 1977 was sub-fertile and a small Longhorn calf crop was received. After being wintered at four levels of energy, the heifers were allotted into the Angus and Longhorn sire groups and exposed to the respective bulls on May 1, 1978. Following a 52 day breeding period the bulls were removed on June 22, 1978, and heifers combined on native pasture. Pregnancy testing was done the second week of August, and all open heifers were sold. When summer grazing was completed, the heifers were wintered on tame mixed hay containing approximately one-third alfalfa. On the first of February, the heifers were moved into calving lots where they could be observed for calving difficulty. At calving, each heifer was scored according to they type of delivery as follows: (1) no difficultly, (2) light pull, (3) hard pull, (4) caesarian section, (5) born dead. After calving the heifers were moved to clean ground and fed a full ration of tame hay and two pounds of barley per head.

The trial had been summarized in tables 16, 17 and 18.

<u>Summary:</u>

In this ease of calving study, using Texas Longhorn bulls on first calf Hereford heifers has resulted in significantly less calving difficulty. Five percent of the Longhorn sired heifers required assistance in the form of light pulls, whereas 23 percent of Angus sired heifers had calving difficultly ranging from moderate to extremely hard pulls. In addition, one heifer in the Angus sired group required a caesarian section, and later died. In contrast to the Angus bulls which were selected very carefully with respect to birth weight, fineness of bone, and breeder recommendations, the Longhorn bulls were selected strictly at random. Pulling calves has been shown in research conducted by USDA-SEA scientists at Miles City, Montana, to cause additional stress

and a greater number of retained placentas (after-birth): resulting in uterine infections and longer intervals between calving and the first heat cycle. In this trial, during the years in which calving difficulty was highest, 75 percent of the calves pulled in Angus sired group had retained placentas. All heifers with retained placentas developed uterine infections which required treatment with penicillin. In addition to the drug expense and time required for treatment, those heifers with uterine infections had a longer interval from calving to first estrus and in many instances were culled from the herd. The Longhorn sired calves had birth weights that averaged ten pounds lighter than their Angus crossbred comparisons, and they were generally finer featured possessing smaller heads and legs, and thinner bodies overall.

In addition to the lighter birth weights, weaning weights among the Longhorn crossbred calves, when compared to the Angus crossbred's, averaged 40 pounds lighter for the heifers and 60 pounds lighter for the steer calves. Price discrimination at sale time among the Longhorn calves has ranged from $6-$10 less per hundredweight.

While stress and calving difficulties are minimized by using a Longhorn bull on first calf Hereford heifers, the sacrifice of weaning weight plus the discrimination loss makes the practice rather expensive. At current calf prices of 95 cents per pound and figuring an average eight cents less for Longhorn's the practice results in an average loss of approximately $70 per head for steers and heifers at sale time.

Although using Angus bulls on first calf Hereford heifers yielded the most pounds of beef for sale and higher net returns, cattlemen that have a large number of heifers to calve should bot rule out the use of Longhorn bulls on at least a portion of their heifers, particularly when good quality calving labor is short.

Table 16. Calving difficultly score – heifer management trial 1979-79.

	Angus					Longhorn				
	1976	1977	1978	1979	4-Yr. avg.	1976	1977	1978	1979	4-Yr. avg.
Calving with:										
No difficulty	16	16	11	12		19	16	9	10	
Light pull	--	1	5	1		--	1	--	2[3/]	
Hard pull	1	2	3	--		--	--	--	--	
Caesarian section	--	--	1[1/]	--		--	--	--	--	
Born dead	--	1	--	1		--	--	--	--	
Possible live calves	18[2/]	19	20	14		19	17	9	12	
Percent born with-Out difficulty	89	84	55	86	77	100	94	100	83	95

[1/] heifer died following Caesarian section.
[2/] one heifer removed because of abnormal reproductive tract
[3/] one heifer died while prolapse was being replaced

Table 17. Three year calving date – heifer management trial 1976-79.

	Angus	Longhorn
No. heifer/breeding group:		
1976	20	20
1977	20	20
1978	22	20
1979	19	19
Total	81	79
No. heifers calving:		
1976	18[1/]	19[2/]
1977	20	17[3/]
1978	20	9[4/]
1979	14[5/]	12[6/]
Total	72	57

[1/] one heifer removed because of abnormal reproductive tract.
[2/] one heifer not included, late calving with a Hereford calf
[3/] three heifers not included, late calving with straight Hereford calves.
[4/] eleven heifers removed that were open with pregnancy tested
[5/] five heifers removed that were open with pregnancy tested
[6/] seven heifers removed that were open with pregnancy tested

Table 18. Four year average calving data and weaning weight 1976-79 calving season.

	Angus				Longhorn			
	Bulls		Heifers		Bulls		Heifers	
	No. Hd.	Lbs.	No. Hd.	Lbs.	No. Hd.	Lbs.	No. Hd.	Lbs.
Birth weight summary:								
1976	7	70	10	68	13	66	6	58
1977	8	73	12	65	8	63	9	59
1978	11	73	9	69	6	60	3	58
1979	7	74	7	68	8	64	4	56
4-Yr. avg. weight		73		68		63		58
	Steers		Heifers		Steers		Heifers	
	No. Hd.	Lbs.	No. Hd.	Lbs.	No. Hd.	Lbs.	No. Hd.	Lbs.
Weaning weight summary:								
1976	5	454	10	400	13	407	5	369
1977	7	440	12	425	8	424	7	358
1978	9	510	9	393	4	382	2	385
1979	5	417	7	392	6	356	5	337
4-Yr. avg. weight		455		402		392		362

Estrus Synchronization and Calving Ease
Among First Calf Heifers

D.G. Landblom

Managing heifer replacements so they will calve as two year old with a minimum of difficulty had been a problem for many cow-calf producers. Several management tools are now or soon will be available which 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 tool that cattleman can use, along with progeny records to select sires known for ease of calving and above average performance. Although not released for commercial use, prostaglandin F2 Alpha has been shown in many research trials to be a compound that will successfully synchronize cows and heifers, provided they are cycling normally and have a functional corpus luteum. In addition to AI and estrus synchronization, research at this station has shown that Longhorn bulls can ne 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 tow 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 purpose; and . (3) to identify an efficient heifer management system.

In this experiment 42 Hereford heifers were sorted into four wintering groups after weaning and fed rations designed to provide sufficient gain to insure a weight of no less than 650 pounds at the beginning of the breeding season on June 1.

Before the beginning of this breeding trial it was necessary to determine the level of sexual maturity of the heifers. K-marker heat detection devices and rectal palpation were both used. K-marker devices were to put on all heifers 30 days before the beginning of the experiment. Each heifer was palpated one day before the beginning of the trial and each was scored as being sexually mature or immature. The heifers were then allotted according to their wintering treatment and level of estrus activity into two breeding groups. Group one was synchronized using the one injection method. With this method normal artificial insemination 12-14 hours after detection in standing heat is done for the first five days of the breeding season. On the sixth day at 8:00 A.M. all heifers not inseminated during the first five days were given 25 mg prostaglandin F2 Alpha. After the injection of prostaglandin, AI breeding was continued normally until 80 hours elapsed. At 80 hours all heifers not previously inseminated were inseminated as a group without regard to standing heat. Following the group inseminations 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. With this method two injections of prostaglandin, separated by eleven days, are used. Because of the separation period the first injection had to be administered eleven days before the beginning of the breeding season. The first injection was given on May 22 and the second on June 1. After the second injection the heifers were handled in exactly the same manner as group 1. No heifers were inseminated during the eleven day period between injections. An abbreviated description of the synchronization schedule is shown in table 20.

Semen from an Angus bull, Shoshone Monitor 17 An50, was purchased from Minnesota Valley Breeders' Association for use in this study. The bull was recommended by the company as being and easy calving bull that transmitted growth performance to his calves. The synchronized group inseminations at 80 hours were done by Minnesota Valley's technician Mr. Pete Martin.

Heat detection was done by both visual observation and with epididectomized marker bulls equipped with chin-ball markers.

The Longhorn bull used for clean-up breeding was placed with the heifers after the five day waiting period on June 15 and was removed on July 5. He was loaned to the station by Mr. Duane Hanson of the Rocking Chair Ranch, Reeder, North Dakota.

A fine boned Angus bull of station ownership was placed with the heifers for the remainder of the period.

On September 20 the heifers were again palpated to diagnose pregnancy and estimate fetal age. Estimating fetal age is only an approximation subject to variation. The most positive results of synchronization will be available when the heifers calve. Our breeding records indicate that the oldest calves will be born about the first of March.

The limited data collected to date is summarized in table 19.

The trial is planned for several breeding seasons, with the accumulated data to be reported at future Research Roundup programs.

Table 19. Estimated fetus ages on September 20th, 19790

Single Prostaglandin injection		Double prostaglandin injection	
No. Head	Fetus age – days	No. Head	Fetus age – days
1	110-120	3	110-120
2	100-110	3	100-110
8	90-100	5	90-100
7	80-90	3	80-90
2	70-80	5	70-80
-	60-70	1	60-70
1	open	1	open

Table 20. Design for estrus synchronization.

Single Injection Method.

	Day of Breeding season:	
Period I	1	
	2	
	3	Inseminate normally 1st five day of breeding season.
	4	
	5	
Period II	6	8 AM administer 25mg prostaglandin To all heifers not inseminated during Period I.
	7	Continue breeding normally until 80
	8	hours post injection time.
	9	At 4 PM (80 hours after the prostaglandin Injection) all heifers not inseminated During periods I and II were inseminated As a group with out regard to standing heat.

Double Injection Method.

Day of Breeding Season:	
11 Days before Start of breeding Season	Administer 25 mg prostaglandin.
1	The 2nd injection of prostaglandin Is given at 8 AM on the 11th day, Which is the start of the breeding Season.
2	Inseminate normally all heifers
3	Found in standing heat until 80 hrs Post injection time.
4	At 4 PM (80 hrs after the 2nd injection Of prostaglandin) all heifers Not inseminated during the 80 hr Period are inseminated as a group Without regard to standing heat.

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

Section IV

Calf Diarrhea Studies

Calf Diarrhea Studies

D.G. Landblom. P. Kotta, G. Goen
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Objectives of Investigation

The objectives of this investigation was to determine the relationship of bovine colostrum immunoglobulin content to that of calf serum immunoglobulin content and simultaneously to determine the relationship of the immunoglobulin levels of calf serum in the dam's colostrum to the incidence of calf scours.

The other objective was to determine the disease causing factors as isolated from feces and their relationship to immunoglobulin levels. It was also proposed that various techniques for the isolation of disease producing organisms be evaluated.

The data presented is based on information obtained from 49 animals.

Virological Isolations

Emphasis was placed on the rotavirus and coronavirus. Other viral agents were also searched for in all specimens. Both the rota and corona virus were found in equal numbers in the calves having scours and those not having scours. No other viral agents were observed in either group or calves.

Bacterial Agents

Emphasis was placed on the chemotherapeutic resistance and the potential disease producing ability. E. coli isolated from the feces of calves having diarrhea were antibiotic resistant in 43% of the cases and in 57% of the calves exhibiting no clinical signs of diarrhea.

Potential disease producing E.coli were present in 43% of the calves exhibiting clinical signs of diarrhea and in 57% of the calves having no clinical signs of diarrhea.

Comparison of Immunoglobulins

The average serum immunoglobulin levels of calves with and without clinical signs of diarrhea were essentially identical. The same was found to be true for the immunoglobulin levels in the colostrum of the dams.

Table 1. Number of pathogenic agents found in feces of calves with and without diarrhea (total animals involved 49).

	Number of cases	Percent of calves
Coronavirus		
D	3	50
N	3	50
Rotavirus		
D	1	50
N	1	50
Resistant E. coli		
D	3	43
N	4	57
Pathogenic E. coli		
D	6	43
N	8	57

D Calves having clinical signs of diarrhea.
N Calves not exhibiting signs of diarrhea.

Table 2. Immunoglobulin content of colostrum and calf serum of calves with or without diarrhea (total animals involved 49).

	Number of cases		
Ig Serum			
D	3.089	(H 4.81)	(L 2.26)
N	3.373	(H 4.80)	(L 2.105)
Ig colostrum			
D	12.882	(H 19.46)	(L 6.25)
N	12.77	(H 28.79)	(L 5.440)

D Calves having clinical signs of diarrhea.
N Calves not exhibiting signs of diarrhea.

Section V

Swine Research

Table Of Contents:

One Versus Two Inseminations
For Successful Swine Artificial Insemination

D.G. Landblom and J.L. Nelson

Past research at this station has indicated that two inseminations administrated 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 indicates that ovulation in the gilt occurs at approximately 18-20 hours after the onset of standing heat. In an effort to reduce cost of inseminations, producers may be inclined to try and match insemination and ovulation, thereby eliminating one insemination. Therefore this trial was designed to compare the economics and reproductive efficiency of one insemination at 19-20 hours post detection of standing heat as compared to the current recommendation for two inseminations spaced 12 hours apart.

Procedure:

Twenty head of crossbred gilts (Hampshire X Duroc X Yorkshire) weighing 300 pounds or better and at least nine months of age were randomly allotted to one of two breeding treatments. The gilts were housed and fed as a group in outdoor lots using portable houses and self feeders.

Gilts in heat were detected by rotating a boar into and out of the pen each morning and evening until all gilts were inseminated. Any gilts that would stand for the boar upon introduction into the pen were marked and placed into individual pens inside a barn.

Gilts assigned to breeding group I were inseminated as close to 20 hours as possible. Actual recorded time from detection to insemination was 20.3 hours ± one hour.

Gilts assigned to breeding group II were inseminated twice. The first insemination was made 12 hours after detection of standing heat and followed in 12 hours by the second insemination.

The frozen semen used for insemination was prepared by International Boar Semen of Eldora, Iowa. This semen was a composite of three boars representing the Duroc, Hampshire and Landrace breeds. Actual boars used were the Duroc- Hi Test 930013; Hampshire – Record Setter 940007 and Landrace – Rocketline 950011. The cost of the semen amounted to $13.95 per ampule not including freight, liquid nitrogen, equipment of time cost.

Results:

The 20 gilts used in this trial were detected in heat and inseminated during and 18 day period extending from March 14th to April 1st, 1979. The conception rate, number of pigs farrowed, birth weight and weaning are shown in table 1.

Table 1. Results of single or double inseminations.

	Single Inseminations @ 20 hrs - Post detection	Double insemination @ 12 & 24 hrs – Post detection
No. gilts	10	10
No. gilts farrowing	2	9
Percent conception	20	90
Total no. of pigs bon	23	88
Average pig/litter farrowed	11.5	9.8
No. pigs farrowed/gilt inseminated	2.3	8.8
Average birth wt., lbs.	3.5	3.5
No. of pigs weaned	18	70
Average weaning weight, lbs.	32.7	40.0
Total semen cost, $	139.50	279.00
Insemination cost/pig born, $	6.06	3.17

Discussion:

Artificial insemination of swine is not a difficult task although it does require a good conscious effort on the part of the producer.

Although the double insemination technique of breeding gilts will initially cost the producer more money, experience gained in this trial would indicate it is the method of choice.

The single insemination technique not only resulted in poor conception but would not be acceptable since few swine producers would be willing to inseminate gilts from 2:00 to 4:00 A.M.

The use of a detector boar makes the detection part of artificial breeding very simple. The nearby presence of a boar during insemination also provides a stimulus for the gilts and makes for easier inseminations.

Summary:

A double insemination method of breeding gilts artificially resulted in a 90% conception rate and 9.8 pig average litter size. Semen cost averaged $27.90 per gilt inseminated or $3.17 per pig born.

A single insemination at 19-20 hours post detection resulted in a 20% conception rate and 11.5 pigs per litter. Semen cost averaged $13.95 per gilt inseminated and calculated out to $6.06 per pig born alive.

Based on this study and past work at this station, we would have to recommend two inseminations spaced at 12 to 24 hours post standing heat detection.

Using Whey In Swine Growing – Finishing Rations

D.G. Landblom and J.L. Nelson

Whey, a by-product of cheese making, is used in may ways in the production of food and feed, but the supply exceeds the demand. Consumption of cheese products has increased seven fold in the last decade, with a proportional increase in the amount of whey produced. This has created serious disposal problems for cheese plants because both transporting the liquid whey to drying plants and the drying process are costly. Cheese plants such as the one at Dickinson have found it more economical to dump excess whey than to haul and process it. Dumping liquid whey has resulted in loss of a potential food and feed source, and in some cases has created pollution problems. Feeding liquid whey to pigs seemed to offer a partial solution t the disposal problem.

At the request of the North Dakota Dairy Products Commission, the Dickinson Experiment Station started swine feeding research with liquid whey furnished by the Dickinson Cheese Company. These trials were expanded to include dried sweet whey with it became available from the Whey-To-Go drying plant at Mandan.

The following experiments were conducted:

<u>Experiment One.</u>

One hundred eighty Yorkshire and Yorkshire X Hampshire barrows and gilts weighing approximately 40 pounds were randomly allotted and fed rations as shown in table 2. Rations being compared were supplemented for protein with either soybean oilmeal, the synthetic amino acid L-Lysine, or liquid whey fed on a free choice basis. Liquid whey fed in experiment one contained less than seven per cent dry matter consisting of approximately five per cent milk sugar, three-tenths of one per cent fat and nine-tenths of one per cent protein. All rations were processed in a portable grinder-mixer and self fed in meal form. Liquid whey was fed free choice through a gravity flow system consisting of a fiberglass storage tank, PVC rigid wall plastic pipe and stainless steel nipple waterers. During the first two weeks of feeding both whey and water were available to allow the pigs time to become accustomed to whey. Following the adjustment period, liquid whey served as the only source of water and protein supplement. The nipple waterers were located 28 inches above floor level in an arrangement designed to reduce waste. One half of the pigs were housed in an open air confinement system, with a remainder housed in lots planted to spring seeded winter wheat as a grazing crop. The pigs were weighed every 28 days, and were marketed at an average of 220 pounds.

