TIME OF FEEDING AND ITS EFFECTS ON
TIME OF CALVING – A PRACTICAL APPROACH

D.G. Landblom and J.L. Nelson

Calving time is probably the most intense period in the livestock production year. Following its discovery by a Canadian cattleman, research conducted by Agriculture Canada at Brandon, Manitoba resulted in a significant increase in daytime calvings when cows were fed at either 11 A.M. or 9 P.M. Conversely, a negative response was obtained from 8 A.M. and 3 P.M. feedings. Several factors were measured. However, the only one having any significant effect on daytime calvings was the calves sire.

To evaluate time of calving from a practical standpoint, feeding times of 8 A.M. and 5 P.M. were selected. The experiment was started during the winter of 1981-82, when straightbred Hereford and crossbred Angus X Hereford cows ranging in age from 2-10 years were separated into two groups and fed complete mixed wintering rations. Ration composition in Group I (8 A.M.) consisted of Sudan silage, alfalfa hay, wheat straw and minerals, whereas Group II received Sudan silage, alfalfa hay, corn grain and minerals.

During the winter of 1982-83, 2-year old heifers and cows of all ages were again randomized into two groups each and fed long hay rations at the predetermined times of 8 A.M. and 5 P.M. Feeding at the experimental times was started two weeks before calving each year.

Parameters being evaluated include age of cow, calf sire, sex and birth weight of calf.

Heifers and cows were wintered separately and the percentage of calvings and distribution relative to time are shown in Figures 1 and 2.

Summary:

1. A total of 263 Hereford and Angus X Hereford crossbred cows and 147 first calf heifers of the same breed composition have been used to compare the effect of morning (8 A.M.) versus late afternoon (5 P.M.) feeding on times of calving.

2. Late afternoon feeding has developed a favorable shift in the distribution of calving times. Favorable calving hours were identified as falling between 6 A.M and 8 P.M. Late afternoon feeding of first calf heifers resulted in 12.7% more calvings during the desirable calving period, and shifted 14% of the cows into the desirable time frame.

3. No differences were measured when the effects of cow age, sex, birth weight and sire of calf were analyzed.

4. Data accumulated to date strongly favors the practice of late afternoon feeding (5 P.M.) to increase the number of calvings during the desirable hours.

Insert Figures 1 & 2.

Insert Figures 3 & 4.

Figure 1. Calving percentage for cows fed at 8:00 A.M.

57.3% calved between 6 A.M. & 8 P.M.
42.7% calved between 8 P.M. & 6 A.M.

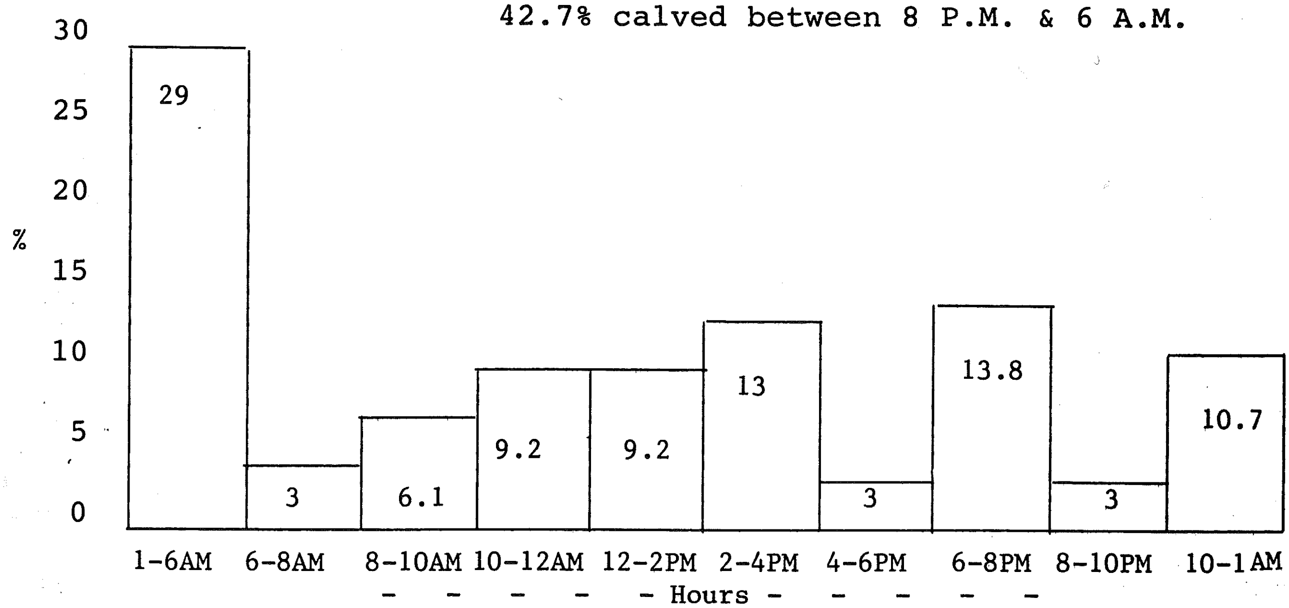


Figure 2. Calving percentage for cows fed at 5:00 P.M.

71.3% calved between 6 A.M. & 8 P.M.
28.7% calved between 8 P.M. & 6 A.M.

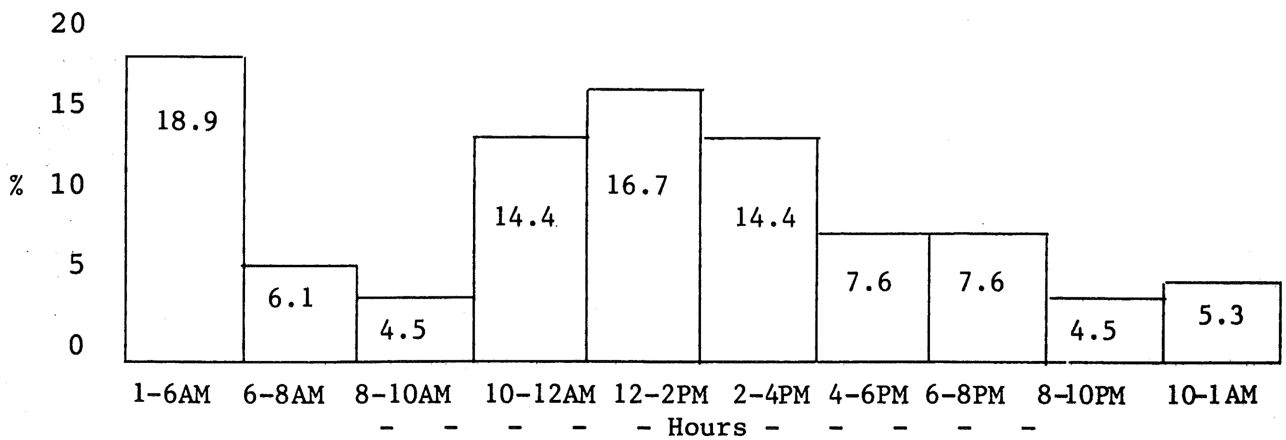


Figure 3. Calving percentage for heifers fed at 8:00 A.M.

61.7% calved between 6 A.M. & 8 P.M.
38.3% calved between 8 P.M. & 6 A.M.