<u>Experiment Two</u>

In the second experiment, 110 Yorkshire X Hampshire barrows and gilts averaging 40 pounds were uses to compare the substitution value of dried sweet whey with barely in growing-finishing rations. The trial also measured the measured the optimum amount of whey that could be fed without causing diarrhea and/or suppression of gain. Dried whey containing approximately 73 per cent lactose, on a dry matter basis, has been shown to have a laxative effect when fed to weanling pigs. Becker, et al. (1957) and Krider, et al. (1949) reported that weanling pigs on rations containing 4, 8, and 20 per cent whey developed diarrhea, and Shearer, et al. (1968) reported that diarrhea became progressively worse as lactose levels ere increased from 15 to 40 per cent. However, gain suppression was experienced only at the 30 and40 per cent lactose levels. The control ration fed in experiment two contained no whey. It was compared with trial rations in which dried whey replaced 15, 30, and 45 per cent of the barley in the ration. Lactose levels in the trial rations were 10, 21 and 32 per cent, respectively. Equal amounts of oats were included in all rations, which were formulated to contain 15.7 per cent crude protein in the growing phase and 12.7 per cent in the finishing phase.

<u>Experiment Three</u>

Forty eight Yorkshire and Yorkshire X Hampshire barrows and gilts averaging 53 pounds were randomly allotted and fed rations containing either 15 or 30 per cent dried whey in combination with wheat, oats and barley. In each ration barley and oats were held constant, with the dried sweet whey replacing either 15 or 30 per cent of the wheat, Crude protein levels were 16.0 per cent in the growing ration and 13.5 per cent in the finishing ration. At market weight all barrows were sold on a grade and yield basis to the Hormel slaughtering plant, where carcass measurements were made.

Summary:

Liquid sweet whey fed as the only source of water and supplemental protein promoted satisfactory and economical gains in growing and finishing pigs fed to market weights. Pigs fed rations supplemented with soybean oilmeal or the synthetic amino acid L-Lysine made faster gains and were heavier at the end of the trial. However, liquid whey fed pigs were more efficient in their gains. Feeding liquid whey fed pigs were more efficient in their gains. Feeding liquid whey resulted in feed saving of 107 pounds less feed per 100 pounds gain. This amounted to a saving of $7.60 per 100 pounds gain over soybean meal supplemented pigs and $5.94 per 100 pounds gain over the L-Lysine supplemented hogs.

Pigs adjusted to liquid whey very easily without scouring or diarrhea problems when both liquid whey and water available free choice for approximately two weeks before water was discontinued.

Whey feeding will be most successful when there is a readily available supply of salt-free whey within 25 miles of the hog farm; when pigs weigh at least 35 pounds at the beginning of the feeding period; and , when a closed whey delivery system composed of either plastic or stainless steel components is used. This closed system will reduce contamination, odors, and fly problems to a minimum. However, spilled or wasted whey is very corrosive to concrete which may cause a problem.

Results from experiment two indicate that dried sweet whey can replace up to 45 per cent of the barley in growing-finishing rations. Problems with diarrhea reported by earlier researchers were not evident in this trial even at the highest level of whey. Gain of pigs fed 15, 30, and 45 per cent whey were significantly better than pigs fed the control ration which contained now whey. All whey rations were lower in fiber content than the basic barley-oats control ration and this resulted in faster gains and improved feed efficiency.

Pigs fed 15 and 30 per cent whey rations required nine per cent less feed per pound of gain and those fed the 45 cent ration consumed 11 per cent less feed per pound of gain than did pigs fed the control ration.

Net returns at all levels of whey feeding were higher than the basic ration which contained no whey. Although the 45 per cent level of whey was the most efficient in terms of feed per pound of gain, including whey at this level increased ration costs more than could be offset by the increase in feed efficiency. Net returns for the 30 and 45 per cent groups amounted to $3.01 and $3.13 more than for the control ration. The most economical ration contained 15 per cent dried whey and yielded $4.51 more net return than did the control. Only slight differences in carcass measurements were found, and these were more likely due to genetics than to ration type.

The third investigation evaluated dried sweet whey when fed in combination with either Hard Red Spring Wheat and oats or Hard Red Spring Wheat and barley.

Results of this experiment were similar to those obtained in trial two. No feeding problems of any kind were encountered and the rations produced satisfactory and economical gains. Statistically, pigs fed 30 per cent whey gained better than those fed a the 15 per cent level, but were not the most economical. Rations containing 15 per cent whey were cheaper to mix and resulted in less feed being required per pound of gain. This resulted in a net return of $3.75 more per head then pigs fed the 30 per cent whey rations.

Loin eye muscle area was significantly larger in pigs fed the 30 per cent whey rations compared with pigs raised on the 15 per cent rations.

Table 2. Rations fed to growing – finishing pigs.

A. Experiment One

Ingredient	SBOM	Ration supplement Lysine	Liquid Whey
Oats, lbs.	200	234	236
Barley, lbs.	676	739	740
Soybean oilmeal, lbs.	100	--	--
Lyamine – 50 (50% L-Lysine)	--	3	--
Minerals, vitamins [1/]	24	24	24
Price/ton, $ (1973)	70	60	49
(1974)	111	109	102
(1975)	132	129	126
3-year average cost/lbs., $	.0520	.0495	.0460

[1/] Includes: Limestone 9lbs., di-cal 9lbs., trace mineral salt 5lbs., vitamin B complex 1lb., 30 gms. Vitamin A, 14gms. Vitamin D_3 and 180gms. Zinc sulphate.

B. Experiment Two

Growing ration as fed from start to 120 pounds.

Ingredients In pounds	#1 0% Whey	#2 15% Whey	#3 30% Whey	#4 45% Whey
Dried sweet whey	-	150	300	450
Oats	284.5	284.5	284.5	284.5
Barley	571	425	278	131
SBOM	120	120	120	120
DI-cal	6	5	4	3
Limestone	11	9	7	5
Vitamins & minerals [1/] [2/]	6.5	6.5	6.5	6.5
Total	1,000	1,000	1,000	1,000
Finishing ration fed from 120 pounds to market.				
Dried sweet whey	-	150	300	450
Oats	284.5	284.5	285.5	284.5
Barley	673	525	378	231
SBOM	20	20	20	20
Di-cal	6	5	4	3
Limestone	10	9	7	5
Vitamins & minerals [1/] [3/]	6.5	6.5	6.5	6.5
Total	1,000	1,000	1,000	1,000

[1/] includes trace mineral salt, 5lbs.; vitamin B complex, 1lbs.; vitamin A, 30mgs; vitamin D, 14gms; and zinc sulfate, 180gms.
[2/] growing ration calcium and phosphorus averaged 0.62% and 0.53%.
[3/] finishing ration calcium and phosphorus averaged 0.60% and 0.51%.

c. Experiment Three

Growing ration as fed from start to 120 pounds

Ingredients In pounds	15# Whey wheat + barley	30# Whey wheat + barley	15# Whey wheat + oats	30# Whey wheat + oats
Dried sweet whey	150	300	150	300
Oats	330	183	-	-
Barley	-	-	330	182.5
Winter wheat	400	400	400	400
SBOM	99.5	99.5	99.5	99.5
Di-cal	5	4	4	4
Limestone	9	7	10	7.5
Vitamins & minerals 1/ 2/	6.5	6.5	6.5	6.5
Total	1,000	1,000	1,000	1,000
Finishing ration as fed from 120 pounds to market weight.				
Dried sweet whey	150	300	150	300
Oats	409	263	-	-
Barley	-	-	411	263
Winter wheat	400	400	400	400
SBOM	20	20	20	20
Di-cal	6	4	4	4
Limestone	9	7	9	7
Vitamins & minerals 1/ 3/	6.5	6.5	6.5	6.5
Total	1,000	1,000	1,000	1,000

1/ Includes: trace mineral sald 5 lbs.; vitamin B complex 1 lb.; vitamin A 30gms., vitamin d, 14gms., and zinc sulfate 180 gms.

2 growing ration: calcium and phosphorus averaged 0.66% and 0.53%.

3/ finishing ration: calcium and phosphorus averaged 0.61% and 0.51%.

Table 3. Response of growing-finishing pigs fed in experiments one, two and three.

A.Experiment One (three year average).

	Ration supplement					
	Whey		SBOM		Lysine	
	Pasture	Confinement	Pasture	Confinement	Pasture	Confinement
Initial wt., lbs.	35	51	34	51	35	51
Final wt., lbs.	190	205	200	211	192	217
Gain, lbs.	156	154	165	160	158	166
Days fed	127	117	127	117	127	117
Avg. daily gain, lbs.	1.22	1.31	1.30	1.36	1.24	1.42
Cost/lb. of feed, $	.046	.046	.052	.052	.0495	.0495
Feed/cwt gain, lbs.	285	297	410	397	395	386
Feed cost/cwt gain, $	13.11	13.66	21.32	20.64	19.55	19.10

B.Experiment Two

	No Whey	15%	30%	45%
No. head	27[2/]	27[2/]	28	28
No. days on feed	110	110	110	110
Initial wt., lbs.	47	47.5	46.5	46.5
Final wt., lbs.	207.5	227	232.5	228.5
Total gain, lbs.	160.5	179.5	186	181.5
ADG, lbs.	1.47	1.64	1.70	1.66
Feed/hd/day, lbs.	5.85	5.98	6.15	5.88
Feed/lb. gain, lbs.	3.96	3.64	3.63	3.55
Cost/lb. feed, $	.0555	.0576	.0612	.0620
Cost/cwt gain, $	21.98	20.94	22.22	21.94
Feeding economics:				
Return/hd @ $35/cwt	76.77	83.96	85.86	84.42
Feed cost/hd., $	-35.28	-37.96	-41.33	-39.80
Feeder pig/cost/hd., $	-26.67	-26.67	-26.67	-26.67
Net return, $ [1/]	14.82	19.33	17.86	17.95
		4.51	3.04	3.13

[1/] net return figure is market value less cost of feeder pig and feed costs, and does not include costs for veterinary supplies, Equipment, housing, depreciation, taxes, insurance etc.

[2/] one pig removed from trial due to pneumonia, and one due to lameness.

Table 4. Carcass summary from experiments two and three.

	No Whey	15%	30%	45%
Experiment 2				
Carcass length, in.	31.4	31.4	31.5	31.6
10th rib backfat, in.	.81	1.0	1.0	.90
Loin eye muscle quality	2.7	2.8	2.4	2.6
Loin eye area, sq. in.	4.8	4.2	4.9	4.8
Per cent lean meat	55.8	52.8	54.0	54.7
Experiment 3	15% whey Wheat + barley	30% whey wheat + barley	15% whey wheat + oats	30% whey wheat + oats
Carcass length, in.	31.5	32.4	31.3	31.6
10th rib backfat, in.	1.4	1.3	1.2	1.4
Loin eye muscle quality	2.5	2.6	3.0	2.7
Loin eye area, sq. in.	3.6	4.3	3.5	3.9
Per cent lean meat	47.6	50.5	49.3	48.2

Table 5. Approximate composition of feedstuffs used in this trial compared to whole milk.

	Dry Whole milk [1/]	Dried sweet whey[1/]	HRS wheat [2/]	US No.1 barley [2/]	US No.2 oats [2/]
Dry matter	97.8	95.4	100	100	100
Crude fiber	--	--	3.4	5.6	12.4
Ether extract (fat)	26.8	1.3	2.2	2.1	5.1
N-free extract (carbohydrate)	38.0	73.3	76.3	76.6	65.7
Protein (Nx6.25)	26.0	12.0	16.1	13.0	13.2
Swine digestible Protein, %	26	10.9	14.8	9.2	11.1
Energy:					
Swine DE Kcal/kg	5500	3651	4012	3461	3213
Ash (minerals)	6.0	10.3	2.0	2.7	3.6
Calcium, %	0.97	0.7	.06	.27	.11
Phosphorus, %	0.75	0.6	.47	.41	.39
Sodium, %	0.38	1.25	.10	.02	.07
Vitamin A (IU/kg)	2250	101	31	144	38
Riboflavin, (Mg/kg)	3.0	5.1	1.3	2.2	1.8
Thiamine, (Mg/kg)	.54	.9	6.0	5.7	7.0
Niacin (Mg/kg)	1.4	1.9	66.8	64.5	17.8
Pantothenic acid (Mg/kg)	5.9	9.6	15.6	7.3	14.5
Pyridoxine, (Mg/kg)	.68	.7	--	3.3	1.3
Biotin (Mg/kg)	.09	.09	.10	.20	.30
Choline (Mg/kg)	181.4	494.4	899	1157	1206
Ascorbic acid (Mg/kg)	16.6	--	--	--	--
Folic acid (Mg/kg)	.1	.2	.48	.60	.40
Vitamin B_{12} (Mg/kg)	.0008	.004	--	--	--

[1/] analysis from Minnesota Valley Testing Laboratories, Inc., New Ulm, Minnesota.
[2/] from applied animal nutrition, 1969, 2nd Ed; Crampton, E.W. and L.E. Harris.

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Four Feeding Systems For Growing-Finishing Swine

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

AGENT computer service which provides the capability of formulating least cost swine rations is available to North Dakota swine producers through their country extension agents.

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

Previous work at this station has shown that growing-finishing rations for swine based on two-thirds barley and one-third oats properly supplemented with soybean meal, minerals and vitamins 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 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 start of the trial all pigs were wormed with Atgard and vaccinated for erysipelas, and at approximately 100 pounds the pigs were dewormed and continued on feed until finished.

The rations compared were as follows:

a) Grower-finisher rations formulated with the aid of the AGENT computer service.
b) Commercial pelleted grower-finisher ration purchased locally and fed according to the manufacturer's directions.
c) Grower-finisher rations formulated using home-grown grains and a commercially prepared protein concentrate.
d) Grower-finisher ration recommended by the Dickinson Station, prepared using home-grown grains, soybean meal, vitamins and minerals.

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

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

Table 6. Grower ration composition using home-grown grains. 1/

Grower:	AGENT ration	Dickinson ration	Commercial supplement ration	
			Developer	Grower
Feeding period	40-120lbs	40-120lbs	40-70lbs	70-125lbs
Oats, lbs.	223	285		
Barley, lbs.	615.5	572	825	875
Soybean oilmeal 501, lbs.	122.3	120		
Meat & bone meal, lbs.	17.5			
Limestone, lbs.	9.5	11		
Di-calcium phosphate, lbs.		6		
Trace mineral salt, lbs.	2.5	5		
Methionine, lbs.	0.7			
Vita Pack, lbs.	8.9			
B-vitamin fortafeed, lbs.		1		
Vitamin A, gms.		30		
Vitamin D, gms.		14		
Zinc sulfate, gm.		180		
Six-In-One supplement, lbs.			175	125
Total pounds	1000	1000	1000	1000
Cost/cwt inc.processing @$10/ ton	6.31	5.41	6.05	5.46

1/ complete pelleted swine developer fed from 40-75 pounds cost $7.88/cwt.

Table 7. Finishing ration composition using home-grown grains. 1/

Finisher:	AGENT ration	Dickinson ration	Commercial supplement ration
Feeding period	80-220lbs	120-220lbs	125-220lbs
Oats, lbs.	223	285	
Barley, lbs.	658.8	613	925.0
Soybean oilmeal 501, lbs.	52.4	80	
Meat & bone meal, lbs.	20.6		
Limestone, lbs.	8.2	10	
Di-calcium phosphate, lbs.		6	
Alfalfa pellets, lbs.	25.3		
Trace mineral salt, lbs.	2.5	5.0	
Methionine, lbs.	0.3		
Vita Pack, lbs.	8.9		
B-vitamin fortafeed, lbs.		1	
Vitamin A, gms.		30	
Vitamin D, gms.		14	
Zinc sulfate, gms.		180	
Six-In-One supplement, lbs.			75
Total Pounds	1000	1000	1000
Cost/cwt inc. processing @ $10/ton	5.60	5.03	5.06

1/ complete pelleted swine finisher fed from 75-220 lbs @ $6.40/cwt.

Table 8. Gains, feed data and returns for four rations for growing-finishing hogs.

	Dickinson Ration		Commercial Pellet		AGENT Raton		Commercial supp. ration	
	Lot 1	Lot 6	Lot 2	Lot 7	Lot 3	Lot 4	Lot 5	Lot 8[1/]
No. head	6	5[2/]	6	6	5[2/]	6	6	6
Days fed	125	125	125	125	125	125	125	118
Finished wt., lbs.	211	217	224	242	216	232	214	189
Starting wt., lbs.	36	36	34	36	35	35	35	35
Gain, lbs.	175	181	190	206	181	197	179	154
ADG, lbs.	1.40	1.45	1.52	1.65	1.45	1.58	1.43	1.23
Feed Data:								
Feed consumed/hd, lbs.	660	613	562	663	732	757	688	708
Feed/hd/day, lbs.	5.28	4.90	4.49	5.31	5.85	6.06	5.50	4.78
Feed/cwt gain, lbs.	376	351	297	321	403	383	384	366
Ration cost inc. processing @ $10/ton:								
Developer			7.88	7.88			6.05	6.05
Grower	5.41	5.41			6.31	6.31	5.46	5.46
Finisher	5.03	5.03	6.40	5.60	5.06	5.60	5.06	5.06
Avg. feed cost/ Cwt gain, $	19.68	18.40	20.04	21.53	23.03	21.92	20.75	20.02
Economics:								
Gross return @36cents	73.85	75.95	78.40	84.70	75.60	81.20	74.90	66.15
Less feeder pig cost	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Less total feed- Cost/hd	34.54	32.12	37.92	44.43	41.82	43.33	37.17	30.83
Net return/pig	9.31	13.83	10.48	10.57	3.78	7.87	7.73	5.32
Combined net return- (2 lots)	11.36		10.38		6.01		6.48	

[1/] tail biting developed in lot 8 and could not be controlled 10%. This lot removed from the trial at 118 days. Data included to show effects of tail biting.

[2/] one pig removed from each of lots 3 & 6 due to health problems not trial related

<u>Summary:</u>

The AGENT ration fed in 1979 probably undervalued oats and barley, since gains and efficiency were as good or better with the Dickinson Station ration. The poorer feed efficiency of the AGENT ration may be a result of the use of alfalfa in the finishing phase. Complete pelleted feed will produce maximum gain and feed efficiency, but at an additional expense for the feed. Producers having suitable feed grinding equipment can prepare rations as recommended by the Dickinson Station or formulate their own rations with the help of the County Agent and AGENT, which will produce very satisfactory gains and returns. Rations of home grown feed grains properly supplemented, such as the Dickinson Station ration used in this trial, will produce net returns equal to or better than any other ration in this comparison.