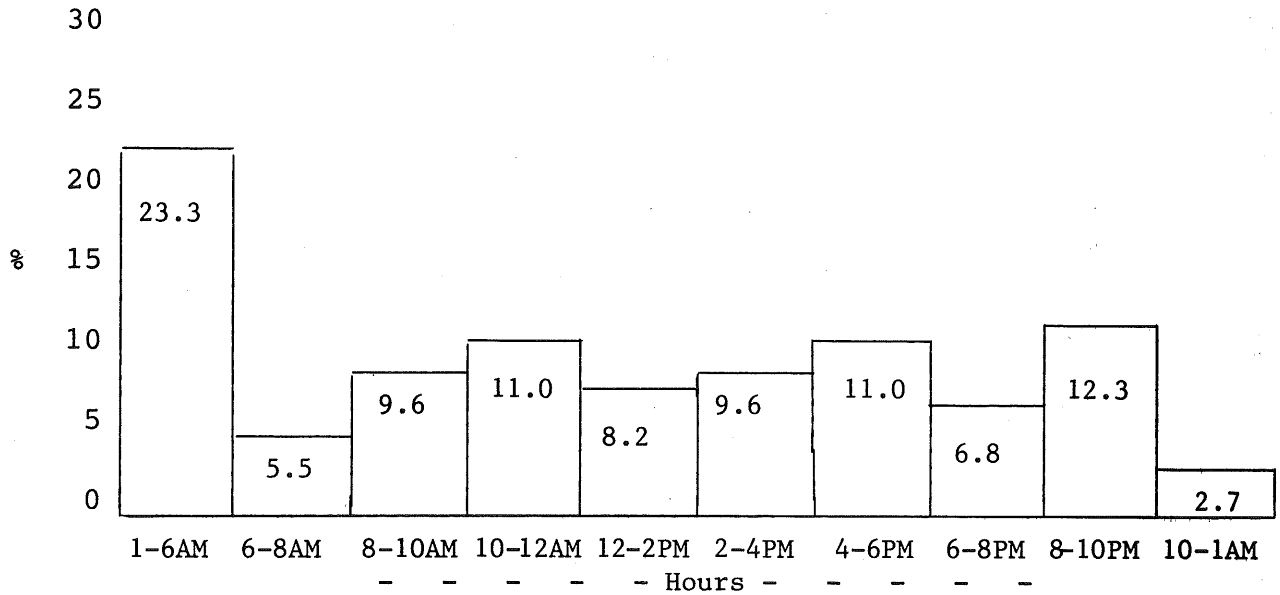
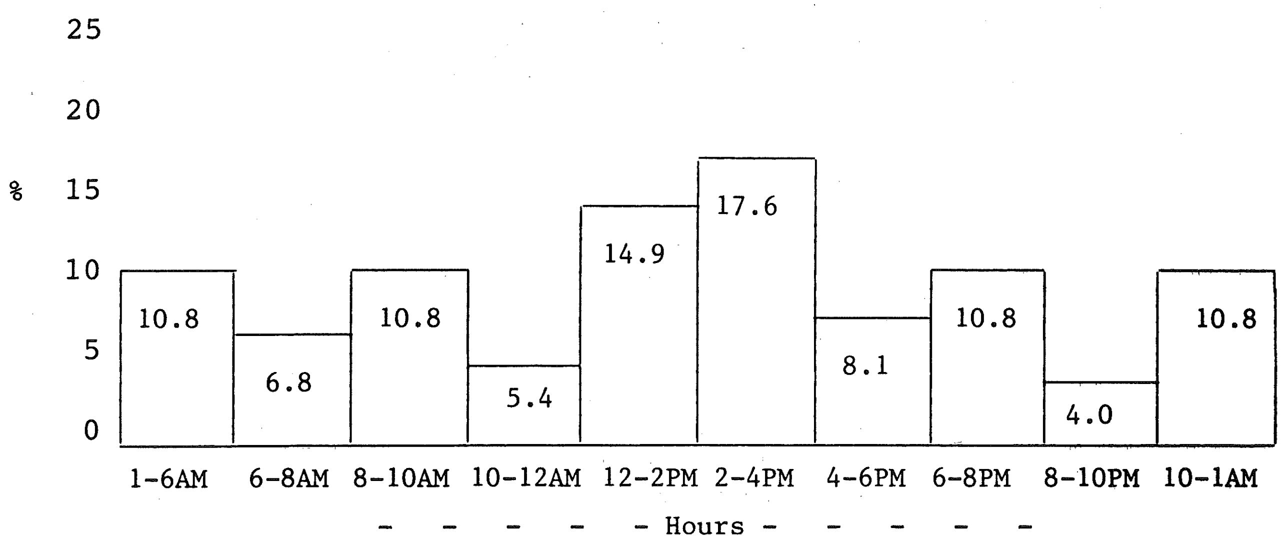


Figure 4. Calving percentage for heifers fed at 5:00 P.M.

74.4% calved between 6 A.M. & 8 P.M.
25.6% calved between 8 P.M. & 6 A.M.



A COMPARISON OF RUMENSIN AND BOVATEC FED IN WINTERING RATIONS TO BEEF CALVES

J.L. Nelson and D.G. Landblom

North Dakota produces over one million calves each year, and some over 70,000 head of fed cattle are marketed annually. Therefore, any feed additive that will improve rate of gain and/or feed efficiency should have a very positive effect on the economics of the livestock industry. Currently two products sold under the trade names, Rumensin (monensin sodium) and Bovatec (lasalocid sodium), are reported to improve both rate of gain and feed efficiency.

Past work at this station, reported in the 1979 Annual Report, indicated Rumensin fed steer calves were 6-12% more efficient than control calves, although there was no advantage in rate of gain.

Dr. William Dinusson reported in the 1981 Livestock Research Roundup Report of the Dickinson Station that steers receiving Rumensin gained 6.7% faster than unsupplemented control steers.

J.W. Spears, North Carolina State University, reported in the August 1982 abstracts, American Society of Animal Science, that daily gain was significantly higher and ruminal acetate levels were lower in steers fed Bovatec.

L.W. Lomas, Southeast Branch Experiment Station of Kansas State University, reported in the August, 1982 abstracts of American Society of Animal Science, that steers fed 100 mg Bovatec gained 16.4% faster than control steers, while steers fed 200 mg Bovatec per head daily gained 23.9% faster.

L.B. Embry, South Dakota State University, reported in the 1982 abstracts of American Society of Animal Science, that steers fed Bovatec had improvements in weight gain of 16% and feed efficiency of 13% over controls. Performance of steers fed Rumensin was about equal to controls during these short finishing experiments with cattle unadapted to either Bovatec or Rumensin.

In this trial Hereford and Angus X Hereford (BWF) steer calves raised at the Dickinson Experiment Station were weighed and allotted by breed and weight class into nine lots. The lots consisted of three lots of heavy weight BWF steers, three lots of light weight BWF steers and three lots of light weight Hereford steers, with six steers per lot.

During initial processing, all steers were given a 7-way booster vaccination, were wormed with Rumatel(R) and treated for lice with Lysoff(R) pour-on. In addition, half the steers in each pen were randomly selected to receive an ear implant called Compudose 200(R).