Section VI

Range, Pasture and Forage Research

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Three Pasture Grazing System For Cow-Calf Production

P.E. Nyren

The cow-calf trial compares animal performance on both a fertilized and unfertilized three pasture grazing system. The 3-pasture rotation consists of crested wheatgrass for spring and early summer, native for mid to late summer, and Russian wildrye for fall grazing. The fertilized pastures are given a broadcast application of 50 lbs nitrogen per acre from ammonium nitrate each spring. Ten cow-calf pairs are grazed on each of the pastures with the size of the pastures being varied to compensate for the differences in forage production (table1).

The cool-late spring and below normal precipitation for the two month period extending form April20 to June 20 in 1979 combined to decrease forage production on all pastures compared to 1978. Overall forage production declined 28% on the unfertilized and 50% on the fertilized pastures. The sharp decline in forage production on the fertilized pastures over 1978, and ideal year, is not unexpected since without adequate soil moisture during the growing season the N fertilizer cannot be utilized. The N will remain in the soil profile, however, available for use by the plants when adequate growing conditions prevail.

Utilization on the pastures ranged from a low of 24% on the unfertilized native to a high of 84% on the unfertilized Russian wildrye (table 1). While utilization on the crested wheatgrass was higher than normal, regrowth following the June rains tended to offset this. The higher utilization on Russian wildrye, however, is not unusual since grazing is deferred until after the growing season when the plants have had adequate time to replenish their food supplies.

Animal performance on the pastures did not reflect the lower forage production but the length of the grazing season had to be shortened by 37 days on the unfertilized system and 78 days on the fertilized. Average daily gains (ADG) for cows on the fertilized crested wheatgrass was slightly higher than the unfertilized 2.8 and 2.2 lbs respectively (Table 3). Calf ADG were 2.6 lbs on the fertilized and 1.9 lbs on the unfertilized (table 4). Total per acre gains for the 31 days on crested wheatgrass was 73 lbs per acre on the unfertilized and 209 lbs per acre for the fertilized.

The animals were moves to the native pastures on June 22 and remained there for 28 days. During this time the cows and calves on the unfertilized pasture gained 1.5 and 2.0 lbs per head per day respectively while those on the fertilized gained 0.7 and 1.4 lbs per head per day respectively. Per acre gains for the calves were the same, each group producing 32 lbs per acre for the 28 day period.

Both sets of animals were moved to the Russian wildrye pastures on July 20. The animals on the unfertilized pastures remained there until August 23. During this 34 day period the cows gained 0.5 lbs per head per day and 11 lbs per acre while the calves gained 2.3 lbs per head per day, and produced 48 lbs of beef per acre. The cows and calves on the fertilized Russian wildrye grazed until August 30 and gained 1.0 and 1.9 lbs per head per day respectively. Beef production on the fertilized pastures was 26 lbs per acre for the cows and 48 lbs per acre for the calves.

Cows on unfertilized system grazed 50 acres for 93 days and gained a total of 25 lbs per acre, while their calves gained 38 lbs per acre. Cows and calves on the fertilized pasture system grazed 36 acres for 100 days and produced total gains of 95 lbs per acre, of which 41 lbs were cow gains and 54 lbs were calf gains.

Table 1. Forage production and utilization during the grazing periods – Grazing Systems Trial 1978-79.

Pastures	Pasture size Acres	Year	Period grazed	Days in period	Forage produced lbs/acre	Forage utilized lbs/acre	Forage left on ground lbs/acre	Percent utilization
Crested wheatgrass	16	1978	5/22-6/19	28	2030	1068	962	53
(unfertilized)		1979	5/22-6/22	31	1675	1174	501	70
Crested wheatgrass	8	1978	5/15-7/10	56	5060	3426[1/]	1634	68
+ 50 lbs N/A		1979	5/22-6/22	31	2243	1713	530	76
--	--	--	--	--	--	--	--	--
Native grass	18	1978	6/19-8/14	56	1954	1141	813	58
(unfertilized)		1979	6/22-7/20	28	1195	290	905	24
Native grass	12	1978	7-10-9/15	67	3943	2270	1673	58
+50 lbs N/A		1979	6/22-7/20	28	1846	1135	711	61
--	--	--	--	--	--	--	--	--
Russian wildrye	16	1978	8/14-9/29	46	1760	1320	440	75
(unfertilized)		1979	7/20-8/23	34	1280	1033	247	81
Russian wildrye +50 lbs N &	16	1978	9/15-11/9	55	2727	1963	764	72
30 lbs P_2O_5/A		1979	7/20-8/30	41	1754	1386	368	79

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

Table 2. 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 (0)	990	1044	55	2.0	34
Crested wheatgrass +50 lbs N/A	5/15-7/10 6/12-7/10	56 (28)	10 (1)	958 (885)	1066 (1000)	108 (115)	1.9 (4.1)	135 (14)
-- -- --	--	--	--	-- --	--	-- --	--	--
Native grass (unfertilized)	6/19-8/14	56 (56)	10 (1)	1044 (1115)	1069 (1145)	25 (30)	0.4 (0.5)	14 (2)
Native grass +50 lbs N/A	7/10-9/15 (7/10-8/7)	67 (28)	10 (1)	1066 (1000)	1008 (1040)	-58 (40)	-0.9 (1.4)	-5 (3)
-- -- --	--	--	--	-- --	--	-- --	--	--
Russian wildrye (unfertilized)	8/14-9/29	46	10	1070	1084	14	0.3	9
Russian wildrye +50 lbs N & 30 lbs P_2O_5/A	9/15-11/9	55	10	1008	1092	84	1.5	52

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

Table 3. Weights and gains of cows and one bull – Grazing Systems Trial 1979.

Pasture	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	5/22-6/22	31	10	970	1038	67	2.2	42
(unfertilized)			(1)	(1190)	(1110)	(-80)	(-2.5)	(-5)
Crested wheatgrass	5/22-6/22	31	10	976	1064	88	2.8	110
+50 lbs. N/A			(1)	(1135)	(1110)	(-25)	(-0.8)	(-3)
--	--	--	--	--	--	--	--	--
Native grass	6/22-7/20	28	10	1038	1080	42	1.5	23
(unfertilized)			(1)	(1110)	(1135)	(25)	(.9)	(2)
Native grass	6/22-7/20	28	10	1064	1084	19	0.7	16
+50 lbs. N/A			(1)	(1110)	(1130)	(20)	(0.7)	(2)
--	--	--	--	--	--	--	--	--
Russian wildrye	7/20-8/23	34	10	1080	1098	18	0.5	11
(unfertilized)			(1)	(1135)	(1160)	(25)	(0.7)	(1.5)
Russian wildrye	7/20-8/30	41	10	1084	1124	41	1.0	26
+50 lbs. N &								
30 lbs. P_2O_5/A			(1)	(1130)	(1140)	(10)	(0.2)	(0.8)

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

Table 4. Weights and gains of calves – Grazing Systems Trial 1978-79.

Pasture	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/A
Crested wheatgrass	1978	10	180	228	48	1.7	30
(unfertilized)	1979	10	160	218	58	1.9	36
Crested wheatgrass	1978	10	152	255	103	1.8	129
+50 lbs. N/A	1979	10	171	252	81	2.6	101
-- -- --	--	-- --	--	-- --	--	-- --	--
Native grass	1978	10	228	328	100	1.8	58
(unfertilized)	1979	10	218	275	57	2.0	32
Native grass	1978	10	255	342	87	1.3	73
+50 lbs. N/A	1979	10	252	291	39	1.4	32
-- -- --	--	-- --	--	-- --	--	-- --	--
Russian wildrye	1978	10[1/]	328	410	82	1.8	51
(unfertilized)	1979	10	275	352	77	2.3	48
Russian wildrye +50 lbs. N &	1978	10	342	426	84	1.5	52
30 lbs. P_2O_5/A	1979	10	291	368	77	1.9	48

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

See tables 2 and 3 for dates and days in grazing period.

Interseeded Pasture Grazing Trial

P.E. Nyren

The interseeded pasture grazing trial compares animal performance on pastures interseeded to Russian wildrye and Travois alfalfa as well as one given a broadcast application of 50 lbs N each spring, one treated with the interseeder but not seeded (control interseeded) and one pasture left untreated as a check.

Ten cow-calf pair were grazed on each of the pastures with the size of the pastures being varied to compensate for differences in production (table 5).

The animals were moved onto the pastures June 22 and remained there until July 20 a total of 28 days (Table 4).

Forage production on all pastures was well below the 1978 levels. The lowest producing pasture was the interseeded Travois with 1074 lbs per acre, 121lbs per acre less than the untreated check. The fertilized pasture produced the most forage with 1846lbs per acre followed by the interseeded Russian wildrye with 1401lbs per acre and the interseeded control with 1325lbs per acre (table 5).

The cool-late spring and low precipitation from April 20 to June 20 had a detrimental effect on forage production from all pastures regardless of treatment. Forage samples were collected from all pastures prior to grazing and exclosure cages were placed on each pasture. When the animals were removed samples were collected both inside and outside each cage. Analysis of this data shows that there was little or no growth during the time the cattle grazed the pastures. Decreases in total production varied from 3% on the fertilized native to 32% on the control interseeded. This lack of regrowth during the grazing period attributed to the short grazing season.

Although the forage production was substantially lower then 1978 on all pastures, beef gains were not as drastically affected. The cows showed better average daily gains (ADG), than 1978, on all pastures except the fertilized (table 7). Per acre gains for the cows were highest on the interseeded Travois with 62lbs per acre, 22lbs per acre higher than the next highest, the interseeded Russian wildrye.

Average daily gain for the calves was similar to 1978 ranging from a high of 2.2lbs per head per day on the Travois interseeded to a low of 1.1 on the interseeded Russian wildrye. Per acre gains ranged from 60lbs per acre on the Travois to 31 lbs per acre on the interseeded Russian wildrye (table 8).

Combining both cow and calf gains gives a total beef production figure of 122lbs per acre for the Travois interseeded pasture 38lbs per acre better than the next highest producer, the control interseeded and 67lbs per acre higher than the untreated check (table 8).

Despite low forage production, the interseeded Travois pasture produced more beef than any of the other pastures. This may be due in part to the higher forage value of the alfalfa. The alfalfa has been heavily grazed each year and seems to be spreading, filling in some of the skips which occurred in seeding. The stand of Russian wildrye remains poor and the actual contribution to forage production is small. Any improvements in forage production or animal performance would more then likely be attributed to the stimulation of the stand by the interseeding operation.

Table 5. Forage production and utilization during the grazing periods- Interseeded Pasture Grazing Trial 1978-79.

Pastures	Year	Pasture Size acres	Period grazed	Days in period	Forage produced lbs/acre	Forage utilized lbs/acre	Forage left on ground	Percent utilization
Unfertilized	1978	18	6/19-8/14	56	1954	1141	813	58
Native	1979		6/22-7/20	28	1195	289	905	24
Fertilized	1978	12	7/10-9/15	67	3943	2270	1673	58
Native 50lbs N/A	1979		6/22-7/20	28	1846	1135	711	61
Interseeded	1978	10	6/19-8/7	49	1980	1027	953	52
Control	1979		6/22-7/20	28	1325	762	563	58
Interseeded	1978	10	6/19-8/7	49	2290	1272	1018	56
Travois alfalfa	1979		6/22-7/20	28	1074	647	427	60
Interseeded	1978	15	6/19-8/14	60	2064	1256	808	61
Russian wildrye	1979		6/22-7/20	28	1401	474	927	34

Table 6. Weights and gains of cows and one bull – Interseeded Pasture Grazing Trial 1978.

Pastures	Period grazed	Days in period	No. of cows & bull[1/]	Ave. initial wt/cow lbs.	Avg. final wt/cow lbs.	Avg. gain/hd lbs.	Avg. Daily gain/hd lbs.	Avg. gain/A lbs.
Unfertilized	6/19-8/14	56	10	1044	1069	25	0.4	14
Native	(6/19-8/14)	(56)	(1)	(1115)	(1145)	(30)	(0.5)	(2)
Fertilized	7/10-9/15	67	10	1066	1008	-58	-0.9	-5
Native 50lbs N/A	(7/10-8/7)	(28)	(1)	(1000)	(1040)	(40)	(1.4)	(3)
Interseeded	6/19-8/7	49	10[2/]	1021	1122	10	0.2	10
Control	(6/19-8/7)	(49)	(1)	(1040)	(1100)	(60)	(1.2)	(6)
Interseeded	6/19-8/7	49	10	1034	1106	72	1.5	72
Travois alfalfa	(6/19-8/7)	(49)	(1)	(1145)	(1175)	(30)	(0.6)	(3)
Interseeded	6/19-8/14	60	10	1018	1049	31	0.5	21
Russian wildrye	(6/19-8/14)	(60)	(1)	(1215)	(1200)	(-15)	(0.25)	(-1)

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

Table 7. Weights and gains of cows and one bull – Interseeded Pasture Grazing Trial 1979.

Pastures	Period Grazed	Days in period	No. of cows & bull[1/]	Avg. initial wt/cow lbs.	Ave. final wt/cow lbs.	Avg. gain/hd lbs.	Avg. Daily gain/hd lbs.	Avg. gain/A lbs.
Untreated Native control	6/20-7/20	28	10 (1)	1038 (1110)	1080 (1135)	42 (25)	1.5 (0.9)	23 (2)
Fertilized Native 50lbs N/A	6/20-7/20	28	10 (1)	1064 (1110)	1084 (1130)	19 (20)	037 (0.7)	16 (2)
Interseeded Control	6/20-7/20	28	10[2/] (1)[3/]	1156 (1435)	1180	25	0.9	25
Interseeded Travois alfalfa	6/20-7/20	28	10 (1)[3/]	1158 (1350)	1220	62	2.2	62
Interseeded Russian wildrye	6/20-7/20	28	10 (1)	1120 (1455)	1180 (1435)	60 (-20)	2.2 (-0.7)	40 (-1)

[1/] ( ) indicates data pertaining to bulls.
[2/] on 7/17 cow number 524 and her calf were removed and relaced due to sickness.
[3/] no weights available for bulls on interseeded pastures.

Table 8. Weights and gains of calves – Interseeded Pasture Grazing Trial 1978-79.

Pastures	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/A lbs.	Total gain cows-calves, bull, lbs/A
Unfertilized	1978	10	228	328	100	1.8	56	72
Native	1979	10	218	275	57	2.0	32	55
Fertilized								
Native	1978	10	255	342	87	1.3	73	71
50lbs N/A	1979	10	252	291	39	1.4	32	48
Interseeded	1978	10[1/]	219	332	113	2.3	113	214
Control	1979	10	232	290	59	2.1	59	84
Interseeded								
Travois	1978	10	227	340	113	2.3	113	188
Alfalfa	1979	10	266	326	60	2.2	60	122
Interseeded								
Russian	1978	10	228	332	104	1.7	69	89
Wildrye	1979	10	242	274	31	1.1	31	71

[1/] On 7/17 one calf was replaced with another due to sickness.
See tables 6 and 7 for dates and days grazed

Sod Seeding In Western North Dakota

Interseeding research has been conducted by the Botany Department and Dickinson Experiment Station, North Dakota State University in western North Dakota since 1969. These studies have included stand counts and/or production data from 8 species interseeded into native mixed grass prairie with 3 different machines using 8 types of sod control. Also included in these studies was two seeding dates and 3 fertility levels.

A small plot trial seeded in the fall of 1969 has shown that interseeding alfalfa into native mixed grass prairie can increase production as much as 32 percent (Nyren, et al. 1978). These plots were seeded with a machine which used lister type blades to cut and remove the native sod from a 36 cm strip. While this machine achieved excellent sod control it left the soil surface very rough. Ten years after the seeding operation it is still difficult to drive or walk across the treated area. In an effort to overcome the rough destructive appearance of the lister type interseeder, a John Deere 1500 power-till seeder was purchased and equipped with a sprayer attachment. In the spring of 1976 two pastures were seeded, one to Russian wildrye and one to Tracois alfalfa. The sod control strips were 30 cm wide and treated with .70 Kg AI/ha of Glyphosate. Due to the lack of soil moisture and lack of growth of the native sod almost no control was achieved with the herbicide even on areas where much higher rates were applied.

In an effort to overcome this dependence on the height and growth of the vegetation at the time of seeding a Melrose 701 drill was required and modified for interseeding. Since the drill was not available until May of 1977 there was no time to develop the best modification for interseeding. The drill was modified by moving the double disk furrow openers to the rear and placing a shank, with a 30cm cultivator sweep attached, between the single coulter and the double disk furrow openers. A pack wheel was mounted behind the furrow openers to firm the seedbed. The pastures were again seeded with this machine in May of 1977. The results were excellent sod control and an uneven stand due to lack of control on seeding depth. The interseeded pastures have been grazed every year since they were seeded. In 1977 the seeded pastures were grazed during the month of July by 10 heifers. In 1978 and 1979 the pastures were grazed by 10 cow-calf pairs. Included in the study with the interseeded Russian wildrye and Travois alfalfa is a fertilized pasture given yearly applications of 56 kg/ha N and a pasture treated with the Melroe drill but not seeded, as well as a untreated check.

Although the alfalfa stand was uneven to begin with it has spread and filled in to the point where a good stand has developed. The Russian wildrye stand has remained poor throughout the entire 15 acre pasture. Data from the 5 pastures has shown that the alfalfa interseeded pasture has produced an average of 2.6 times more lbs/acre of beef than the fertilized pasture.

Task C of the Old West Regional Commission's sod seeding grant included 7 specific objectives. Of these, 5 were studied on native mixed prairie in western North Dakota.