All steers were self fed a complete mixed ration composed of alfalfa hay, alfalfa-brome hay, barley and supplement, along with salt and di-calcium phosphate.

Table 1. Rations as Fed during the Trial

	Bovatec	Control	Monensin
Initial ration- January 12, 1983:			
Barley, lbs.	250	250	250
Mixed Hay, lbs.	600	600	600
Alfalfa, lbs.	93	93	93
Supplement*, lbs.	50[1/]	50	50[2/]
Trace Mineral Salt, lbs.	5	5	5
Di-cal Phosphate, lbs.	2	2	2
Total lbs.	1,000	1,000	1,000
[1/] Bovatec supplement provided 12.5 mgs. of lasalocid per lb. of feed. [2/] Monensin supplement provided 10 mgs. of monensin sodium per lb. of feed.			
Barley, lbs.	430	430	440
Mixed Hay, lbs.	400	400	400
Alfalfa, lbs.	93	93	93
Supplement*, lbs.	70[1/]	70	60[2/]
Trace Mineral Salt, lbs.	5	5	5
Di-cal Phosphate, lbs.	2	2	2
Total lbs.	1,000	1,000	1,000
[1/] Bovatec supplement provided 17.85 mgs. of lasalocid per lb. of feed. [2/] Monensin supplement provided 12 mgs. of monensin sodium per lb. of feed.			

The steers were on feed from January 12, 1983 until May 3, 1983, a total of 109 days. At the close of the trial, the steers were weighed on two consecutive days with the average weight calculated as the final weight. All steers were sold at auction on May 3 at Western Livestock Market in Dickinson, ND. The average selling price of $61.70 was used to calculate return over feed costs.

Tables 2, 3 and 4 show the results of this trial.

Table 2. Heavy Weight Black Whiteface Steers

	Bovatec		Control		Rumensin	
Lot Number	2		3		4	
Number Head	6		6		6	
Initial Wt., lbs.	3395		3405		3405	
Avg. Wt., lbs.	565.8		567.5		567.5	
Final Wt., lbs.	5260		5177.5		5300	
Avg. Wt., lbs.	876.7		862.9		883.3	
Total Gain, lbs.	1865.0		1772.5		1895	
Avg. Gain, lbs.	310.8		295.4		315.8	
Days Fed	109		109		109	
Avg. Daily Gain, lbs.	2.85		2.71		2.89	
Avg. Selling Price/Cwt., $	61.70		61.70		61.70	
Avg. Value/Hd., $	540.90		532.40		545.01	
Ration Fed/Lot:	**Lbs.**	**Cost**	**Lbs.**	**Cost**	**Lbs.**	**Cost**
Barley	6,115	191.09	6,599	206.23	6,091	190.33
Mixed Hay	6,337	126.74	6,778	135.56	6,191	123.82
Alfalfa Hay	1,391	34.78	1,495	37.38	1,358	33.95
Supplement	1,012	106.26	1,090	97.05	858	89.27
Di-cal Phosphate	29.8	6.26	32.2	6.76	29.1	6.11
Trace Mineral Salt	74.8	4.49	80.4	4.82	73.1	4.39
Grinding		187.00		200.94		182.50
Total	14,960	656.62	16,075	688.74	14,600	630.37
Pounds Feed/Lb. Gain, lbs.	8.02		9.07		7.70	
% Feed Savings	11.5		0		15.1	
Feed Cost/Steer, $	109.44		114.79		105.06	
Feed Cost/Cwt Gain, $	35.21		38.86		33.26	
Return Over Feed, $	431.46		417.61		439.95	
Advantage Over Control, $	13.85		0		22.34	

Table 3. Light Weight Black Whiteface Steers

	Bovatec		Control		Rumensin	
Lot Number	7		6		5	
Number Head	6		6		6	
Initial Wt., lbs.	2980		2985		3000	
Avg. Wt., lbs.	496.7		497.5		500.0	
Final Wt., lbs.	4790		4672.5		4862.5	
Avg. Wt., lbs.	798.3		778.8		810.4	
Total Gain, lbs.	1810		1687.5		1862.5	
Avg. Gain, lbs.	301.7		281.2		310.4	
Days Fed	109		109		109	
Avg. Daily Gain, lbs.	2.77		2.58		2.85	
Avg. Selling Price/Cwt., $	61.70		61.70		61.70	
Avg. Value/Hd., $	492.55		480.52		500.02	
Ration Fed/Lot:	**Lbs.**	**Cost**	**Lbs.**	**Cost**	**Lbs.**	**Cost**
Barley	5,529	172.78	5,665	177.04	5,632	176.01
Mixed Hay	5,785	115.70	6,007	120.14	5,780	115.60
Alfalfa Hay	1,264	31.60	1,304	32.59	1,262	31.54
Supplement	916	96.22	941	83.74	796	82.80
Di-cal Phosphate	27.2	5.21	28.1	5.90	27.1	5.69
Trace Mineral Salt	67.9	4.07	70.1	4.21	68.0	4.08
Grinding		169.88		175.19		169.56
Total	13,590	595.46	14,015	598.81	13,565	585.28
Lbs. Feed/Lb. Gain	7.51		8.30		7.28	
% Feed Savings	9.5		0		12.2	
Feed Cost/Steer, $	99.24		99.80		97.55	
Feed Cost/Cwt. Gain, $	32.90		35.48		31.42	
Return Over Feed, $	393.31		380.72		402.47	
Advantage Over Control, $	13.09		0		21.75	

Table 4. Light Weight Hereford Steers

	Bovatec		Control		Rumensin	
Lot Number	24		23		25	
Number Head	6		6		6	
Initial Wt., lbs.	2865		2905		2900	
Avg. Wt., lbs.	477.5		484.2		483.3	
Final Wt., lbs.	4707.5		4702.5		4732.5	
Avg. Wt., lbs.	784.6		783.8		788.8	
Total Gain, lbs.	1842.5		1797.5		1832.5	
Avg. Gain, lbs.	307.1		299.6		305.4	
Days Fed	109		109		109	
Avg. Daily Gain, lbs.	2.82		2.75		2.80	
Avg. Selling Price/Cwt., $	61.70		61.70		61.70	
Avg. Value/Hd., $	484.10		483.60		486.69	
Ration Fed/Lot:	**Lbs.**	**Cost**	**Lbs.**	**Cost**	**Lbs.**	**Cost**
Barley	5,499	171.83	5,794	181.07	5,656	176.75
Mixed Hay	5,859	117.18	6,044	120.88	5,889	117.78
Alfalfa Hay	1,268	31.70	1,322	33.06	1,276	31.90
Supplement	914	95.97	960	85.42	803	83.53
Di-cal Phosphate	27.3	5.73	28.5	5.99	27.4	5.75
Trace Mineral Salt	68.1	4.09	71.0	4.26	68.6	4.11
Grinding		170.44		177.75		171.50
Total	13,635	596.94	14,220	608.43	13,720	591.32
Lbs. Feed/Lb. Gain	7.40		7.91		7.49	
% Feed Savings	6.4		0		5.3	
Feed Cost/Steer, $	99.49		101.40		98.55	
Feed Cost/Cwt. Gain, $	32.40		33.85		32.27	
Return Over Feed, $	384.61		382.19		388.14	
Advantage Over Control, $	2.42		0		5.95	

Discussion:

This trial clearly shows that both Rumensin(R) and Bovatec(R) will improve feed efficiency and lower overall feed costs. An analysis of variance of animal gains showed that while there appears to be differences in rate of gain, the differences were not large enough to be significant at the 95% probability level.