Th original plans for the sod seeding study were to use a John Deere 1500 power-till equipped with a sprayer attachment. Plots were seeded with this machine in early June 1977 to study the effect of 2 herbicides applies at 6 band widths on plots seeded to 2 grasses and 1 variety of alfalfa. Plots seeded to Russian wildrye (Elymus junceus) and green needlegrass (Stipa viridula) were sprayed with Glyphosate at 2.2 kg AI/ha or Paraquat at .56 kg AI/ha on three band widths of 15, 20 and 30 cm over rows 46 cm apart. The plots seeded to Travois alfalfa (Medicago sativa) were treated with the same herbicide rates on 23, 32 and 36 cm bands over 61 cm row spacing.

Data collected on these plots indicated no control from either herbicide regardless of the width of the control strip. Seedling counts done on the grass plots after 1 growing season showed not significant differences between any of the treatments. Seedling counts on the Travois plots showed significantly mores seedlings on the 23 cm Glyphosate treated plots than on any other treatment (table 1). The next best stand was on the 23 cm Paraquat treatment but this was not significantly higher than any other treatment except the 36 cm Paraquat. There seems to be no logical explanation for the better stands to be on the plots treated with the narrower control strips since the herbicide rates were kept constant on all treatments.

Table 1. Seedlings per meter of row on Travois seeded plots.

Treatment	Band width (cm)	Travois
Paraquat	23	14.6 ab[1/]
Paraquat	32	8.9 bc
Paraquat	36	6.1 c
Glyphosate	23	21.6 a
Glyphosate	32	13.3 bc
Glyphosate	36	12.6 bc
Check	0	10.8 bc

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

The poor control from the herbicide treatments on this and other trials conducted on native range coupled with the high cost of these chemicals forced a re-evaluation of out sod control methods. It was felt that mechanical sod control had more practical application in work on native range than chemical. In the spring of 1977 a Melroe 701 drill was acquired and work was begun on modifying this machine for interseeding use. Because of the time frame of the study 4 modification were designed and tested at the same time to determine the most effective. Modification number 1 consisted of removing the single coulter, which is standard equipment on the Melroe drill, and replacing it with 2 coulters set side by side 6 cm apart. This was then followed by a shank with a 30 cm cultivator sweep attached. The double disk seeding assembly was removed and a new seeding unit was constructed. The new seeding assembly utilized a seeding shoe from a Planet Jr. grass seeder to form the seedbed. This was followed by a packwheel to firm the seedbed. The second modification retained the stock single coulter followed by the seeding assembly described for modification number 1. Sod control was achieved by the use of two half sweeps mounted on each side of the seeded row. Since the support shanks for these sweeps was not mounted in line with the seeding assembly they achieved the same sod control without disturbance to the seeded row.

In the third modification the single coulter was removed and replaced with one of the double disk seeding assemblies. The double disk assembly cut and spread the sod to form a notch in which the shank and 30 cm cultivator sweep ran. These were then followed by a Planet Jr. seed assembly to which two side fins had been added to further spread the sod leaving a open furrow. A pack wheel followed in the furrow to firm the seedbed

The fourth modification was the same as the one used to see the pastures in the spring of 1977, and used the stock single coulter followed by a shank and 30 cm cultivator sweep with the stock double disk seeding assembly. This was then followed by a pack wheel to firm the seedbed.

These four modifications plus the stock seeding unit were used in October of 1977 to seed crested wheatgrass (Agropyron desertorum) into native range. Three replications were seeded with each of the five units. Visual comparisons of the 5 units indicated that the best seedbed was made by modifications 1 and 2. These plots were seeded again in May of 1978 to compare not only the 5 units but also the date of seeding.

Results from this phase of the study confirmed our visual observations that modification numbers 1 and 2 prepared the best seedbed. Table 2 shows the results of seedling counts done in the fall of 1978.

Table 2. Crested wheatgrass seedlings per M of row by seeding date.

Modification	October	May	Average
1	49.3 a[1/]	17.0 a[2/]	33.3 a[1/]
2	21.7 b	5.8 b	14.0 b
3	8.3 c	5.0 b	6.7 c
4	4.3 c	0.0 c	2.2 cd
5	2.3 c	0.4 c	1.4 d

[1/] values in the same column followed by the same letter are not significantly different at the $P < .05$ level.
[2/] values in the same column followed by the same letter are not significantly different at the P , .10 level.

Modifications 1 and 2 both had significantly more seedlings than any of the other treatments. In comparing the October vs. May seeding the fall seeding had a significantly ($P < .05$) better stand on all treatments except modification number 3.

In the spring of 1978 another small plot study was undertaken to determine the amount of sod control necessary to establish Travois alfalfa, green needlegrass and Russian wildrye in native mixed prairie. Three rates of fertilizer were also evaluated to determine the value of adding nitrogen (N) and phosphorus (P).

Plots were set up to test three sod control widths; 0, 6 and 30 cm and three fertility rates; ON+OP, 56 kg/ha N + 22 kg/ha P and 100 kg/ha N + 45 kg/ha P. These plots were seeded on June 19 and 20, 1978. Seedling counts in the fall of 1978 showed no significant differences between any of the treatments on the green needlegrass plots (table 3). The Russian wildrye showed significantly better stands on the plots treated with the 6 cm sweep and those treated with the 30 cm sweep and given either the low or high rate of fertilizer. The addition of

Table 3. Seedlings per meter of row and alfalfa seedling heights for grasses and alfalfa seeded into native mixed grass prairie.

		Seedlings/M of row			
Sod Control (cm)	Fertility level (kg/ha)	Green needlegrasses	Russian wildrye	Travois alfalfa	Travois alfalfa seedling height (cm)
0	0	1.3 a [1/]	1.0 b	35.8 a	10.1 c
6	0	1.9 a	7.6 a	31.2 ab	12.3 b
30	0	2.1 a	3.0 b	21.3 bc	12.7 b
30	56N+22P	2.2 a	7.5 a	13.0 c	20.8 a
30	100N+45P	4.7 a	4.5 ab	9.6 c	22.3 a

[1/] values in the same column followed by the same letter are not significantly different at the $P < .05$ level.

N and P fertilizer to the Travois seeded plots significantly decreased stands over the no sod control and 6 cm sod control treatments, however, height measurements show a significant (P , .05) relationship between the addition of N and P fertilizer and increased height of the alfalfa seedlings (table 3).

Yield data was taken on the alfalfa seeded plots in August of 1978 and 1979 (table 4).

Table 4. Yield of native mixed prairie interseeded to Travois alfalfa (kg/ha)

Sod Control (cm)	Fertility level (kg/ha)	1978 Total	1979 Grass	1979 Alfalfa	1979 Total
0	0	2919 b[1/]	1700 a	259 ab	1960 a
6	0	3199 b	2182 a	238 abc	2420 a
30	0	2338 b	1764 a	438 a	2202 a
30	56N+22P	3162 b	2078 a	321 ab	2399 a
30	100N+45P	3049 b	2304 a	177 bc	2480 a
Check	0	4032 a	2156 a	0 c	2156 a

[1/] values in the same column followed by the same letter are not significantly different at the P < .05 level.

Production was significantly decreased by all interseeding treatments during the 1978 growing season. The following year, however, there was not significant differences in total production between any of the treatments.

Alfalfa yields on the interseeded plots was highest on the unfertilized 30 cm sod control plot but was not significantly different from the other unfertilized treatments and the low fertility plots. It would appear that the poor stands resulting from the addition of N and P had a detrimental effect on the subsequent years production.

In May of 1979 the Melroe 702 drill equipped with modification number 1 used to seed Travois alfalfa into established Russian wildrye and smooth brome (Bromus inermis) stands. Seedling counts and yield data were collected on these plots in August of 1979 (table 5). While there was no significant difference in the stand density the seedlings on the Russian wildrye were taller. Forage yields were reduced by the interseeding treatment on both the Russian wildrye and smooth brome.

From the data collected form this and other studies conducted on native mixed prairie in western North Dakota it appears that mechanical sod control is more reliable, practical, and economical than chemical. Successful seedings of Travois alfalfa were achieved in both native mixed prairie and tame grass using the most successful modifications on the Melroe 702 drill. This was done with little disturbance to the native sod.

Table 5. Seedling counts, heights and forage yields of Travois interseeded Russian wildrye and smooth brome.

Species	Seedling/ Meter of row	Seedling heights (cm)	Forage yields (kg/ha)
Interseeded- Russian wildrye	28.4 a[1/]	14.9 a	730 b
Interseeded- Smooth brome	40.5 a	9.5 b	635 b
Russian wildrye- Check	--	--	1840 a
Smooth brome- Check	--	--	1828 a

[1/] values in the same column followed by the same letter are not significantly different at the P < .05 level.

Late fall proved to be the best time to interseed crested wheatgrass although more testing with other species should be conducted.

Of the grass species studied, green needlegrass and Russian wildrye proved to be the most difficult to establish. This study showed better stands for Russian wildrye than green needlegrass however, other studies conducted in western North Dakota and Canada (Dr. Tom Lawrence, personal communication) (Nyren and Goetz, 1978) have shown that Russian wildrye cannot compete with native sod, even when wide control strips are used, and stands decline rapidly following the seedling year.

The direction the research at Dickinson would follow with additional funding from outside sources is to design and test an implement that will prepare native sod for interseeding using a standard grain drill. The most important aspect of range improvement research is the acceptance of these practices by ranchers. The major problems with the systems developed to date is that they are not acceptable to many ranchers. This being either because of the destructive nature of the sod control or the cost of the machinery and chemicals involved. If a machine can be designed which will accomplish the sod control while using a conventional grain drill for seeding the cost of equipment would be a drastically reduced. This then would make interseeding simpler and more practical for ranchers who already have a grain drill and cannot afford the expenditures of more equipment. A simple, relatively inexpensive method of seeding grasses and legumes into native or tamegrass sod would do more to promote this range improvement technique than anything else.

Literature Cited

Nyren, Paul E., and Harold Goetz, 1978. Botany department annual report. North Dakota State University, Fargo. P. 10-11.

Nyren, Paul E., Harold Goetz, and Dean Williams. 1978. Interseeding of native mixed prairie in the great plains. Proc. 1st International Rangeland Congr. P. 636-638.

Techniques for Re-Establishing Selected Native Species

In the spring of 1979 a study was undertaken to determine the best method of reseeding western wheatgrass (Agropyron smithii), green needlegrass (Stipa viridula), blue grams (Bouteloua gracilis), and sideoats grama (B. curtipendula).

The study included the following treatments seeded in the spring of 1979:

1. Fallowed – seeded to western wheatgrass.
2. Fallowed – seeded to green needlegrass.
3. Fallowed – seeded to blue grama.
4. Fallowed – seeded to sideoats grass.
5. Fallowed – seeded to all four species.
6. Fallowed – seeded to western-green needle, bluegrama-sideoats in alternate rows.
7. Fallowed – seeded to blue grama-sideoats followed by a cross seeding of western-green needle the following spring.

In addition to the above plots seeded in the spring of 1979, 14 plots in each rep were seeded to oats. The 7 treatments seeded in the spring were also seeded in October in both fallow and oat stubble. Those same 7 treatments will be seeded in the spring of 1980 into both fallow and oat stubble to compare both types of seedbed as well as the time of seeding.

Table 1. Seedlings per square meter on native re-establishment trial.

Treatments	Stipa viridula	Agropyron smithii	Bouteloua curtipendula	Bouteloua gracilis	Total
Stipa viridula	9.0 a[1/]	--	--	--	9.0 c
Agropyron smithii	--	76.6 a	--	--	76.6 ab
Bouteloua curtipendula	--	--	112.4 a	--	112.4 a
Bouteloua gracilis	--	--	--	26.5 a	26.5 c
Alternate row	1.6 a	7.8 b	32.9 b	10.3 b	52.6 bc
Bocut-Bogr mix	--	--	78.1 a	9.0 b	87.1 ab
Four spp mix	2.9 a	7.1 b	30.4 b	7.1 b	47.5 bc

[1/] values in the same column followed by the same letter are not significantly different at the P < .05 level.

All four species had better stand when seeded alone than when seeded in any of the mixtures (table 1). Sideoats, grama did significantly better on plots where it was seeded alone or with blue grams than when seeded with the cool season species; western wheatgrass and green needlegrass. Data for the total number of seedlings per treatment show sideoats grama had the best stands followed by sideoats+blue grama mix. Poorest stand were on the green needlegrass plots.

The precipitation patterns (low May and early June and good late June and July) may have attributed to the good stands of warm season grasses. The stands of blue grama and western wheatgrass would be expected to fill in as the stands mature while the others may improve but to a lesser extent.

1975 New Alfalfa Trial

This alfalfa trial was established at the Dickinson Experiment Station in the spring of 1975 to test the new varieties not included in previous trials. Ten varieties were included in the trial. Thor was included twice, once with the standard inoculant and once with a commercial seed treatment called innoculime. The plots were 12 by 12 feet and replicated four times.

Due to inadequate spring and early summer precipitation only one harvest was made on the alfalfa plots, this being done on July 2 at approximately on tenth bloom. Due to the dryness, alfalfa matured to harvest slower this year. Forage production, for each variety for the one harvest made in 1979, was considerably lower than the first harvest for 1978. Reduction in forage produced, when compared to the first harvest of 1978, ranged from 2130 lbs/acre (Polar) to 3898 lbs/acre (Kane).
When considering the total yield, forage reduction was even greater with the highest reduction being in Kane (5239 lbs less total production).

The highest producing variety was Polar (2484 lbs) and the lowest was Kane (1570lbs). It would appear that Kane (a northern variety) is quite susceptible to drought conditions as it has for the past three years been the best producer of the varieties in this trial. Only two varieties produced over one tone of forage per acre, Polar yielded 2484 lbs and SX-10 produced 2141 lbs of forage. Two other varieties were close to producing a ton of forage, these were WL-310 and Valor (with yield of 1964 lbs/acre an d1938 lbs/acre respectively).

Lack of adequate spring and early summer precipitation produced drought conditions that had a marked effect on forage production of all varieties, especially Kane, the best producer in all precious years. These drought conditions were perhaps the worst during the period of the trial. When considering the four year average production Kane is still the highest (3884 lbs/acre).

Table 1. 1975 New alfalfa trial (seeded in 1975) lbs/acre production (dry weight)

Variety	Total Production 1976*	1977	1978*	1979	4-yr avg.	For. red. **	1st Cut avg.	2nd cut avg.	1978 1st cut	1976 1st cut
Embro-A57	3788	1411	5640	1694	3133	2486	2431	1403	4180	2441
SX-10	4143	1620	6095	2141	3500	2647	2780	1434	4788	2573
Polar	3363	1397	6104	2484	3337	2130	2565	1545	4614	2588
Spredor	3560	1389	5569	1742	3065	2937	2585	960	4679	2529
Thor (N. Liz.)	3808	1354	5915	1765	3210	2617	2489	1443	4382	2455
Thor (N. Lim.)	4091	1055	5812	1675	3158	2842	2433	1450	4517	2485
Kane	4948	2208	6809	1570	3884	3898	3105	1556	5468	3176
WL-310	4336	1460	5542	1964	3325	2452	2647	1356	4416	2750
Gladiator	4090	1425	6179	1769	3366	3145	2689	1354	4914	2647
G-777	4067	1173	5259	1647	3036	2139	2258	1557	3786	2426
Valor	4538	1182	5836	1938	3373	2779	2708	1328	4717	3000
Average	4066	1425	5887	1853	3308	2733	2608	1399	4587	2643

*In 1976 due to sufficient moisture and regrowth two harvests were made.

**Reduction in forage production (1st harvest) from 1978-1979.

N. Lim. – Commercial seed treatment named innoculime.

N. Liz. – Standard seed inoculant.

1979 Alfalfa Adaptation Trial

In May of 1979 an enlarged alfalfa trial was seeded at the Dickinson Experiment Station and the new Central Grasslands Research Station near Streeter, North Dakota. It is planned that this trial will also be seeded at the Hettinger Experiment Station in the spring of 1980. The trials at Dickinson included 21 varieties and trials at Streeter and Hettinger have 20 varieties (Ladak was included at Dickinson and not at Hettinger or Streeter due to lack of seed). Six of the varieties were used in previous alfalfa trials and were included in this trial as a basis for comparison.

Plot size at all locations was 25 feet by 10 feet. At Dickinson plots were replicated five times since adequate land was available; replicates 2-5 will be harvested for forage production data and replicate one will be harvested for seed production data. Less land was available at Streeter and Hettinger and the plots were replicated three times, with all replicates being used for production data.

Varieties included in this trial are as follows:

Variety	Developing or introducing agency
524	Pioneer Seed Co.
520	Arnold Thomas Seed Co.
D-111	Waterman – Loomis Co.
Trek	Agriculture Canada
Polar I	Northrup, King & Co.
Spredor II	Northrup, King & Co.
Nuggett	North American Plant Breeders
Rangelander	Agriculture Canada
Baker	USDA and Nebraska AES
Norseman	Brazen of Minneapolis
Agate	USDA and Minnesota AES
Anik	Agriculture Canada
Iriquois	Cornell University – Premium Seed Co.
Ramsey	Minnesota AES and USDA
Ranger	USDA and Nebraska AES
Ladak 65	Montana AES
Ladak	Introduction from India
Vernal	Wisc. AES and USDA
Thor	Northrup, King & Co.
Travois	South Dakota AES
Kane	Agriculture Canada

No harvest was made in 1979, however the plots were mowed in mid September to take off the weedy growth. Harvesting of the plots is planned to start in the 1980 growing season.

Exploratory Project – Possibilities of Vegetative Snow Fence Under Rangeland Conditions 1979 Summary

R.E. Ries

Snow, if caught to add snow-melt water to increase stored soil water, offers an important source of water in the semi-arid dryland agriculture of the Northern Great Plains. Various techniques such as level bench terraces, grass barriers and crop residue have been used to harvest snow water. Each has added to the production of the agricultural crop. Little work has been done on perennial rangeland. It is the purpose of this exploratory work to investigate the use of vegetative barriers in rangeland to catch snow and thus increase soil water available for growth by the perennial range species.

The first item of concern was finding species that might work as vegetative snow fences on rangeland. The help of F.B. Gomm, Crops Research Laboratory, Logan, UT, was obtained. He had available some species and species hybrids which appeared to have promise for this use. He provided both transplants and seed of all species except Caragana. Lee Hinds, Lincoln-Oakes Nurseries, provided seed and transplants of Caragana.