During the trial no problems with any of the feeds were noticed. There was no bloat or other feedlot related problems with any of the trial steers except for one calf that was treated for a slight case of lameness.

Steers fed Rumensin(R) appeared to have the best feed efficiency, averaging 10.86% improvement on all three lots. The Bovatec steers averaged a 9.13% savings in feed over control steers.

Feed cost per steer was lower in the Rumensin fed lots followed by Bovatec and control.

Returns were substantially higher for both the Rumensin and Bovatec steers than for the control steers.

Feeding Rumensin(R) improved returns from $5.95 to $22.34 over control fed steers, while using Bovatec returned from $2.42 to $13.85 over control steers.

In summary, based on this trial, both Rumensin(R) and Bovatec(R) were beneficial in lowering costs of feeding by improving feed efficiency. Both the improved feed efficiency and the trend toward faster gain gave both products a dollar advantage over control calves.

Rumensin appeared to promote better feed efficiency (10.86% vs. 9.13%) than did Bovatec. Rumensin also showed a net dollar advantage over Bovatec in this trial ($16.68 vs. $9.78).

Based upon the kind of rations, the class of cattle and the economic advantage reported in this trial, livestock producers cannot afford to ignore the use of these additives.

THE VALUE OF COMPUDOSE

IMPLANTS IN STEER CALVES FED OVER WINTER

J.L. Nelson and D.G. Landblom

Growth promotant implants are widely used in growing and finishing cattle, and according to various authorities, result in increases in rate of gain of 7-18% and feed efficiency of 6-10%.

Compudose(R), a relatively new growth promotant developed by Elanco Products Division of Eli Lilly and Company, has been designed to give sustained release of the naturally occurring estrogen, Estrodiol -17B for periods up to 400 days. This offers the advantage of one implant lasting from weaning to slaughter.

This trial was superimposed on the Rumensin vs. Bovatec trial previously reported. In this trial 27 steers were selected at random to receive the Compudose implant. On Day One of the trial, these steers were implanted subcutaneously with Compudose -200(R) in the posterior median surface of the right ear by inserting the implant needle approximately 1½ inches under the skin and withdrawing the needle as the implant was being deposited. The implants contained 24 mg of Estrodiol -17B.

All steers were self fed a complete mixed ration of approximately 50% barley and 50% roughage for 109 days. Individual weights were taken on the first day and every 28 days thereafter. Two weights spaced by 24 hours were averaged to get the final weight at the close of the trial. Steers were sold at auction at the end of the trial for an average selling price of $61.70/Cwt. While the implants were donated by Elanco Products Division of Eli Lilly and Company, they would normally sell for about $2.40 per implant. The implanting was done during regular processing and handling of steers.

Table 1 shows the results of this trial.

Discussion:

The implantation of Compudose(R) was a simple procedure and was performed during the initial processing of the cattle. The extra time required to perform this operation would not likely average over one minute per steer handled.

This trial was terminated after only 109 days on feed so the long term effect of the implant was not measured. There was no unusual side effects noted when the implant was used.

In summary, based on results of this trial, a livestock producer cannot afford to overlook the value of implanting his calves. Our records show almost $12.00 return per dollar invested in the Compudose(R) implant.

Table 1. Results of Using Compudose Implants vs. No Implant in Wintering Calves

	Compudose	Control
Number Head	27	27
Initial Wt., lbs.	14,120	13,720
Avg. Wt., lbs.	523.0	508.1
Final Wt., lbs.	22,922.5	21,212.5
Avg. Wt., lbs.	851.6	785.6
Days Fed	109	109
Avg. Daily Gain, lbs.	3.01	2.55
Avg. Selling Price @ $61.70/Cwt.	525.42	484.74
Avg. Initial Value @ $65.00/Cwt.	339.92	330.30
Return/Steer, $	185.50	154.44
Value of Compudose Implant, $	31.05	
Cost of Implant, $	2.40	
Net Return/Steer, $	28.65	

WEANING MANAGEMENT STUDY

D.G. Landblom and J.L. Nelson

Stress, trauma, weight loss, and an undesirable amount of sickness characterize the events experienced by a calf that has just been weaned. These events are stimulated by a multitude of changes that a freshly weaned calf must adjust to; the first and most traumatic being, the calf's loss of association and protection provided by its mother. In addition, when the calf is weaned directly into a drylot, it must also adjust to changes in its environment, feed type and physical form, as well as in many cases, dusty lots and water type.

The purpose of this trial is to evaluate three different methods of weaning that range from an abrupt separation of cow and calf and placement in drylot, to a transitionary step by step weaning in which all changes don't occur simultaneously. Stress may be minimized and continued strong gains may be experienced using a transitionary scheme. Using a 30-40 day backgrounding period, any carry over effects will be measured.

The following three comparisons are being evaluated:

1. Conventional drylot weaning (Control).
2. Short term pre-wean creep feeding (28 days) followed by drylot weaning with creep feed.
3. Short term pre-wean creep feeding (28 days) followed by weaning on native range pasture with creep feed for 2 weeks before being moved to drylot with creep feed.

Twenty-six Hereford and Angus X Hereford cow-calf pairs ranging in age from 3 to 11 years were used in each of the treatments briefly described above. In 1982, the pre-weaning creep feeding period ran from September 29th to October 27th.

Group I – Conventional Weaning (Control) grazed native range with no supplementation except minerals until weaning on October 27th. At weaning the calves were separated from mothers, weighed, and transported by trailer to drylot holding pens where they were started on a low energy/high roughage complete mixed ration as shown in Table 1.

Group II – Calves in this treatment grazed native range and had access to a self-fed creep ration consisting of 62% dry rolled oats, 33% dry rolled barley, 5% molasses and Vitamins A and D. When weaned on October 27th the calves were weighed, and transported by trailer to drylot where they were given free-choice chopped mixed hay in the bunk-line and had free choice access to the same self-fed creep feed ration fed on pasture. The creep ration was fed using portable wooden creep feeders.

Group III – Pasture weaning characterized this treatment. The cows and calves grazed native range and the calves had access to creep feed during the pre-weaning period. Creep feed composition was the same as that used in Treatment II. On weaning day for Groups I and II, Group III was moved to a 40 acre ungrazed native pasture that had been set aside. Cows in this group remained with their calves for one week, which allowed the calves' time to adjust to their new surroundings, and to find the water source, mineral feeder, and creep feeder. After this short adjustment period the cows were removed, calves weighed and turned out to continue grazing and eating creep feed for an additional two weeks. Following the two week grazing, they were reweighed, placed in drylot, given access to the same self-fed creep ration fed on pasture, and fed chopped mixed hay free choice in the bunk line.

After the pasture weaned group was in the drylot environment for 10 days, calves in all treatments were switched to a complete mixed ration containing 45% dry rolled oats, for a 39-day growing period.

While initial weights were being taken on pasture, the calves were vaccinated with a 7-way vaccine to protect them from diseases associated with clostridium organisms. Final weights were taken following an overnight feed and water shrink.

Composition of as fed rations are shown in Table 1, and Consumption and Economics are shown in Table 2.

Weight changes were monitored at selected intervals throughout the experiment. A summary of weight fluctuations by interval is given in Table 3 for the 30-day period following weaning. Table 4 contains a summary of pre-weaning, post-weaning (30 day), short backgrounding, and combined results.

Summary:

1. No unusual physical problems were encountered with conventionally weaned and creep fed calves moved directly to drylot at weaning. Although not a big problem, cows from calves weaned on pasture managed to work a gate loose and get back along side to set aside pasture and had to be driven back. Strong fences and considerable distance between cows and weaned calves is very important.

2. Short term (28 days) late fall creep feeding aided in reducing weaning stress as measured by total weight gain and interval weight changes.

3. Calves weaned conventionally lost significantly more weight during the first week following weaning. By two weeks post-weaning daily feed intake and body weight gain had increased significantly and leveled off by three weeks post-weaning time.

4. Cost per pound of gain was very similar among different methods. Calves creep fed on pasture and weaned into drylot with creep ration were the most efficient, gaining 111 pounds during the period at a cost of 33¢ per pound of gain. Conventionally weaned calves gained 102 pounds at a cost of 35.5¢ per pound of gain. Pasture weaned calves gained slightly slower, 95 pounds, at a cost of 38.4¢ per pound of gain. Calves pasture weaned utilized less total pounds of processed feed, but also gained slower and were slightly less efficient than their drylot confined counterparts. While their overall gains were slower, the large initial weight loss followed by heavy fills measured in Group I were not experienced in Group III. In terms of weight loss immediately after weaning, Group II was intermediate.

5. Illness among calves was encountered in all treatment, and ranged from one case of hardware disease and two cases of coccidosis to scattered cases of upper respiratory illness. It should be noted that no illness was detected in calves weaned on pasture until they moved into the drylot environment.

6. This trial will be continued to measure effects of yearly variation.

Table 1. Creep Feed and Complete Mixed Rations Used

Creep feed Dry Rolled Grain Mixture:			
Oats, %	62		
Barley, %	33		
Molasses, %	.5		
Vitamin A, IU/lb.	5,000		
Vitamin D, IU/lb.	500		
Mixed Ration:	**Base Ration**	**1st Change**	**2nd Change**
Mixed Hay, %	74	64	54
Dry Rolled Oats, %	25	35	45
T.M. Salt, %	.5	.5	.5
Di cal, %	.5	.5	.5
Vitamin A, IU/lb.	5,000	5,000	5,000
Complete Mixed Growing Ration:			
Mixed Hay, %	54		
Dry Rolled Oats, %	45		
T.M. Salt, %	.5		
Di cal, %	.5		
Vitamin A, IU/lb.	5,000		
	100%		

Table 2. Feed Consumption and Economics among Calves Comparing Three Weaning Management Methods

	Control Conventional Weaning	Pasture Creep Drylot Weaning W/Creep	Pasture Creep Pasture Weaning W/Creep Drylot W/Creep
Number Head	26	25	26
Creep Feed before Weaning, lbs.		1422	2154
Lbs./Head		56.9	82.8
Total Creep Cost, $		68.28	103.66
Creep Cost/Hd., $		2.73	3.99
Creep on Pasture after Weaning, lbs.			1654
Lbs./Head			63.6
Total Creep Cost, $			81.70
Creep Cost/Hd., $			3.14
Pasture Cost/Hd., $			3.20
Drylot Phase:			
Mixed Hay, lbs.		1735	922
Cost/Head, $		2.08	1.06
Creep Feed, lbs.		6518	2060
Cost/Head, $		12.19	3.72
Mixed Ration, lbs.	24941	12742	14192
Cost/Head, $	36.31	19.65	21.37
Total Cost, $	36.31	36.65	36.48
Total Gain, lbs.	102	111	95
Cost/Lb. Gain, ¢	35.5	33.0	38.4
Treatments:	1 lung cong. 2 coccidiosis	2 lung cong. 1 hardware disease	2 lung cong.

Table 3. Weight Gains at Selected Intervals during the 30-Day Period Following Weaning on October 27th

	Selected Intervals			Average 30-Day Post Weaning Gain
	Nov. 3	Nov. 16	Nov. 26	
Days between each weighing	7	13	10	30
Treatment I:				
Conventional-weaning (Control)	-2.06	3.36	.01	1.11
Treatment II:				
Pasture creep-Drylot wean with creep	-.15	2.75	-.01	1.15
Treatment III:				
Pasture creep/Pasture wean with creep/Drylot with creep	1/	.77	1.61	.97

1/ Weaned on pasture one week after Groups II and III.

Table 4. Weight Gains among Calves Using Three Weaning Management Methods

	Pre-Weaning Gain	30-Day Post-Weaning Gain	Post-Weaning Backgrounding	Combined Gains
Days	28	30	39	97
Conventional-weaning (Control)	1.26	1.11	.91	1.05
Pasture creep Drylot weaning with creep	.64	1.15	1.47	1.14
Pasture creep Pasture weaning with creep Drylot with creep	.86	.97	1.18	.97

TRACE ELEMENT INVESTIGATIONS

Dickinson Experiment Station

H. Casper, D. Landblom, W. Slanger, C. Keller

In 1982 serum and hair samples were collected from cow-calf pairs shortly after calving. These samples were assayed to determine if there were trace mineral differences between healthy and scouring calves. The serum was analyzed for copper content and the hair samples were assayed for copper, zinc, manganese, magnesium and iron. We also determined the copper levels in serums collected at calving in 1979 and 1980. The results of the hair and serum assays are shown in Tables 1 and 2.

Table 1. Serum Copper Levels

Serum Copper*				
Year	**No.**	**Cow**	**Calf**	**ADG.****
1979	33	-	.48+.12	1.94+.24
1980	48	.70+10	.51+.09	1.98+.20
1982	140	.29+.13	.29+.09	1.63+.24

*Parts Per Million

**Average Daily Gain for Animals Sampled.

Table 2. Trace Minerals in Hair*

	Cow Hair			**Calf Hair**	
	Scours	**Healthy**		**Scours**	**Healthy**
Copper	6.2+1.4	6.1+1.5		9.9+1.4	8.8+1.8
Zinc	122+12	122+10		116+12	119+18
Manganese	16.6+4.8	16.3+7.9		3.5+2.4	3.2+1.7
Magnesium	356+85	375+115		313+134	286+89
Iron	114+78	110+58		81+55	67+45
Number	12	19		12	19

*Parts Per Million – Dry Matter Basis

The serum copper levels varied substantially from year to year. The 1982 average level (0.29+.13) was substantially below the recommended minimum of 0.5 ppm. Greater than 95% of the calf serum coppers were less than 0.45 ppm. Levels consistently below 0.5 ppm may be indicative of copper deficiency. The correlation between the herd averages of calf serum copper and ADG for 3 years was substantial (r=0.999), but its ramification is not yet known. Blood samples will be collected during the 1983 calving season to see if the pattern continues.

Trace mineral analysis did not show a significant difference between hair samples from healthy and scouring animals. The correlations between the various trace elements and also between those minerals and growth rates are being evaluated. Initial examination indicates there are several correlations, but the practical use of these interactions is not clear. Hair samples from other experiment stations and ranches have been analyzed and will be statistically evaluated.