Species Available:

<u>Elymus cinereus</u> (Elci)	seed and transplants
<u>Agropyron eloongatum</u> (Agel)	seed and transplants
<u>Caragana</u> (Car)	seed and transplants
<u>E. angustus</u> (Elan)	transplants
<u>E. giganteus</u> (Elgi)	transplants
Elci x Elan	transplants
Elgix Elan	transplants
(Elcix Elan) x (Elgi x Elan)	transplants

Study Methods:

These species were seeded and transplanted into perennial rangeland near Dickinson, North Dakota in cooperation with Paul Nyren and Dean Williams, NDSU, Dickinson Experiment Station. Field layout was in a randomized complete block design. Initially the treatment of grazing was going to be evaluated but plants remained so small during 1979 that grazing was not initiated. These species were seeded and seeded and planted in 6m rows after an interseeder cut a furrow about 2.5 inches wide and 1.5 inches deep in the sod of the perennial rangeland. Seeding was done with a single row plot seeder with double disk openers and depth bands. Transplanting was done using cone container stock and rod the size of the cone container was used to make the hole for the transplant. Seeding and planting was done May 15, 1979 with transplants receiving about 1-1/2 quarts of water after transplanting. The remainder of May was dry but June and July has reasonable precipitation (table 1). Plants were observed through the summer with survival and seedling counts taken on September 20, 1979. Information gained so far is just initial survival or seedling establishment between the different species or hybrids (Table 2 and 3). When the seedlings (transplanted or seeded) get bigger, grazing may be initiated as well as soil water measurements to document any increased soil water occurring from snow trapped by the row of vegetation in the rangeland.

Table 1. Precipitation and temperature during 1979 growing season.

	Pptn. Inches	Temp. Mean Monthly °F
May	0.91*	48*
June	2.15**	63*
July	3.00**	69*
August	1.25**	65*
September	1.30**	

*U.S. Weather Bureau – Dickinson Experiment Station
**Recorded on site

Table 2. Results from seeding and transplanting Elci, Agel and Caragana.

Randomized Complete Block — Split Plot Analysis of Variance

Source	d.f.	F	P > F
Replications	1	2.78	.3440 ns
Treatments (planting or seeding)	1	476.69	.0291*
Species (Elci, Agel, Caragana)	2	16.63	.0115*
Treatments + Species		11.60	.0216*

Means for Treatment Averaged Across Species:

Treatment	Plants established or surviving/6 m row
Seeded	54 a[1/]
Planted	10 b

Means for Species Averaged Across Treatments:

Species	Plants established or surviving/6 m row
Caragana	67 a
Agel	26 b
Elci	4 b

[1/] means in columns with different letters are significantly different at P = .05 level according to Duncan's multiple range test.

Table 3. Percent Survival Results for All Species Transplanted (Elci, Agel, Caragana, Elan, Elgi, Elci x Elan, Elgi x Elan and [(Elci x Elan) x (Elgi x Elan)].

Randomized Complete Block — Analysis of Variance

Source	d.f.	F	P . F
Replication	1	1.54	.2553 ns
Species	7	5.13	.0233*
Errors (Rep + Spe)	7		
	15		

Means for species averaged across replications

Species	% survival
Caragana	83.5 a[1/]
Elan	82.5 a
Elcix Elan	79.5 a
Agel	70.0 ab
Elgi	62.0 ab
Elgi x Elan	53.5 ab
(Elci X Elan) X (Elgi x Elan)	37.5 bc
Elci	15.0 c

[1/] means in column with different letters are significantly different at P = .05 level according to Duncan's multiple range test.

Summary:

Data from the first year of this trial show seeding to have resulted in more plants/6 m row than transplanting. This would be expected as more seeds were placed in the ground than transplants. After this winter, survival of seedlings and transplants may be more similar. The interesting point was success obtained by direct seeding, especially for caragana.

Transplant survival percentages were generally good. Some of the plants were not in the best of shape when received in the mail form Logan and this can not be discounted as a factor. Caragana survival was highest followed by Elymus angustus. Poorest survival was observed for Elymus cinereus. Statistically significant difference are given in Table 3.

Growth of seeded and transplanted plants during the 1979 growing season was slow. A count after the winter of 1979-80 will be taken to further document plant survival.

Brome Grass Variety Evaluation

Smooth brome (Bromus inermis) is one of the most widely used introduced forage grasses used in North Dakota. Since its initial introduction from Hungary in 1884 many varietal selections have been made. To determine which of the varieties available to North Dakota stockmen are best suited to western North Dakota an evaluation trial was started in the spring of 1979.

Twelve varieties of smooth brome were seeded in 3 x 7.6 meter plots replicated four times. These varieties along with the seed source are as follows:

Varieties	Source
Lincoln	University of Nebraska
Lyon	University of Nebraska
Lancaster	University of Nebraska
Barton	Land O Lakes, Webster City, Iowa
Beacon	Land O Lakes, Webster City, Iowa
Baylor	North American Plant Breeders
Blair	North American Plant Breeders
Rebound	South Dakota State University
Manchar	Lincoln Oaks Nursery, Bismarck
Northern	Lincoln Oaks Nursery, Bismarck
Mandan 404	Northern Great Plains Research Center, Mandan
Fox	University of Minnesota

The plots were seeded with a small plot seeder developed at the ARS Research Station, Mandan, North Dakota. Problems in getting the seed to feed through the drill caused some skips in the plots.

A heavy cover of pigeon grass developed during the summer and plots were mowed several times in an attempt to reduce the competition.

Yield and quality evaluation will begin in 1980.

Summary of the Yields of the Cool Season Species Adaptation Trial for 1977, 1978, and 1979

				Fargo			**Dickinson**			**Hettinger**	
Entry number	**Common Name**	**Scientific Name**	**1977 lbs/acre**	**1978 lbs/acre**	**1979 lbs/acre**	**1977 lbs/acre**	**1978 lbs/acre**	**1979 lbs/acre**	**1977 lbs/acre**	**1978 lbs/acre**	**1979 lbs/acre**
1	Montana Wheatgrass	Agropyron albicans	2418	3621	-------	1180	1282	1220	1938	6137	-------
2	Fairway Wheatgrass	Agropyron cristatum	4468	4441	4623	1911	2212	2016	2288	5780	3071
3	Fairway Wheatgrass	Agropyron cristatum	4814	4838	5514	2154	1999	1885	2526	5960	3186
4	Thickspike Wheatgrass	Agropyron dasystachyum	3186	3964	------	1775	1826	1650	1962	6783	2124
5	Crested Wheatgrass	Agropyron desertorum	5352	5127	3701	2223	2307	1859	2220	6690	3582
6	Crested Wheatgrass	Agropyron desertorum	4624	4726	3619	2036	2666	1822	2363	6623	2876
7	Tall Wheatgrass	Agropyron elongatum	5100	6415	5322	1486	1488	1345	---------	5372	--------
8	Tall Wheatgrass	Agropyron elongatum	4950	6324	4390	1687	1190	1204	696	----------	---------
9	Tall Wheatgrass	Agropyron elongatum	3917	5253	--------	1632	2366	1891	---------	6080	2667
10	Tall Wheatgrass	Agronpyron elongatum	5243	6037	4882	1660	1285	1680	---------	------------	----------
11	Tall Wheatgrass	Agropyron elongatum	5633	5825	3729	1700	1386	1164	----------	-------------	----------
12	Beardless Wheatgrass	Agropyron inerme	--------	--------	---------	1411	1926	1559	----------	3443	----------
13	Intermediate Wheatgrass	Agropyron intermedium	4712	6670	4670	2270	2055	1998	2529	6336	3198
14	Intermediate Wheatgrass	Agropyron intermedium	4338	5682	3678	2428	2409	1880	2023	5799	2352
15	Intermediate Wheatgrass	Agropyron intermedium	4314	5568	4305	2533	2346	2102	2421	6329	2237
16	Intermediate Wheatgrass	Agropyron intermedium	5960	6489	4987	2880	2752	2328	2479	6217	2753
17	Intermediate Wheatgrass	Agropyron intermedium	3251	3502	5322	1517	1369	1394	1096	4781	--------
18	Stembank Wheatgrass	Agropyron riparium	3199	3434	2839	1040	1714	1424	2098	7070	2254
19	Siberian Wheatgrass	Agropyron sibiricum	2380	4021	2221	1703	1899	1593	2453	5931	1978
20	Western Wheatgrass	Agropyron smithii	4770	5375	4271	2043	2130	1981	1944	5304	2441
21	Western Wheatgrass	Agropyron smithii	4389	5321	5144	1947	2383	2187	1802	7822	2846
22	Western Wheatgrass	Agropyron Smithii	4325	5215	4594	1462	1825	1859	1652	6786	2746
23	Slender Wheatgrass	Agropyron Trachycaulum	4699	4973	4390	1714	1586	1503	1524	4560	---------
24	Slender Wheatgrass	Agropyron trachycaulum	3224	6003	4769	1788	1617	1497	1802	------------	----------
25	Pubescent Wheatgrass	Agropyron trichophorum	5250	5984	5272	2546	1904	2090	1641	7408	1639
26	Pubescent Wheatgrass	Agropyron trichophorum	4260	4293	--------	1795	2174	1763	1343	5205	2136
27	Pubescent Wheatgrass	Agropyron trichophorum	4339	5809	4362	2176	2106	1880	2074	6114	2215
28	Pubescent Wheatgrass	Agropyron trichophorum	2618	----------	----------	1074	1809	1431	---------	4159	2079
29	Pubescent Wheatgrass	Agropyron trichophorum	3307	4624	---------	1347	2587	1639	1088	4505	---------
30	Creeping Foxtail	Alopecurus arundinaceus	2424	3149	3543	1541	1748	1593	---------	4471	----------
31	Creeping Foxtail	Alopecurus arundinaceus	2448	---------	2288	969	1321	---------	---------	2975	----------
32	California Brome	Bromus carintus	2584	---------	----------	---------	------------	----------	----------	-------------	-----------
33	Smooth Brome	Bromus inermis	3410	5307	5305	2410	3106	2482	2207	7825	3170
34	Smooth Brome	Bromus inermis	4379	5772	4234	1717	1964	2355	2053	6905	3285
35	Smooth Brome	Bromus inermis	5042	6287	5068	1670	2174	2041	2115	7125	2955
36	Smooth Brome	Bromus inermis	3825	5205	4560	1649	3052	2391	2125	6976	2840
37	Smooth Brome	Bromus inermis	4060	5080	4577	1571	2327	2509	2346	7307	3349
38	Smooth Brome	Bromus inermis	4298	6305	5533	1510	2171	2192	2074	6713	3045
39	Smooth Brome	Bromus inermis	4128	5365	4691	1675	2069	1993	1839	5741	2852

				Fargo			**Dickinson**			**Hettinger**	
Entry number	**Common Name**	**Scientific Name**	**1977 lbs/acre**	**1978 lbs/acre**	**1979 lbs/acre**	**1977 lbs/acre**	**1978 lbs/acre**	**1979 lbs/acre**	**1977 lbs/acre**	**1978 lbs/acre**	**1979 lbs/acre**
40	Prairie Sandreed	Calamovifa longifolia	---------	----------	----------	1386	1120	1929	----------	-------------	----------
41	Orchardgrass	Dactylis glomerata	748	----------	-----------	----------	1363	1898	-----------	--------------	----------
42	Orchardgrass	Dactylis glomerata	---------	3553	-----------	850	1523	1713	-----------	2329	-----------
43	Orchardgrass	Dactylis glomerata	1598	----------	-----------	-----------	1302	1254	-----------	--------------	-----------
44	Orchardgrass	Dactylis glomerata	850	----------	----------	2244	1190	1446	-----------	--------------	------------
45	Orchardgrass	Dactylis glomerata	697	----------	----------	1700	1224	1582	----------	-------------	-----------
46	Orchardgrass	Dactylis glomerata	----------	4080	-----------	876	1443	2494	-----------	4752	-----------
47	Orchardgrass	Dactylis glomerata	2150	----------	-----------	----------	1161	17585	-----------	--------------	------------
48	Orchardgrass	Dactylis glomerata	-----------	----------	-----------	----------	1329	2012	-----------	--------------	------------
49	Orchardgrass	Dactylis glomerata	-----------	3740	4814	1479	1108	2622	-----------	--------------	------------
50	Orchardgrass	Dactylis glomerata	----------	----------	-----------	748	1152	1424	----------	--------------	------------
51	Altai Wildrye	Elymus agngutus	4573	----------	----------	1607	748	-----------	-----------	1683	------------
52	Canada Wildrye	Elymus canadensis	4406	6086	5102	2587	1476	1684	-----------	--------------	------------
53	Basin Wildrye	Elymus cinereus	----------	-----------	-----------	-----------	1233	-----------	-----------	1597	------------
54	Basin Wildrye	Elymus cinereus	-----------	-----------	-----------	1054	----------------	-----------	-----------	4044	------------
55	Mammoth Wildrye	Elymus giganteus	-----------	-----------	1441	1700	2074	-----------	-----------	--------------	------------
56	Blue Wildrye	Elymus glaucuc	----------	-----------	-----------	-----------	----------------	-----------	----------	--------------	-----------
57	Russian Wildrye	Elymus junceus	2516	4188	4581	1390	1258	1243	1952	2831	2301
58	Russian Wildrye	Elymus junceus	2958	4245	3475	999	1040	1114	1934	2482	2085
59	Russian Wildrye	Elymus junceus	2883	4016	3793	1152	1346	1175	1877	2942	1891
60	Beardless Wildrye	Elymus triticoides	----------	----------	----------	1938	----------------	1424	----------	--------------	-----------
61	Tall Fesue	Festuca arundinacea	-----------	----------	----------	714	1134	972	-----------	--------------	-----------
62	Tall Fescue	Festuca arundinacea	-----------	----------	----------	1088	1020	1266	-----------	--------------	-----------
63	Tall Fescue	Festuca arudinacea	1258	----------	----------	774	1304	1684	-----------	--------------	-----------
64	Tall Fescue	Festuca arundinacea	1972	----------	---------	952	1188	1519	-----------	--------------	-----------
65	Tall Fescue	Festuca arundinacea	----------	----------	----------	----------	986	1537	-----------	--------------	-----------
66	Meadow Fescue	Festuca elatior	-----------	-----------	----------	1216	1323	1522	-----------	--------------	------------
67	Meadow Fescue	Festuca elatior	-----------	----------	----------	570	1396	1605	-----------	--------------	------------
68	Sheep Fescue	Festuca ovina	-----------	----------	-----------	----------	2437	1514	-----------	--------------	------------
69	Hard Fescue	Festuca ovina var:durisucula	-----------	3341	3534	1568	2171	1469	-----------	6392	2983
70	Perenial Ryegrass	Lolium perenne	----------	----------	----------	1513	595	-----------	-----------	--------------	------------
71	Perennial Ryegrasss	Lolium perenne	2227	----------	-----------	-----------	----------------	-----------	-----------	--------------	------------
72	Perennial Ryegrass	Lolium perenne	----------	-----------	-----------	-----------	----------------	-----------	-----------	--------------	------------
73	Perennial Ryegrass	Lolium perenne	----------	-----------	-----------	-----------	----------------	-----------	-----------	--------------	------------
74	Indian Ricegrass	Oryzopsis hymenoides	-----------	----------	-----------	-----------	1054	-----------	-----------	--------------	------------
75	Reed Canarygrass	Phalaris arundinacea	935	---------	----------	----------	----------------	-----------	-----------	--------------	------------
76	Reed Canarygrass	Phalaris arudinacea	3870	5565	5944	1400	912	1593	-----------	--------------	------------
77	Reed Canarygrass	Phalaris arundinacea	3321	6987	4961	995	820	1379	-----------	--------------	-----------
78	Reed Canarygrass	Phalaris arundinacea	1802	5372	9170	1207	1547	2192	-----------	--------------	-----------
79	Reed Canarygrass	Phalaris arundinacea	3162	6392	4305	2414	1840	1446	----------	--------------	------------
80	Reed Caranrygrass	Phalaris arundinacea	3256	6653	5328	1488	1509	2170	-----------	--------------	------------

				Fargo			Dickinson			Hettinger	
Entry number	**Common Name**	**Scientific Name**	**1977 lbs/acre**	**1978 lbs/acre**	**1979 lbs/acre**	**1977 lbs/acre**	**1978 lbs/acre**	**1979 lbs/acre**	**1977 lbs/acre**	**1978 lbs/acre**	**1979 lbs/acre**
81	Reed Cararygrass	Phalaris arundinacea	2695	5937	5551	1615	1415	1763	-----------	--------------	------------
82	Timothy	Phleum pratense	----------	-----------	----------	1360	1428	-----------	-----------	--------------	------------
83	Timothy	Phleum pratense	1241	3892	-----------	1233	1471	2497	-----------	--------------	------------
84	Timothy	Phleum pratense	---------	----------	-----------	-----------	----------------	-----------	-----------	--------------	------------
85	Timothy	Phleum pratense	2559	5361	5144	1485	1602	2742	-----------	--------------	------------
86	Canby Bluegrass	Poa canbyi	-----------	-----------	-----------	867	1469	-----------	-----------	--------------	------------
87	Kentucky Bluegrass	Poa pratensis	1258	3001	-----------	1250	1135	1639	-----------	3488	------------
88	Alkali Sacaton	Sporubolus airoides	----------	-----------	-----------	-----------	----------------	-----------	-----------	--------------	------------
89	Green Needlegrass	Stipa viridula	----------	5007	-----------	935	1822	-----------	-----------	4828	------------
90	Green Needlegrass	Stipa viridula	2431	4902	3475	1832	1715	2226	1683	5501	------------
91	Mandan Ricegrass	Stipa viridula x Oryzopsis hymenoides (Stiporyzopisi caduca)	-----------	-----------	-----------	-----------	1613	-----------	-----------	3472	------------

Section VII

Summary of Information Related To
Acquisition Of The Kubik Polled Hereford Ranch

Station Expansion

By

Thomas J. Conlon

This is a summary report of activities over the past several years which have resulted in the purchase of the Kubik Polled Herford Ranch for the purpose of increasing and expanding the livestock research program of the Dickinson Branch Station.