VACCINATION OF PREGNANT HEIFERS WITH E. COLI BACTERINS TO REDUCE THE INCIDENCE AND SEVERITY OF CALF SCOURS

J.L. Nelson and D.G. Landblom

It is often said that an ounce of prevention is worth a pound of cure. If this is true, then a program of prevention by vaccination rather than treatment by medication would be desirable. Colostrum from heifers is normally lower in antibody level than colostrum from older cows. Also, heifers tend to produce less milk and are usually poorer mothers than mature cows. Therefore, a pre-calving vaccination program to increase specific immunities in the heifer would seem to be a valid management decision. Recent research at Kansas State University[4/] indicates that poor energy input for heifers prior to calving may lower antibody count, and in the process, affect the colostrum protection for the calf.

Currently, there appears to be some difference of opinion as to the value of vaccination as a preventative for calf scours between U.S. and Canadian workers.

Work reported by Schipper and Landblom[3/] indicated that vaccination of cows with E. Coli bacterins had no demonstrable preventative activity to clinical enteritis in the neonatal calf. The vaccines used in this trial were the K99 and the Coligen vaccine.

In other studies by Dr. Schipper, (personal communication) conducted during two calving seasons, 14.6% of Vicogen and 12.3% of Coligen vaccinated heifers had calves that demonstrated clinical enteritis. Only 5.4% of the control calves (heifers not vaccinated) developed clinical enteritis.

Canadian researchers Makarechian and Acres[1,2/] reported positive results in reducing the incidence of calf scours by vaccinating the heifers with the Vicogen brand of E. Coli vaccine. In their work, vaccination of heifers with Vicogen at 7 and 3 weeks prior to start of calving reduced the incidence of calf scours considerably. They concluded that every dollar invested in Vicogen vaccination returned $5.96 at weaning. They also concluded that had the entire herd been vaccinated, it would have increased returns by 12.2% at weaning.

This trial was designed to evaluate the effects of vaccination of pregnant heifers with Vicogen(R) (Connaught Laboratories) to prevent or reduce the incidence of calf scours caused by the E. Coli bacterin. It was hoped that results of this trial might help remove the confusion that exists between current Canadian and U.S. research findings.

In January, 1983, one hundred fourteen pregnant Hereford and Hereford X Angus heifers expected to calve in March and April 1983, were stratified by breed type and age of pregnancy and then randomly assigned to either a vaccinated or control group.

On January 17, 1983 the heifers were sorted into two groups, Vicogen vaccinated or control. All heifers were given a 5cc booster vaccination of 7-way vaccine, and a 3cc injection of Vitamins A and D. (500,000 I.U. Vit. A and 75,000 I.U. Vit. D per cc). In addition, all treatment heifers were given a 5cc subcutaneous injection of Vicogen(R) vaccine. On February 16, 1983 (20 days later), the Vicogen heifers were given a 5cc booster vaccination of Vicogen.

Both groups of heifers were housed in uniform, but separate calving areas approximately 6 acres in size. These areas are equipped with a slotted board fence for wind protection and an automatic waterer. Both calving areas are adjacent to smaller corrals and a maternity barn. As the heifers calved, they were moved into the small corrals until they were mothered up and the calves were nursing well. Those heifers requiring assistance at calving were moved directly into the maternity barn. Following delivery, the heifer and her calf were usually moved outside into the corrals within 24-48 hours. Groups of cows and calves 4-7 days old were then transferred to a clean, ungrazed forty acre pasture and held until the trial terminated on May 18, 1983.

All heifers were self-fed mixed alfalfa-crested hay using large round bales fed in 8 foot diameter steel hay feeders. Following calving, the heifers were fed five pounds of grain (70% oats and 30% wheat mixed) bulked up with chopped hay daily. In addition, they had access to mixed hay and limited grazing. Portable 8x8 foot plywood calf shelters provided weather protection for the calves.

All births were recorded showing birth weight, birth date, type of delivery, sire and time of calving. Heifers were checked and assisted when necessary on an every three hour schedule around the clock.

All calves were closely watched to see if they nursed and were accepted by their mothers. Two calves died at birth or shortly thereafter. One was stepped on and suffered internal damage by its mother, while the other calf failed to breathe after a difficult delivery. All calves were checked daily and those showing signs of diarrhea or scours were caught and treated with Sulkamycin-S boluses at the rate of one bolus per fifty pounds body weight. Calves were re-treated whenever it was deemed necessary. Cost of the Sulkamycin-S bolus was approximately 30¢ per bolus or 60¢ per treatment, assuming the calf weighed about 100 pounds.

The calves born in this trial were sired by Angus, Milking Shorthorn or Texas Longhorn bulls.

Discussion:

As shown by the brief weather table, the spring of 1983 was an almost perfect calving season with warm and dry conditions prevailing. Both March and April had an abundance of clear sunny days, which coincided with the peak calving activity.

Approximately 25% of the calves in both groups were treated for scours at an average of 12 days. No calves died due to scours, and of the calves treated, 1.5 treatments per calf were required to control the diarrhea, on the average.

Discussion (Continued):

In summary, it appears that in 1983, little if any benefit was derived by vaccinating the pregnant heifers with Vicogen, since no serious outbreaks of scours were noted. However, the weather patterns in 1983 were warmer and drier than normal, which no doubt had a positive effect on calf health and freedom from scours. This trial will be continued for at least two more years to get information under more adverse conditions.

Results of this year's trial are shown in Table 1.

A brief summary of the 1983 weather conditions for the months February through May is shown in Table 2.

Table 1. Results of 1983 Trial Comparing Incidence of Scours in Calves Born From Heifers Vaccinated with Vicogen vs. Those Born From Heifers Not Vaccinated

	Vicogen Vaccinated	Control
No. Heifers Vaccinated	59	55
1st Vaccination	January 27, 1983	--
Booster Vaccination	February 16, 1983	--
Cost for 2 Vicogen Vaccinations, $	100.30/Lot 1.80/Cow	
1983 Calving Period:	**Feb. 23 – May 11**	**March 4 – May 1**
% Born by Month		
February	1.7	0
March	67.8	60.0
April	27.1	38.2
May	3.4	1.8
Total	100.0	100.0
No. Live Calves	58	54
Calving %	98.3	98.2
Calves Treated For Scours:		
Heifers	5	7
Bulls	9	9
Total	14	16
% Treated	24.1	29.6
No. Treatments/Calf	1.5	1.43
Range of treatment	(1-3)	(1-2)
Cost of Sulkamycin-S:		
Treatment/Lot, $	12.60	13.80
Treatment/Calf, ¢	0.90	0.86
Avg. Age in Days of - Calf Treated:		
Heifers	10.2	12.3
(Range in Age)	(8-16)	(10-16)
Steers	13.6	12.3
(Range in Age)	(6-27)	(8-19)

Table 2. A Brief Summary of Weather Conditions During the Period From February through May, 1983

	Feb.	March	April	May
Avg. Maximum Temperature, ˚F	37.6	36.4	50.4	62.1
Range, ˚F	11-58	21-57	31-68	32-86
Avg. Minimum Temperature, ˚F	16.6	20.3	24.4	34.4
Range, ˚F	-4-28	3-30	10-44	21-48
Precipitation, inches:				
Snow	1	1.5	1.75	9
Rain			.32	1.15
Sky Conditions:				
Days Cloudy	19	21	7	18
Days Clear	9	10	23	13

References:

[1/] Makarechian, M. and S.D. Acres. "Effectiveness of Two Vaccines in Reducing the Incidence of Calf Scours", The 60th Annual Feeders Day Report, Department of Animal Science Faculty of Agriculture and Forestry. The University of Alberta, Edmonton, Alberta, Canada. June 12, 1981.

[2/] Makarechian, M. and S.D. Acres. "Economic Aspects of Vaccination Against Calf Scours", The 61st Annual Feeders Day Report, Department of Animal Science Faculty of Agriculture and Forestry. The University of Alberta, Edmonton, Alberta, Canada. June 10, 1982.

[3/] Schipper, I.A. and D. Landblom, S. Pommer, T.J. Conlon. "Calf Enteritis Investigation", The 32nd Livestock Research Roundup. Dickinson Experiment Station, Dickinson, North Dakota. October 13, 1982.

[4/] Spire, Mark. "Five-point Scours Program Outlined", Tri State Livestock News. P.O. Box 129, Sturgis, South Dakota 57785. Saturday, April 2, 1983.

A COMPARISON OF TWO ESTRUS SYNCHRONIZATION METHODS IN MATURE COWS

D.G. Landblom and J.L. Nelson

Lutalyse, a naturally occurring compound in animal systems, has been released by the Food and Drug Administration for use under the direction of veterinarians for synchronization of estrus in beef cattle. Previous research conducted at many universities in the U.S. and at this station clearly shows that estrus cycles can be successfully synchronized in cattle that are cycling normally. Each injection costs approximately $5.00 at today's prices, and requires handling the cows twice. While requirements for the FDA clearance were being satisfied, extensive data was collected with the double injection method. At the same time alternate methods using a single dose of Lutalyse were being proposed in an effort to obtain equally good results at a lower cost to the producer. This experiment, which compares single versus double injections of Lutalyse, is designed to evaluate overall effectiveness, management requirements and economics of the two methods under typical ranch conditions.

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

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

Refer to Table 1 for a detailed description of each synchronization method.

A summary of accumulated breeding results and partial economic analysis is shown in Table 2.

Discussion:

Very poor response to synchronization was obtained in the double injection group during the 1982 breeding season. Due to the nature of each of the two management methods, inseminations, particularly the timed inseminations, were not done on the same day. The single injection group was inseminated just before a rainy cool period, and the double injection group was inseminated during the rainy period. Total accumulation of moisture was 3.41 inches over a 4-day period. Rain, fog and mud made heat detection difficult because expression of heat is depressed substantially in this type of weather.

Table 1. Design for Estrus Synchronization with Mature Cows

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

Table 2. Single vs. Double Injection Synchronization With Lutalyse$^{(R)}$ In Mature Cows

	Single Injection						Double Injection				
	1980-81	**1981-82**	**1982-83**	**Combined Years**	**%[1/]**		**1980-81**	**1981-82**	**1982-83**	**Combind Years**	**%**
No. head	22	25	25	72			25	24	23	72	
No. inseminated 1st five days, %	8	12	5	23	32		--	--	--	--	--
No. responding to 1st injection in the double injection group, %	--	--	--	--	--		19	16	11	46	64
No. in heat before 80 hrs.	9	8	6	21	29		19	13	10	42	58
No. that did not show heat but were inseminated at 80 hrs.	5	5	9	18	25		6	11	13	30	42
No. conceiving that cycled after 80 hrs.	5	1	7	13	18		2	0	1	3	4
No. not responding to synchronization	0	4	5	9	13		2	7	9	18	25
No. open	2	5	0	7	10		3	0	2	5	7
Conception rate for each management system	18	15	15	48	67		13	15	7	35	49
Economics:											
Days of labor	8						5				
Breeding cost for semen + Lutalyse, $	256	275	237	= 768			450	432	369	= 1251	
No. conceiving to synchronized estrus	18	15	15	= 48			13	15	7	= 35	
Semen + Lutalyse Cost/Cow conceiving to synchronization, $	16.00						35.74				

[1/] Percent will not add due to rounding.

Summary:

1. Lutalyse (Prostaglandin F_2 Alpha) can be used several different ways to synchronize estrus cycles in beef cattle. This trial has been designed to evaluate two of those methods in an attempt to reduce labor, handling and costs while maintaining equal or better reproductive performance. A single injection of Lutalyse given once to all cows not detected and inseminated after five days of artificial breeding was compared with administering two injections separated by eleven days.

2. Labor requirements for injections and heat detection ranged from five days in the double injection group to eight days in the single injection group.

3. Conception rate was variable between treatments and between years. When results from individual years are combined, a single injection of Lutalyse$^{(R)}$ yielded the highest conception rate of 67%. The double injection scheme was consistently lower and when combined over years, yielded a 49% conception rate.

4. Based on these data, breeding by appointment is a labor saver. However, higher conception rates would have been attained by inseminating at estrus, which would necessitate more work.

5. Using the single injection method has resulted in a substantial reduction in the cost per cow conceiving, and ranged from $16.00 to $35.74 in the single and double injection groups respectively.

ESTRUS SYNCHRONIZATION AND CALVING EASE AMONG FIRST CALF HEIFERS

D.G. Landblom and J.L. Nelson

Managing heifer replacements so they will calve as two year olds with a minimum of difficulty has been, and continues to be, a problem for many cow-calf producers. In beef cattle production, selection pressure is placed on maximum performance, which tends to increase birth weight. Birth weight has been shown in several detailed studies to be highly correlated with difficult births. Conformation, while important, hasn't been as highly correlated with calving difficulty as has birth weight. The first calf heifer is a special problem indeed, because, although she is still growing, the economics of beef production give producers no alternative but to strive for maximum production. While selection for maximum performance is often associated with heavier birth weights, individual sires have been identified that sire calves with light birth weights and possess above average pre and post-weaning performance. Easiest access to these type sires is through artificial insemination.

Artificial insemination has not been widely used in beef herds for many reasons, but a few of the major ones are: special training and handling facilities are required, extra handling of cows and heifers is necessary, time for heat detection and insemination is often limited, and pounds of calf lost among females that don't conceive is costly. The advent of estrus synchronization has changed some of the previously accepted disadvantages. Most notably labor is not eliminated, but is substantially reduced and within the time frame of a conventional 21-day A.I. breeding period, synchronized females will show two heat cycles.

In this heifer breeding management study we have combined some well established management techniques with the advanced technology of estrus synchronization. In executing the study we've incorporated the following:

1. Heifers have been sorted into groups according to weaning weight and fed to weigh 700 pounds by the start of the breeding season.
2. All heifers were inseminated once artificially.
3. A.I. sires were selected on progeny test data for calving ease and pre and post-weaning gain.
4. Heifers were synchronized with Lutalyse(R) using either a single or double injection method.
5. Texas Longhorn bulls were used for clean-up breeding to insure calving ease.
6. A short 45-day breeding season was used.

Primary objectives as they relate to the design of this study are to evaluate two methods of synchronization with Lutalyse(R) to determine whether or not calving difficulty can be minimized through the use of progeny tested sires while cleaning up with the Longhorn breed, and to evaluate the overall efficiency and effectiveness of the heifer management system being suggested.