The Dickinson station was established by the legislative assembly of 1905. The reasons for establishing an agricultural research station in southwestern North Dakota, as set forth in the enabling legislation of 1905 was for the purpose of: “making experiments with native grasses and other forage products as well as other agricultural products of the soil, with a view of improving and enlarging the supply of forage of said district and increasing the agricultural products thereof.”

The Dickinson Press on April 29, 1905 summarized some exceptions as follows: “One of the important epochs in the history of western North Dakota was the locating this week of the Dickinson Experiment Station. One of the principal objects of the Dickinson station will be to get forage plants adapted to this locality, meaning the entire country west of the Missouri river. Experiments will not be confined to grasses and grain crops alone, but will be extended to tree culture and finally to the feeding of stock.”

Plans to include research work with livestock were finally realized in 1945. The legislative bill creating the livestock addition stated : “ The agricultural experiment station, when enlarged, *** shall make experiments with livestock breeding, nutrition, management and diseases, and shall conduct such other agricultural research as may further contribute to the benefits of agricultural research as may further contribute to the benefits of agricultural and livestock production of western North Dakota and the State of North Dakota in addition to the experiments now conducted ***.

To accomplish this assignment the legislature of 1945 provided an appropriation to purchase a section of land upon which there was located an old farmstead which included several ancient wood frame buildings in varying stages of disrepair. Funds also were provided to buildings in varying stages of disrepair. Funds also were provided to build a scale house, corral and pole shed large enough for four small cattle pens. Thirty-six head of Hereford cows constituted the entire herd provided for livestock research. This was a start, but it was far form what was needed to develop an effective livestock research program.

The cattle herd had to be increased to provide sufficient numbers of animal to do the many kinds of work necessary in breeding, feeding, management and disease control.

Increasing the size of the cattle herd necessitated an increase in land to provide necessary pasture and hay as well as feed grain for feeding trials. At the time the livestock farm was added to the station a group of farmers, ranchers and businessmen donated an additional 100 acres. The total size of the station at that time was 880 acres. Over the years several parcels of that land have been sold to aid the development of the City of Dickinson. This included land for a refinery, a new high school , and new Dickinson State College stadium and right of way for Interstate 94. All funds from land sales have been used to purchase replacement land for added livestock research and these exchanges of higher valued land for city development, for lower valued farmland resulted in an appreciable increase in the size of the station. Except for the original purchase of the livestock farm in 1945, no appropriations from the State General Fund have been asked for or received for the purpose of land purchase at the Dickinson Branch Station.

Land acquisition at the Dickinson Station from 1905 through 1970 was follows:

1. Original site – SE1/4-32-140-96. According to the first annual report this quarter section of land was donated by citizens of Stark Country and the City of Dickinson, for purpose of creating an agricultural and grass experiment station.
2. The size of the station remained unchanged for 40 years, until 1945, when the legislature authorized establishment of the livestock farm, for the purpose of conducting experiments with livestock in the areas of feeding, breeding, management and disease. For this monumental job the legislature purchased Section 5-139-96, 640 acres less 20 acres in right of way for US Highway No. 10, a run-down farmstead and 36 cows.
3. In 1945, ranchers and businessmen headed by Ray Schnell SR., Paul Mann Sr., Ray Gress Sr., Harry Semerad and George Braun purchased and donated an additional 100 acres located in Section 4-139-96. Total land holdings at this time was 880 acres.

4. In 1952 approximately 70 acres from Section 5-139-96 was sold to Dickinson refinery interests. This parcel of land was that portion of the section south of U.S Highway 10. Total land holdings dropped to 810 acres.
5. In 1953 the NW1/4-32-140-96 and the SW ¼-29-140-96 was purchased with monies form the sale of land to the refinery plus station earnings. Total land holdings then amounted to 1130 acres.
6. In 1954 Ray Douglas and I effected a transfer of 600 acres of land in Billings County, Section 12-138-101, less the SW ¼ of the SW 1/4 , from the U.S. Government to the State of North Dakota for the exclusive use of the North Dakota Agricultural Experiment Station. This parcel, deep in the Badlands, is known as the Dickinson Experiment Station Summer Range. Total land then amounted to 1730 acres.
7. IN 1958 the SW ¼-32-140-96 was purchased with station earnings to bring the total land holdings to 1890 acres.
8. In 1963 construction of Interstate 94 transected the Station at two sperate points, cutting the Station into four segments, reaching our land area by 90 acres, for a total of 1800 acres.
9. In 1965, yielding to the pressure of city expansion, 39 acres of the parcel held in Section 4-139-96 was sold to the Dickinson Publix School District.
10. In 1967, legislative action transferred and additional 20 acres from Section 4-139-96 to Dickinson State College.
11. In 1969, and option taken on the South ½ of Section 23-140-97 was experienced, and in January, 1970 the option on the NE ¼ of Section 23-140-97 was exercised. Money for the purchase of these three quarters of land came from right-of-way payments for I-94, sale of land to the school district and transfer of land to Dickinson State College.
12. Total land holdings at this time was 2220 acres, only 620 acres of which was purchased by legislative appropriation.

During the years since 1945 a viable and productive research program with beef cattle and swine has been developed and maintained in the subject matter areas of livestock breeding, feeding, management and disease control, as directed by the legislation of 1945, However, research has been severely handicapped because of limited acreage and the consequent limitation in the number of animals that acreage would support.

North Dakota livestock producers have strongly supported the research program since its beginning, but have been critical of the limited numbers of livestock being used in trails. In September, 1973, at a meeting of the North Dakota Stockmen's Association Executive Committee, I discussed the livestock research program at the Dickinson station and limitations imposed by inadequate land holdings. The committee recommended that we continue attempts: to increase the size of the station; to increase the size of the brood cow herd; and, to give increased attention to cow-calf management.

In June, 1974, the 45th Annual Convention of the NDSA passed a resolution supporting substantial increases in funds for Livestock research at Dickinson and elsewhere in the State.

In November 1974, a report on a Cow-Calf Proposal was prepared for the Experiment Station and Extension Service Consultation Board.

This report was an answer to the questions raised in the April 20, 1974 meeting of the Consultation Board concerning the proposal for expanded cow-calf research made by the North Dakota Stockman. Th motion which prompted the report was as follows:

> "April 20, 8: a.m., the chairman reconvened the meeting. Discussion continued concerning the cow/calf proposal. It was moved by Mr. Guy, seconded by Mr. Kubik, the North Dakota State University make an analysis of the cost of acquisition, development, operation and expected results of the proposed cow/calf operation. Further, it was desired that the length of time to install and the estimated life of the experimental unit should be evaluated with the idea that such information could be used in application to the Board of Higher Education for by the stockmen to the North Dakota legislature or by the state of North Dakota for other sources of funding and that such study be made available by December 1, 1974. The motion was amended to suggest that NDSU determine the extent of benefits and the number of people affected as well as the number of herds affected and how the proposed cow-calf operation would relate to existing facilities and programs. The amended motion passed unanimously."

The committee submitting this report included Experiment Station and Extension personnel and several livestock association representatives. It uncluded:

M.L. Buchmann- Chairman, Department of Animal Science
Mel Kirkeide – Extension Animal Husbandman

Tom Conlon – Dickinson Experiment Station
Howard Olson – Carrington Experiment Station
Tom Shockman – President, Cattle Feeders Asso.
Delbert Moore – President, North Dakota Stockman's Assoc.
Jack Dahl – Immediate past president,
North Dakota Stockman's Assoc.
Clair Michels – Executive Secretary,
North Dakota Stockmen's Assoc.
Kyle Miller – Chairman, Agricultural Committee GNDA
Kenneth Ramsy – President, North Dakota Beef Councel
Laverne Linnell – County Extension Agent's Association

The committee recommendation was as follows:

"The committee recommends to the Administration of the North Dakota State University, the Experiment Station and Extension Service Consultation Board and the North Dakota Legislature that an additional location be provided for expanding grassland research and for studying forage utilization and management by cow-calf units in central North Dakota. It is further recommended that this additional location by under the direct supervision of the Animal Science Department at North Dakota State University.

The committee further recommends that additional land must be added to the Dickinson Experiment Station to permit them to expand their cow herd to approximately 300 cows, to expand their grass and forage research work under the conditions of lesser amounts of rainfall and year round grazing which can be practiced in the western short grass range area.

This recommendation is made with the understanding that this expansion is in addition to support of the present experiment station budget."

Very early in the 70's the City of Dickinson began to experience growing pains. City planners envisioned eventual annexation and development of the section of land originally purchased in 1945 for livestock research.

With the need and support for a larger livestock research unit, plus the growing pressure of city expansion in mind, we began to seek potential new locations.

In October, 1975 the Adolph Burkhardt ranch in Billings County was advertised for sale. Harold Goetz and I inspected the ranch site. Dean Arlon Hazen and the NDSS were informed of its availability, and possibility of purchase was favorably received by local farmers, ranchers and businessmen. However, complications relative to necessary legislative3 action. Since Burkhardt's had ready buyers, they decided to proceed with a sale to private interests.

In the fall of 1976 efforts to locate a suitable relocation site for livestock research were renewed, as described in the attached letters.

Box 55
Dickinson, North Dakota 58601

December 14, 1976

Dean Arlon G. Hazen, Director
Agricultural Experiment Station
North Dakota State University
Fargo, North Dakota 58102

Dear Dean Hazen,

A group of ranchers, farmers and businessmen from southwestern North Dakota had formed and ad hoc committee to:

1. Promote a needed expansion of the Dickinson Experiment Station.
2. Suggest a way to finance such expansion.
3. Provide for orderly development of the City of Dickinson.

The important features of this proposal are outlined here with, for your consideration.

I. To meet the needs of western North Dakota livestock producers the Dickinson station should be expanded to double its present size.

II. The station now holds some high value land adjacent to the City of Dickinson, the sale of which, if carefully and properly handled should provide enough funds for purchase of the required land for necessary expansion, plus sufficient funds for relocation of the livestock research farm facilities.

III. The problem that need to be solved, is to find a way to purchase a new site and re-locate the livestock research work<u>, before the present site is sold</u>. The present site is needed until facilities are available at a new location.

IV. It is proposed, that the State Legislature be requested to advance funds, or funds to be obtained from the Bank of North Dakota, for additional land and relocation of the physical plant for livestock research.

<u>Funds advanced are to be repaid from proceeds of sale of high value land, which is desired for orderly expansion of the City of Dickinson.</u>

Dean Arlon G. Hazen ,Director
December 13, 1976

It is extremely important that the sale of this land be carefully planned and carried out for the following reasons ;

1. To provide as much money as possible for expansion and relocation of livestock research farm facilities.
2. To provide for orderly development of the City of Dickinson.

It is suggested that the Board of Higher Education control the release of this land by the best possible means to assure maximum return to the experiment station.

<u>It is the opinion of this committee that the release of the entire acreage at one time is not advisable.</u> To do so would not be in the best interest of the Experiment Station because the maximum return for the land would not ne realized. Neither would it be in the best interest of planning and development for the City.

While we recognize that certain laws and rules have been established to provide for sale of stat owned lands we believe that this is a unique situation which may require modification of existing rules by the State Legislature.

V. This proposal is intended to be self- liquidating, as much as possible, and has the support of:
   1. The City of Dickinson
   2. Area farmer and ranchers
   3. The North Dakota Stockman's Association, as shown in convention resolutions each year since 1974.

VI. Present station acreage is 2248 acres. Selling 584 acres would leave 1664 acres which, added to approximately 3000 acres new land would total 4664 acres, making a unit capable of handling 300-350 brood cows. A livestock research farm of about this size, suitably equipped, is needed.

VII. Large acreages are not easy to find. The unit will probably have to be put together by purchase of several smaller lots, to add to land now held by the Station.

Briefly summarized the proposal it to:

1. Take options on up to 3000 acres of suitable land.
2. Purchase by legislative appropriation.
3. Offer for controlled sale over a 5 to 10 year period 584 acres of Dickinson Experiment Station land holdings.
4. Proceeds of sale of land to be used for relocation of the livestock research farm, and for repayment of funds advanced by the Legislature for land purchases.

VIII. Estimated potential returns from sale of 584 acres of high value land now held by the Dickinson Experiment Station are as follows:

1. Appraised value of 42 acres not within the City limits in Section 4-139-96 id $12000 per acre.
2. The remaining acreage in Section 5-139-96 is 542 acres. A smaller tract of privately owned comparable land has recently been sold for $3000 per acre. It has been estimated that controlled development as suggested could result in an average return of $5000.00 per acre. On this basis it is estimated that a minimum return from this land would be $2,130,000.00, with a possible return of over $3,000,000.00.
3. We emphasize that obtaining maximum return from sale of this land will depend on controlling its development.

IX. Estimated maximum cost of 3000 acres of replacement land is $1,500,000.00 based on a per acre cost of $500.00. It is possible that certain acreages may be acquired at less than $500.00 per acre. Based on these estimates, a minimum of $600,000.00 could be realized for relocation of physical facilities. More than double that amount is possible over the suggested development period.

X. The proposal has been discussed with local legislators, Rep. John Gengler, Rep. Wm. Lardy, and Senator Howard Freed. Senator Freed had agreed to introduce the necessary legislation.

The proposal has also been discussed with Governor Link, who indicated that he thought the proposal was an attractive one, and worth pursuing.

We are aware of your approval to purchase an option on land which fits into the proposal. As you have indicated, until we have options, it is nearly impossible to work out acceptable future plans. We certainly believe options are necessary, and urge you favorable consideration of additional options necessary for this proposal.

The committee members are listed for your information.

Mr. Fred Ehlers, Hettinger; Mr. Walter Gietzen, Glen Ullin; Mr. Frank Kubik, Jr., Manning; Mr. Con Short, Beach; Mr. Allen Rustan, New England; Mr. Maurice O'Connell, Dickinson; Mr. George Letvin, Dickinson; Mr. Kenneth Mann, Dickinson; Mr. Dave Price, Dickinson; Mr. Henry Schank, Mayor, City of Dickinson.

Sincerely,
Raymond J. Douglas
For the Committee

North Dakota State University
Of Agriculture and Applied Science
Fargo, North Dakota 58102

January 6, 1977

Agricultural Experiment Station
Office of Director

Area code 701
Telephone 227-7654

Dr. K.A. Gilles
Campus

Dear Dr. Gilles:

This communication is to provide a summary of actions taken to date relative to potential change of real estate holdings for use by the Dickinson Experiment Station. I recommend this information be supplies to the State Board of Higher Education as background for actions which the Board may take in the future.

Basically, there has been an effort made during the past several months to locate landowners who might be willing to sell land to the State of North Dakota for the purpose of relocating and expanding the headquarters for the livestock research program of the Station. The purpose of this effort is in contemplation of the expansion of the City of Dickinson and to avoid our being displaced with not place to go as well as to provide an acreage large enough to accommodate livestock trials with meaningful numbers of animals for statistically useful results. The proposal is to require and develop additional lands prior to disposing of some of our present holdings adjacent to the City of Dickinson. In order to have a commitment for which to work, the device of securing Options for Purchase has been utilized. The activity may ne considered as long-range planning.

The activity to this time has not been confined to personnel of the Main and Dickinson Stations. In addition to Superintendent Tom Colon and his associates at Dickinson, there has been a group of about 12 individuals from the City of Dickinson and from the surrounding area who have met in and ad hoc manner to assist in the planning, contracting, and negotiation of Options for Purchase. More recently the group has pursued plans to have specific legislation introduced into the 1977 Legislative Session to allow purchase of additional lands and to dispose, in time, of presently held land in an amount up to about 584 acres.

To date three Options for Purchase have been obtained. Two of these Options for Purchase are for a period ending in August, 1977, and the third ending in January,1978. There is a potential for one additional Option for Purchase, currently being pursued.

Dr. K.A. Gilles January 6, 1977

The optioned lands are adjacent and/or nearby our present holdings known as the Kaisershot land (480 acres) which is about four miles north and west of the present headquarters of the Dickinson Station.

The Options for Purchase are:

Mr. & Mrs. Albert J. Schmidt	960 acres @ $425/acre	$408,000
Mr. & Mrs. Vincent Marsh	480 acres @ $500/acre	240,000
Mr. & Mrs. Jacob Kainz	320 acres @ $500/acre	160,000
Total	1,760 acres	$808,000

Average option price per acre is $459.09.

It is my understanding the ad hoc group mentioned above is working with selected legislators to implement legislation which would authorize the State Board of Higher Education to utilize and appropriation from the General Fund to make the land purchases. The device of a nonprofit corporation would be provided in the legislation to handle the mechanics of the subsequent land sales of up to 584 acres of presently owned land as the development of the City of Dickinson take place. Membership in the corporation would include representation from the State Board of Higher Education as well as from Dickinson and the surrounding area.

Mr. Raymond J. Douglas, Agricultural Consultant, American State Bank, Dickinson, is one of the principal members of the hoc committee working on this activity. Senator Howard A. Freed, Dickinson, is the principal legislator interested in sponsoring the proposed legislation.

I am aware Mr. Hertz of our State Board of Higher Education is being kept advised relative to this activity by members of the ad hoc committee. To this time I have indicated the support of the office I represent in helping to fully explore the potentials of this proposed partial relocation and expansion of the program of the Dickinson Experiment Station. It is my hope and recommendation the administration of NDSU and the State Board of Higher Education will also be supportive of the concept which is outlined in this communication.

Sincerely,
Arlon G. Hazen
Director

AGH/b

Cc: Supt. Conlon
Mr. Douglas

As mentioned in Dean Hazen's letter, plans to have legislation introduced into the 1977 legislature were pursued, and senate bill number 2384 was introduced by Senators Freed, Maher, Krauter, Barth and Jacobson.

Forty-fifth

Legislative Assembly
Of North Dakota

Introduced by
Senators Freed, Maher,
Krauter, Barth, Jacobson

SENATE BILL No. 2384

Assigned To Committee On:			Aye	Nay
Senate				
House	Page			
Committee Report	S. J.	H. J.		
Senate ☐ Do pass ☐ IND Post ☐ Amend				
House ☐ Do pass ☐ IND Post ☐ Amend				
Legislative Action on Amendments				
Senate ☐ Adopted ☐ Not Adopted				
House ☐ Adopted ☐ Not Adopted				
2nd Reading and Final Passage				
Senate ☐ Pass ☐ Fail				
House ☐ Pass ☐ Fail				

A BILL for an Act to authorize the state board of higher Education to sell certain land presently used by the Dickinson Experiment station; to provide for the use of the proceeds of The sale of such land; to provide for the purchase of Replacement land for the use of the Dickinson experiment Station; to provide an appropriation; and to declare an Emergency.

BE IT ENACTED BY THE LEGISLATIVE ASSEMBLY OF THE STATE OF NORTH DAKOTA:

SECTION 1.) The state board of higher education is authorized to sell and convey the following property presently used by the Dickinson experiment station and comprising approximately five hundred eight-four acres:

1. The portion of land owned by the board in the northeast quarter of section five, township one hundred thirty-nine north, range ninety-six west.
2. That portion of land owned by the board in the southeast quarter of section five, township one hundred thirty-nine north, range ninety-six west.
3. That portion of land owned by the board in the west half of section four, township one hundred thirty-nine north, range ninety-six west.
4. That portion of land owned by the board in the southwest quarter, the south half of the northwest quarter, and lots three and four, all of section five, township on hundred thirty-nine north, range ninety-six west.

SECTION 2.) Notwithstanding section 54-01-05.2, the land described in section 1 shall be sold to nonprofit Corporation whose members shall be: one member of the state board of higher education or that member's designated representative; the director of the Dickinson experiment station or the director's designated Representative; one member or the Dickinson city commission; one member of the Dickinson school board; One member of the Dickinson planning and zoning commission; and six members appointed by the Dickinson city commission. The specific terms for the sale and conveyance of the land described in section 1 To the nonprofit corporation shall be determined by the state board of higher education and the nonprofit Corporation. The agreement my provide that payment by the nonprofit corporation for the land will be

Made from proceeds received as the land is sold by the nonprofit corporation. However, the agreement Shall provide that the nonprofit corporation shall not sell the land at less than the appraised value Of the land being sold at the time of sale and that all the land shall be sold and the proceeds paid to the State board of higher education within ten years after the sale of land to the nonprofit corporation. The Agreement shall also provide that the nonprofit corporation shall reserve nine and two-tenths acers Designated by the board for future use by Dickinson state college.

SECTION 3.) All payments received by the state board of higher education from the nonprofit corporation upon sale of land described in section 1 shall be deposited in the general fund of the state treasury.

SECTION 4.) The state board of higher education is authorized to purchase the following described land, comprising Approximately two thousand three hundred twenty acres, as replacement land for use by the Dickinson Experiment station:

1. The southeast quarter of section eleven, the northwest quarter of section thirteen, the north half of section fourteen, and the south half of section fifteen, all in township one hundred forty north, range ninety-seven west.
2. The south half of section twenty-two and the northeast of section twenty-seven, all in township one hundred forty north, range ninety-seven west.
3. The west half of section eight, township one hundred forty north, range ninety-six west.
4. The southwest quarter of section three, the east half of section ten, and the east half of the northeast quarter of section fifteen, all in township one hundred forty north, range ninety-seven west

SECTION 5.) APPROPRIATION.) There is hereby appropriated out of any moneys in the general fund in the state treasury, not otherwise appropriated, the sum of $1,500,000.00, or so much thereof as may be necessary , to the state board of higher education for the purpose of purchasing the land described in section 4 and constructing facilities on the land, all for the use of the Dickinson experiment station, for the biennium Beginning July 1, 1977, and ending June 30, 1979.

SECTION 6.) EMERGENCY.) This act is herebye declared to be an emergency measure and shall be in effect from and After its passage approval.

Senate bill 2384 travelled and unusual and often bumpy road. Introduced in the Senate it passed without a dissenting vote but was voted down in the house. A vote to reconsider was successful and upon reconsideration that bill passed in the House. It was signed into law by Governor Link. A drive to refer the bill to a vote or the people, by a group called Citizens for Rural Justice, was successful. The referendum was placed on the September, 1978 primary election ballot and was voted down, with the action of the legislature being upheld. The bill carried an emergency clause which, according to State law cannot be suspended by referral petition and remains law unless voted out by the people. The Board of Higher Education elected to wait until the results for the vote on the referral in the September 1978 election were known. IN the meantime, all options on the land to be purchased for expansion expired and the Board was unable to effect extension of the options. The defeat of the referral was a hollow victory for proponents of Senate bill 2384 since inaction by the Board which resulted in the loss of options killed the project as effectively as if the referral had been successful.

In September, 1978 I met with Dean Hazen, Dr. H.R. Lund and Dr. Ken Gilles to discuss recommendations for future action. As a result of this discussion, Dean Hazen directed the following letter dated September 28, 1978 to Dr. Gilles setting forth our recommendations to the Board of Higher Education.

North Dakota State University
Of Agriculture and Applied Science
Fargo, North Dakota 58102

September 28, 1978

Agriculture Experiment Station
Office of Director

Area code 701

Dr. K.A. Gilles
Campus

Dear Dt. Gilles:

It is requested that the next meeting of the State Board of Higher Education included an agenda item to consider the results of the September 5 vote on the Referred Measure No. 1, more specifically, Senate Bill No. 2384 enacted into law by the 1977 Legislature. This legislation authorizes the Board to sell certain land presently used by the Dickinson Experiment Station, and to purchase replacement land for use by Dickinson Experiment Station. A copy of this bill is attached to this letter.

It is my strong recommendation the Board refrain from taking any positive action to implement any of the parts of this legislation in the immediate future.

It is also my recommendation the Board consider very carefully an alternate procedure of consenting to and supporting legislation during the forthcoming 1979 Legislature which would either amend and reenact Senate Bill 2384 or have it repealed and different legislation enacted in its place.

If amendment or repeal and substitute legislation were to occur, I would suggest the sponsorship of such legislation originate with Dickinson area legislators, and that it be understood such legislation was with the support and consent of the State Board of Higher Education, providing the legislation includes:

1. Authorization to the Board for land purchases from an appropriation from the General Fund to cover the estimated cost of purchasing replacement and expansion land and facilities for the Dickinson livestock program.
2. Authorization for suitable replacement and expansion lands to be located and recommended for purchase by an appropriate committee responsible to the Board.
3. Authorization for the Board to develop and publicly announce a procedure to sell the current holdings approximating 584 acres as described in Senate Bill 2384. Such sale or sales to be distributed over a period of approximately 10 years from the time of purchase of replacement and expansion land, and for an amount comparable with or exceeding the professional appraised value at or near the time a sale is to be made.
4. The proceeds from the sales, less expenses. Be deposited in the General fund.

   The above recommendations are offered as a consequence of the experiences encountered to date in out efforts to meet the growing concerns about the proximity of out livestock unit to the City of Dickinson, and the need for additional land and facilities to improve our research program with livestock at the Dickinson location.

   The above recommendations also represent what I believe to be the major points of a consensus between you, Superintendent Tom Conlon, Associate Dean and Director Roald Lund, and me during our lengthy visit of September 27.

Some of the reasons for the recommendations being made are:

1. Senate Bill 2384 was subjected to controversy following its introduction and during its development. As a consequence, in the effort toward compromise the language of the bill as enacted leaves much to be desired by way of mechanics and authorization. At the outset the concept enumerated in the items listed above for

inclusion in amended or replacement legislation was proposed by those of us representing the viewpoint of the Agricultural Experiment Station. We still believe very strongly it is both unnecessary and very cumbersome to be required to initiate and utilize a loan from the Bank of North Dakota. This provision should not be included in future legislation.

2. There has been some criticism of the concept of a “nonprofit corporation” to handle the land sales. Undoubtedly the Board could devise a simpler and more acceptable way to handle this aspect of the legislation, such as a small land sale committee or a professional land development organization.
3. It is entirely possible more suitable lands for replacement and expansion could be located for purchase at a lower per acre price than those optioned and authorized for purchase in Senate Bill 2384 if it were known to the public in advance of the search that there were readily available funds to make the purchases and authority to conclude the purchases in a reasonably short period of time. In any case, a criticism against quiet negotiation for options in advance of authorization for purchase would be eliminated.
4. The language of Senate Bill 2384 indicated replacement facilities might be restricted to location on the replacement land only. This is contrary to the expectation and proposal that the major replacement facilities would actually be located on presently owned land, but would serve both presently owned land and the proposed replacement and expansion land.
5. The language of Senate Bill 2384 provides for reservation of 9.2 acres for future use by Dickinson State College. This land originally came from a private donation for the use and benefit of the livestock program of the Dickinson Station. While the Station has no objections to the provision for added acreage for Dickinson State College to meet its needs, it is reasonable and morally appropriate to insure that adequate funding for replacement land is available when such transactions take place. This is another supporting reason for use of General Fund money for purchase of replacement and expansion land.
6. Filing of petitions for referral of Senate Bill 2384 in July, 1977 caused the Board to decline to exercise any options for purchase of land until after the next general election in 1978. Efforts to extend all of the existing options were unsuccessful. The position of the Station was that unless all four parcels could be obtained, it would be unwise to invest in any of them. Therefore, to date no land purchases have been made and no options exist.

The supporting vote of September 5 on the referred measure does support the Legislature’s authorization for the Board to proceed with the implementation of the law. As a consequence, there are individuals who now believe the Board should move with dispatch to implement the provisions of the legislation. Superintendent Conlon and I agreed prior to the vote, and on at least two occasions since the vote, that it would be very unwise to renegotiate with the landowners of the four parcels of land authorized for purchase. There is no authority to purchase any other than the designated and legally described land. Toward this end, and in answer to a news reporter’s questions for public press release just prior to the election, I assured the people of North Dakota the question of land purchase under this legislation was moot due to the expiration of the options. This was my profound and sincere interpretation of events to that time, and is still my personal conviction and opinion. It is also my opinion that particular extensive, state-wide new release was a factor in causing many voters to sustain the legislation. My purpose in suggesting a “yes” vote was to uphold the integrity of our legislative process and the credibility of our State Board of Higher Education.

It is my understanding the vote in the Dickinson area was to defeat Senate Bill 2384, meaning disapproval of the legislation. It was elsewhere in the state that adequate “yes” votes were cast to sustain the legislation. It is my considered judgement we can utilize out energies to a much greater long-term advantage by making a sincere effort to accept the criticisms leveled against us and use them for guidance toward alternate or future legislation which would be more compatible with our basic objectives and aims. We must have substantial local support if a branch station is to be successful, and an unwarranted display of power could add to those who have not accepted the current legislation.

Sincerely,
Arlon G. Hazen
Director

AGH/b
Enc 1.
Cc: Supt. Conlon

In October, 1978 the Dickinson Station Advisory Board met to consider possible future action. After study of Dean Hazen's recommendations the Dickinson Experiment Station Advisory Board requested and received an audience with the Board of Higher Education in November, 1978. At this meeting the Board of Higher Education recommended that Dean Hazen's letter be used as a guideline for future legislation and, the impetus for future legislation originate with Dickinson area legislators.

As a result of the meeting with the Board of Higher Education the Dickinson Experiment Station Advisory Board recommended a meeting with area legislators, which was scheduled as outlined in the following letter.

North Dakota State University
Of Agriculture and Applied Science
North Dakota Agricultural Experiment Station

November 17, 1978

Dickinson Experiment Station
Dickinson, North Dakota
58601

To: All Legislators in Districts 33, 35, 36, 38 and 39.

Gentlemen:

The Dickinson Experiment Station Advisory Board had scheduled a meeting on Monday, November 27 at 2:30P.M. at the Ramada Inn, in Dickinson, for the purpose of discussing a proposal relating to Senate Bill 2384 which was passed at the last session.

You are cordially invited to this meeting to hear the proposal and to offer comments and suggestions on it.

If you cannot attend, we will forward a copy of the proceedings to you.

Sincerely,

Thomas J. Conlon, Supt.
Dickinson Experiment Station
For the Advisory Board
Mr. Fred G. Ehlers, Hettinger
Mr. Frank Kubik, Jr., Manning
Mr. Walter Gietzen, Glen Ullin
Mr. Con Short, Beach
Mr. Albert Sickler, Gladstone
Mr. Allan Rustan, Dickinson
Mr. Henry Zahn, Jr., New England

TJX:jo

The meeting of November 27 prompted a second meeting of area legislators and others on December 21, as outlined in the following letter of December 13th. At this meeting a proposed amendment to Senate bill 2384 was presented. Area legislators suggested it be introduced by three senators and three representatives from western and central North Dakota. Senator Jack Olin, Dickinson, District 37 agreed to carry the bill through the legislative process. Mr. Olin took the proposed amendment and all suggested additions and changes to the Legislative Counsel where a final draft was prepared as Senate bill 2327. This bill was sponsored by Senators Jack Olin- Dickinson- 37th District; Adam Krauter, Regent, 38th District; Garvin Jacobsen, Alexander, 36th District; and, Representatives Kenneth Thompson, Beach, 39th District; Ralph Christensen, Watford City, 36th District and Jack Murphy, Killdeer, 36th District.

North Dakota State University
Of Agricultural and Applied Science
North Dakota Agricultural Experiment Station

December 13, 1978

Dickinson Experiment Station
Dickinson North Dakota
58601

To: All members – Dickinson Station Advisory Board
Mr. Milton Hertz
Mr. Clair Michels

Gentlemen:

The meeting requested by the legislators on November 27, has been set for Thursday, December 21, from 1:30 P.M. ti 4:30 P.M. at the MDU Hospitality Room – downtown Dickinson.

I am prepared to present the position paper justifying the need for expansion of livestock research in western North Dakota.

In consultation with Albert, Howard Freed and Jack Olin I am also preparing a first draft of amendments to Senate Bill 2384, which I hope to be able to send to you by the end of this week.

Sincerely,
Thomas J. Conlon, Supt.
Dickinson Experiment Station

TJC: jo

Forty-sixth
Legislative Assembly
Of North Dakota

Reengrossed Senate Bill No. 2327

Aye

Introduced by

Senators Olin,
Jacobson, Krauter

Representatives
Christensin, Murphy,
Thompson

Assigned To Committee on: Senate House	Page		
Committee Report Senate: ☐ Do pass ☐ IND Post ☐ Amend House: ☐ Do pass ☐ Do Not Pass ☐ Amend	S.J.	H.J.	
Legislative Action on Amendments Senate: ☐ Adopted ☐ Not Adopted House: ☐ Adopted ☐ Not Adopted			
2nd Reading and Final Passage Senate: ☐ Pass ☐ Fail House: ☐ Pass ☐ Fail			

A Bill for an Act to require the state board of higher Education to purchase a working ranch unit for the Dickinson Experiment station; to create a committee to select the working Ranch unit; to authorize the state board of higher education to Sell certain land presently used by the Dickinson experiment Station; to authorize the board of university and school lands To invest permanent funds of the common schools in the working Ranch unity; to provide an appropriation; and to declare an Emergency

BE IT ENACTED BY THE LEGISLATIVE ASSEMBLY OF THE STATE OF NORTH DAKOTA:

Section 1.) The state of higher education, in Order to adequately fulfill those research needs which cannot Be accomplished at any presently existing or planned Experimental facility and to establish an improved Dickinson Livestock experiment facility, shall purchase a working ranch Unit in southwestern North Dakota, withing a thirty-mile radius Of the Dickinson experiment station headquarters, capable of Supporting a three-hundred unit cow-calf ranching operation. The unit shall consist of at least three thousand acres but not More than three thousand five hundred acres, with at least Fifty percent of the acreage to be western short grass native rangeland.

The unit shall include suitable physical facilities For the improved operation of the Dickinson experimental Livestock research program.

Section 2) A committee is created, composed of the Following membership:

1. The vice president for agriculture at North Dakota State University.
2. The director of the main experiment station.
3. The chairman of the department of botany at North Dakota State University.
4. The chairman of the department of animal science at North Dakota Stare University.
5. The superintendent of the Dickinson branch of the North Dakota agricultural experiment station.
6. The chairman of the state board of higher education, Or a board member designated by the chairman.
7. A bona fide operating livestock producer chosen by The board of directors of each of the following Associations:
   A. The North Dakota stockman’s association.
   B. The North Dakota Hereford association.
   C. The North Dakota polled Hereford association.
   D. The North Dakota angus association.
   E. The North Dakota shorthorn and polled shorthorn Association.
   F. The North Dakota Charolais association
   G. The North Dakota simmental association.
   H. The North Dakota pork producers.
   I. The North Dakota dairy producers association.
   J. The North Dakota livestock feeders association.

The representative of the state board of higher education is Chairman of the committee and shall call an organizational Meeting of the committee as soon as practicable following the Effective date of this Act. The chairman is responsible for Electing the committee in accomplishing the purpose of this Act.

The committee shall perform such acts as are reasonable And necessary in locating and selecting the working ranch unit Described in section 1. The committee is responsible to and Shall report its findings to the state board of higher Education. Committee members shall be paid for expenses Incurred in attending committee meeting and in the performance Of their official duties in the amounts provided by law for Other state officers.

Section 3.) The state board of higher education shall Purchase the working ranch unit described in section 1 upon Selection of the unit by the committee.

Section 4.) The board of university and school lands may Invest an amount to exceed two million two hundred sixty-Five thousand dollars from the permanent fund of the common Schools as a loan to the board of higher education for the Section 1 unit purchases, section 2 committee implantation, And section 6 land sale. The board of higher education is Authorized to borrow from the board of university and school Lands the sum of two million two hundred sixty-five thousand Dollars, or so much thereof as may be necessary, for the Purpose of the section 1 unity purchase, section 2 committee Implementation, and section 6 land sale. The loan from the Board of university and school lands shall be for a term not to Exceed ten years, but the amount of the loan, interest rate, And method of repayment are to be negotiated by the board of University and school lands and the board of higher education. The board of higher education is authorized to grant a security Interest to the permanent fund of the common schools in the Property to be acquired. The members of the state board of Higher education shall not be held personally liable for Repayment of any loan obtained under this section, and the Board shall be liable for repayment only in the manner provided Pursuant to this section.

Section 5.) Upon full transfer of the Dickinson Experimental livestock research program to the working ranch unit the state board of higher education shall transfer custody and control of that portion of land owned by the board in the west half if section four, township one hundred thirty-nine north, range ninety-six west, comprising approximately forty-two acres, to the use of Dickinson state college. The full appraised value of the land transferred to the use of Dickinson state college shall be reflected in the purchase of The working ranch unit under Section 1.

Section 6.) Upon full transfer of the Dickinson Experimental livestock research program to the working ranch Unit, the state board of higher education shall sell the Following property used by the Dickinson experiment station and Comprising approximately five hundred forty-four acres:

1. That portion of land owned by the board in th Northeast quarter of section five, township one Hundred thirty-nine north, range ninety-six west.
2. That portion of land owned by the board in the Southwest quarter of section five, township one Hundred thirty-nine north, range ninety-sic west.
3. That portion of land owned by the board in the Southwest quarter, the south half of the northwest Quarter, and lots three and four, all of section Five, township on hundred thirty-none north, range Ninety-six west.

The land shall be conveyed for the terms and under the Conditions necessary to obtain the best possible return to the State of North Dakota in accordance with section 54-01-05.2. The state board of higher education my not convey any land Described in this section for agricultural purpose. Notwithstanding other provisions of state law and local Ordinances, the board, after consultation with the Dickinson Planning and zoning commission and Stark County planning and Zoning commission may subdivide the land, and dedicate Streets, alleys, and other lands for public use, install water, Curbs, gutters, other utilities, and streets for the purpose of achieving the best possible return to the state of North Dakota.

Section 7.) Any rents or profits or proceeds from the Sale or other disposition of the property described in section 6 shall be used to make principal and interest payments on such Amounts as may be borrowed by the board of higher education Pursuant to section 4. Upon payment of the total principal and Interest on moneys borrowed by the board, any additional rents, Profits, or proceeds as may be received shall be deposited in The general fund in the sate treasury.

Section 8. Appropriation.) There is hereby appropriated The loan proceeds from any loan under section 4 to the state Board of higher education for the following purposes:

Section 1 unit purchase	$1,750,000
Section 2 committee implantation	15,000
Section 5 land sale	500,000
Total loan proceeds	$2,265,000

Section 54-44-1-11 does not apply to the funds appropriated by This section

Section 9. Emergency.) This Act is hereby declared to be an emergency measure and shall be in effect from and after its passage and approval.

After numerous hearings in both Senate and House the bill was passed by both, and was signed into law by Governor Link.

The committee called for in Section 2 of the bill, for the purpose of locating and selecting a ranch unit, was formed and met for the first time at Dickinson on July 19th, for an organizational meeting. The Selection Committee membership included:

Mr. Milton Hertz, Chairman, Mott – Board of Higher Education
Dr. Kenneth Gilles, NDSU – V.P. for Agriculture, NDSU
Dr. H.R. Lund, NDSU – Director, Agr. Experiment Station, NDSU
Dr. Harold Goetz, NDSU – Chairman, Botany Dept., NDSU
Mr. Clayton Haugse, NDSU – Chairman, An. Science Dept., NDSU
Mr. Raymond Schnell, Dickinson – N.D. Stockmen's Assn.
Mr. Robert Roen, Bowman, - N.D. Hereford Assn.
Mr. Leonard Kostelnak, Killdeer – N.D. Polled Hereford Assn.
Mr. Vern Stevick, Des Lacs – N.D. Angus Assn.
Mr. Eugene Kastner, Glen Ullin – N.D. Shorthorn & Polled Short-horn Assn.
Mr. Ray Reich, Hebron – N.D. Charolais Assn.
Mr. Jake Larson, Almont – N.D. Simmental Assn.
Mr. Albert Brueske, Wimbledon – N. D. Livestock Feeders Assn.
Mr. Art Ridl, Dickinson – N.D. Milk Producers Assn.
Mr. Stanley Heidecker, Taylor – N.D. Dairymen's Assn.
Mr. Walter Gietzen, Glen Ullin – N.D. Pork Producers & Dickinson Experiment Station Advisory Committee
Mr. Tom Conlon, Dickinson – Dickinson Experiment Station

In addition to the Selection Committee, members of the Dickinson Experiment Station Advisory Committee also in attendance were:

Mr. Fred Ehlers, Hettinger
Mr. Albert Sickler, Gladstone
Mr. Allan Rustan, Dickinson
Mr. Henry Zahn, Jr., New England
Mr. Con Short, Medora-Beach
Mr. Frank Kubik, Jr., Manning

The committee directed that advertisement for offers of a suitable ranch site meeting the specifications set forth in the enacted legislation be published throughout the month of August. A second meeting to consider all offers was scheduled for September 5th, 1979.

At the meeting of September 5, two offers were received and considered.

The offer from Mr. Steven Marsh did not meet the required specifications. The offer from Mr. Frank Kubik, Jr., as described in the following proposal, was heard by the committee. The committee approved the proposal, was heard by the committee. The committee approved the proposal unanimously and recommended purchase of the Kubik Polled Hereford Ranch as provided for in Senate Bill 2327.

Final payment for the Kunik Polled Hereford Ranch was made early in January 1980, with the following provisions set forth in the lease agreement made necessary to provide Kubik's the time and facilities to disperse their cattle herd and sell equipment.

Offer of Sale

To: Dickinson Experiment Station
Selection Committee

From: Kubik Polled Hereford Ranch,
A limited partnership

To: Dickinson Experiment Station Selection Committee

In response to your publications inviting offers of a ranch unit for sale, the Kubik Polled Hereford Ranch, a limited partnership, of Manning, North Dakota, herewith submits for your consideration their working ranch unit.

The Kubik Polled Hereford Ranch is located north of Dickinson, North Dakota, in Dunn County, the number one beef cattle county in North Dakota. The ranch is easily accessible on a year round basis by North Dakota Highway No. 22 and a high grade gravel road completed in 1977.

The ranch is capable of supporting a 300 unit cow-calf ranching operation. The Kubiks since 1942 have owned and operated this unit in developing their registered polled Hereford herd of 300 cows.

The ranch is well kept and maintained ranch with an attractive headquarters site protected by eight shelter belts.

As is more fully set forth in the following pages, the Kubicks herewith submit their offer of sale of a working ranch unit.

The offer herewith submitted shall be open and irrevocable until the 30th day of November, 1979, at which time, if not accepted by the date, it shall be in all respects withdrawn.

Dated at Dickinson, North Dakota, this 22ns day of August, 1979.

Kubik Polled Hereford Ranch,
A limited partnership

Frank Kubik, Jr., General Partner

Legal Description

Township 143, Range 96, Dunn County, North Dakota

Section 24:	NE1/4	160 acres
Section 23:	SW1/4	160 acres
Section 22:	S1/2 and NW1/4	480 acres
Section 21:	A11	640 acres
Section 16:	A11	640 acres
Section 28:	N1/2 and SW1/4	480 acres
Section 19:	A11	640 acres
Section 18:	NE1/4 NE1/4	40 acres
Section 20:	19 acres in SE1/4 SE1/4	19 acres
		3,259 acres, more or less

Current and past useages of the above land:

(a) 481.1 acres of cropland;
(b) 335.4 acres of alfalfa and tame grass hayland;
(c) 2,442.5 native rangeland.

The ranch has been self-sufficient from the standpoint of providing all the necessary feed for the 300 cow herd owned by the Kubiks.

Physical Facilities And Equipment

A. Range and Pasture
   1. Forty miles of 3, 4 and 5 barb wire fence enclosing 10 larger pastures and 13 smaller pastures.
   2. Three pasture corrals and working pens and chutes.
   3. Fourteen dugouts, 5 springs, 9 wells serving pastures, equipped with 2 x 10 stock tanks on concrete slabs and wired for automatic operation and 1 pasture well equipped with windmill.
   4. Cattle back rubbers are installed in each pasture and pens.

B. Ranch Headquarters
   1. Well kept and attractive headquarters site protected by 8 shelter belts.
   2. Three homes now occupied by the Kubiks, all modern, one approximately 2,000 square feet, on approximately 1,675 square feet and the third home a 14x70 mobile home.
   3. Corrals, working pens, chutes and loading chute at headquarters, 21 pens with 2,800 feet of bunkline feeders and 2800 feet fence line hay feeders, 650 feet of additional fence line hay feeder.
   4. Five wells at ranch headquarters complete with concrete pits and automatic controls.
   5. Fourteen automatic cattle water fountains installed on concrete slabs.
   6. Two trench silos.
   7. Two landfill garbage disposal pits.
   8. 40x50 threes-story grainery, including a grinder-mixer, grain auger, spouts and tractor set up for handling and moving of feed and grain.
   9. 40x100 all steel (Curvet) building with a concrete floor, 40,000 bushel capacity.
   10. One Quonset 40x80, wood frame with steel cover.
   11. One 38x80 all steel Quonset.
   12. Four pole barns, 20x60, steel covered.
   13. One 20x150 steel covered pole barn.
   14. Five 10x12 steel covered pole sheds used for bull shelters.
   15. Four steel covered calf shelters on skids.
   16. One calf tilting chute.
   17. One two-way radio tower, 170 feet in height. In addition to owner's use of the tower, Motorola Corporation rents antenna space and is paying to the Kubiks at the present time the sum of $210.00 per month for rental of such space.
       a. Five two-way radio units, business band, private, will easily reach Dickinson and neighboring towns.
   18. 60x90 Butler multi-purpose building containing:
       a. Sales arena, amphitheater with a seating capacity for 400, which seating may be expanded, auction booth, inside pens, working chutes, Fairbanks scale and tilting chute, electrically operated.
       b. Farm shop, along with benches and shelving.
       c. Office space.
       d. The building is completely insulated, electrically heated and is completely wired. Two telephone outlets are available.
       e. Two toilets.

C. Farm Equipment
   1. 1974 John Deere 200 Hay Wagon, 3 ton.
   2. 1972 4020 John Deere Tractor and Loader, 95 horse.
   3. 1968 95 John Deere combine, hydrostatic drive, and chaff saver, with cab and cooler.
   4. 1970 Gehl Feeder Box.
   5. 1967 Case Chisel Plow.
   6. 1969 Oliver Disc.
   7. 1976 McCormick Deering Vibra Shank.
   8. 1968 John Deere Drill and Transport.
   9. 1971 Fertilizer Loader.
   10. 1972 Melroe Drag.
   11. 1971 New Holland Swather.
   12. 1970 Oliver Tractor, 95 horse, cab and cooler with three point hitch.
   13. 1972 Hoff Silage Wagon.
   14. 1969 Six bottom Oliver Plow.
   15. 1968 Cheverolet 1 ½ ton truck, with box and hoist.
   16. 1967 Silage Chopper – Gehl, two row.
   17. 1974 40 foot Grain Auger, 7 inch diameter, motor and power take-off.

18. 1975 Dozer blade for Oliver Tractor.
19. 1976 six row corn cultivator.
20. Ten horse McCormick Deering, hydrostatic drive, garden tractor with mower, roto tiller, and power take-off attachments.
21. 1976 John Deere Rake – 7 wheel.
22. Three point hitch Allis Chalmers tree disc.
23. 1975 snow blower – Lundell.
24. Two 500 gallon gas tanks with electric pumps.
25. Cattle sprayer with motor.

All of the above itemized equipment is in good working condition at the present time. At the time of delivery of possession the owner's supply of machinery repairs on hand at the time of the transfer which is quite extensive will be transferred with the machinery at no charge to the purchaser.

Sales Price

1.	Buildings, improvements, fixed facilities	$874,598.80
2.	Miscellaneous equipment and farm machinery	$97,400.00
3.	Real estate: 816.5 acres crop, alfalfa and tame Grass and hayland at $300.00 per acre and 2,442.5 Acres of rangeland at $218.24 per acre (Average price less value of registered Kubik Polled Hereford Ranch Polled Herefords)	$778,001.20
	Total	$1,750,000.00

Terms of Payment

1. The sum of $208,700.00 payable on or before the 3rd day of December, 1979;
2. The balance of the purchase price of $1,541,300.00 payable on the 2nd of January, 1980.

Abstracts, Warranty Deed and Title

Kubik Polled Hereford Ranch, a limited partnership, will convey the premises by Warranty Deed, free and clear of all liens, mortgages, encumbrances and reservations of record, except:

1. Mineral reservation as described elsewhere in this offer;
2. Public utility easements and road easements now of record;
3. Coal, oil and gas leases now or hereafter placed of record prior to the date of delivery of possession.

Kubiks will also provide up-to-date abstracts of title to the described property evidencing marketable title to the same Kubik Polled Hereford Ranch, a limited partnership. In the event that any defects in the title do appear, upon the Board of Higher Education making said defects known to Kubiks, the same will be cured or perfected within ninety (90) days. In the event such defects cannot be cured within ninety (90) days, then and in that event, at the election or option of the Board of Higher Education, this agreement may be cancelled and all sums paid prior thereto by the Board of Higher Education to Kubiks shall be refunded.

In the event that an agreement is entered into between Kubik Polled Hereford Ranch and the Board of Higher Education, any formalized agreement must provide that the contract may not be assigned by the Board of Higher Education or the State of North Dakota, as the case may be, to any private individual, firm corporation without the express written consent of Kubik Polled Hereford Ranch.

Real estate taxes for the year 1979 and all prior years' real estate taxes will be paid by Kubiks. Real estate taxes for the year 1980, if any, shall be paid by Dickinson Experiment Station or the State of North Dakota, as the case may be.

Minerals

No minerals will be included as the offeror, Kubik Polled Hereford Ranch, will retain and reserve from the sale of the real estate all minerals of every kind and nature, including but not limited to all oil, gas, uranium, coal, sand, gravel, clay, lightweight aggregates, volcanic ash, zeolites, lime, limestone and cement rock, stone, salt and potash, sodium sulfate, other minerals together with their compounds and by-products in an under and that may be produced from said lands. It is the express intention of the parties hereto the Kubik Polled Hereford Ranch is reserving all minerals of every kind and nature whether now known or unknown now owned by the Ranch notwithstanding the purported provisions of Section 47-10-25 of the North Dakota Century Code.

The owner's oil, gas and coal are presently leased. Copies of the leases will be provided upon request.

Kubiks own less than fifty percent (50%) of the minerals under the offered property. Other owners of minerals in and under the property are believed to be:

1. State of North Dakota;
2. Federal Land Bank;
3. United States of America; and
4. Burlington Northern Railroad.

Delivery of Possession and Risk of Loss

Kubiks will deliver procession of all the property set forth in this offer on the 2nd day of January, 1980, subject, however, to the minimum essential retained use and occupation of the premises by Kubiks in order to conduct an orderly dispersion sale of their herd and auction sale of the remaining farm machinery. For this reason, the following reserved uses and occupation of certain buildings is required:

a. Use and occupation of the 2,000 square foot main house until November 1, 1980;
b. Use and occupation of the 14 x 70 mobile home until November 1, 1980;
c. Use and occupation of the 1,675 square foot home until May 1, 1980, and from and after that date will be available to purchaser upon request.
d. Joint use with the purchaser of the corrals, chutes, barns as may ne necessary for the Kubiks to winter their cattle herd through the 1979-1980 winter and use of the sales barn to conduct their annual sale in February and a dispersion sale in the fall of 1980.
e. Use of the pasture for the summer of 1980, with said pastures to be delivered on the 15th day of October, 1980, to the purchasers. In addition to the Kubik cattle on the pastures, the Kubiks will maintain and breed the 20 cows and bull to be donated to the Dickinson Experiment Station, as more fully set forth herein, upon the same pastures.

With the exception of the itemized reservations set forth above, Kubiks will deliver possession of all property on the 2nd day of January, 1980. Until delivery of possession, the risk of loss of damage to the property by fire or other casualty shall be on the Kubiks. If any loss or damage occurs during such period to any improvement for fixtures to be included in the sale, Kubiks may at their option repair or replace the destroyed or damage property. In the absence of such repair or replacement, the purchase price as otherwise described herein shall be reduced by the amount which is equivalent to the value of the property destroyed or damaged.

Kubiks shall during the period of their occupation and use of the premises be responsible for the maintain all fences, wells, corrals in their present condition, ordinary wear and tear excepted.

Purchaser, the Dickinson Experiment Station, may prior to actual date of delivery of possession begin tilling and storing, maintaining and moving their property upon the premises.

Feed, Hay and Hayland

Any crops, hay or feed raised upon the premises in the year 1980 and thereafter shall be the property of the Dickinson Experiment Station.

Any feed, hay, stray or silage carry over from the year 1979 not used by the Kubiks for feeding and caring of their own stock will be offered for sale to the Dickinson Experiment Station at its then market value.

Donation to Dickinson Experiment Station

In hopes of the continued development of the Havre Line 1 King Domino Polled Hereford Line, in the event this offer is accepted and Kubiks disperse their cow herd, the Kubiks intend to donate 20 females and one of their top producing bulls to the Dickinson Experiment Station. The 20 females and one herd bull of the Havre Line 1 King Domino line were started at the Montana Experiment Station, Havre, Montana, in 1948, and since that time have been kept as closed line. The Havre Line 1 King Domino cattle have complete records which have been kept since 1948 as to birth, weaning and yearly weight, and also have been carcass evaluated. The cattle are genetically sound and are in strong demand. It is the hopes of the Kubiks to see this work continued so that the surplus cattle raised by the Dickinson Experiment Station may be sold to the public for breeding seed stock.

The donation, however, will be conditioned upon the Dickinson Experiment Station agreeing to comply with the following:

1. The original cows and herd bull will not be sold for at least ten (10) years, except if required due to age, sickness, physical impairment or sterility without the consent of Frank Kubik, Jr.
2. The cows shall not be used for cross breeding and shall be continued as a closed line for a period of tn (10) years.
3. The cows and bull are being donated in order to make available to the public the seed stock from this line and, therefore, any offspring not reatained for expansion purposes by the Dickinson Experiment Station shall be made available for sale to the general public.

Based on recent sales at the ranch for comparable animals, the conservative fair market value of the 20 cows and herd bull to be donated is $85,000.00.