In order for estrus synchronization to be successful, beef females must be sexually mature and cycling properly. In 1979, KaMar heat detection devices and rectal palpation were used to identify those heifers that were cycling. This method was found to be totally unacceptable and a waste of time and money. In all other years of the study epididectomized sterile bulls with marking harnesses have been used to measure pre-breeding estrus activity. All animals that were wintered, with limited exceptions, were used in the breeding studies and were not eliminated until identified as open after being pregnancy tested.

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

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

Table 1. Design for Estrus Synchronization

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

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

Semen from an Angus sire, Shoshone Monitor 17An50, was purchased from Minnesota Valley Breeders Assn. in 1979, and in 1980 and 1981 semen from an Angus bull, Kadence Shoshone 7An47, was purchased from Select Sires, Plain City, Ohio. In 1982, Angus semen was purchased from American Breeder Service. Sires used were Stardust Expansion 17An1337, Northern Prospector 29An1329 and Prairie Lane Rito 29An1343.

Accumulated breeding results, calving difficulty, birth weights, actual and adjusted weaning weights and economic analysis are given in Tables 2, 3, 4 and 5.

Summary:

1. Four years of synchronization and calving data, and three years of weaning data have been summarized in this progress report.

2. Synchronized estrus conception rates have been variable. In the double injection group a four year average conception rate of 51% was recorded and ranged from a low of 19% to a high of 62%, and using the single injection method resulted in 42% of the heifers conceiving with yearly variations ranging from a low of 5% to a high of 74%. In years when extremely low conceptions were experienced, only a small number of heifers had cycled before the start of the breeding season; demonstrating the need to have heifers sexually mature before engaging in a synchronization program with heifers using prostaglandin synchronizing compounds.

3. Economically, it was substantially less expensive to use the single injection method but required three additional days of labor. The single injection group cost for semen and Lutalyse per heifer conceiving was $26.33 as compared to $34.34 in the double injection group.

4. Each management method is being evaluated to determine which will return the most net dollars from sale of weaned calves. Economic analysis to date favors the single injection method by a small margin in spite of it being the group recording the lowest four year synchronized estrus conception rate. Most of the difference is due to the added cost of Lutalyse under the double injection regime.

5. A major objective in this study was to reduce calving difficulty and still have satisfactory performance from the calves. Performance was about as expected from any group of young unproven heifers. Calving difficulty, however, was not minimized with the progeny tested bull used in this study. Forty percent of the Angus sired calves required assistance whereas only 2.8% of the Longhorn calves were assisted. Angus bull calves weighing seventy pounds or more were the source of difficulty in a ratio of 2:1 when compared to the Angus heifers. Longhorn sired calves were excellent for calving ease; however, pounds of beef are significantly reduced.

Table 2. Double Injection Method of Synchronization among First Calf Heifers

	Double Injection				
Breeding/Calving Year	**1979-80**	**1980-81**	**1981-82**	**1982-83**	**4-Yr. Total**
No. head	21	24	18	29	92
No. in heat before breeding	7	21	18		
No. in heat + insemination before 80 hrs.	4	18	14	18	54 (58.7%)
No. not showing heat but inseminated at 80 hrs.	17	6	4	11	38 (41.3%)
No. open	1	3	1	5	10 (10.8%)
Conception rate for synchronization estrus	4 (19%)	14 (58%)	11 (61%)	18 (62%)	47 (51%)
Economics:					
Semen + Lutalyse expense[1/], $	336	432	324	522 =	1614
No. Conceiving to Synchronization	4	14	11	18 =	47
4-Year Avg. Cost/Heifer Conceiving	$34.34				

[1/] Average Lutalyse cost was $5.00/injection; semen averaged $7.50/head.

Table 3. Single Injection Method of Synchronization among First Calf Heifers

	Single Injection				
Breeding/Calving Year	**1979-80**	**1980-81**	**1981-82**	**1982-83**	**4-Yr. Total**
No. head	20	24	19	29	92
No. in heat before breeding	3	21	19		
No. Inseminated 1st 5 days of Breeding	5	9	5	7	26 (28.2%)
No. in heat + insemination before 80 hours	0	9	10	8	27 (29.3%)
No. not showing heat but inseminated at 80 hours	16	6	4	14	40 (43.5%)
No. open	1	8	0	1	10 (10.8%)
Conception rate for synchronization estrus	1 (5%)	11 (46%)		14 (74%)	39 (42%)
Economics:					
Semen + Lutalyse expense[1/], $	200	267	222	338 =	1027
No. Conceiving to Synchronization	1	11	14	13 =	39
4-Yr. Avg. Cost/Heifer Conceiving	$26.33				

[1/] Average Lutalyse cost was $5.00/Heifer for 66 head not cycling during first 5 days of breeding; semen averaged $7.50 per head.

Table 4. Calving Difficulty and Birth Weights among First Calf Heifers

	Single Injection						Double Injection				
Management Method	**1979-**	**1980-**	**1981-**	**1982-**	**4-Yr.**		**1979-**	**1980-**	**1981-**	**1982-**	**4-Yr.**
Calendar Year	**80**	**81**	**82**	**83**	**Total**		**80**	**81**	**82**	**83**	**Total**
No. Calving	19	16	18[1/]	27	80		20	21	17	24	82
No. Unassisted	18	16	10	17	61		17	21	9	15	62
Calving Difficulty[2/]:											
A.I. Angus:											
Shoshone Monitor-(17An50)	1/1	--	--	--	1		4/2	--	--	--	2
Kadence Shoshone-(7An47)	--	11/0	13/8	--	8		--	14/6	11/7	--	7
Stardust Expansion-(17An1337)	--	--	--	6/5	5		--	--	--	6/5	5
Northern Prospector (29An1329)	--	--	--	4/4	4		--	--	--	11/4	4
Prairie Lane Rito (29An1343)	--	--	--	3/0	0		--	--	--	1/0	0
Angus Clean-up Bull (A-94)	2/0	--	--	--	0		5/1	--	--	--	1
Longhorn Clean-up Bull	16/0	5/0	5/0	14/1	1		11/0	7/0	6/1	6/0	1
Percent Calving Difficulty	Angus Sired 18/40 = 45%						All Angus 19/52 = 36.5%				
	Longhorn 1/40 = 2.5%						Longhorn 1/30 = 3.3%				

Birth Weight Summary:					
4- Year Avg.	**Bulls**	**Heifers**		**Bulls**	**Heifers**
A.I. Angus:					
Shoshone Monitor	72	--		85	72
Kadence Shoshone	72	68.5		71.3	69.5
Stardust Expansion	75	71		75	75
Northern Prospector	69	71		71	63
Prairie Lane Rito	66	64		--	70
Angus Clean-up Bull	73	--		67	70
Longhorn Clean-up Bull	61	55		61	57

[1/] One heifer died.
[2/] First number indicates number of calves sired/second number indicates calving without difficulty.

Table 5. Three Year Actual and Adjusted Weaning Weights, and Partial Economic Analysis When Comparing Two Synchronization Methods[1/]

	Single Injection				Double Injection			
Management	**Bulls**		**Heifers**		**Bulls**		**Heifers**	
Method	**Actual**	**Adj.**	**Actual**	**Adj.**	**Actual**	**Adj.**	**Actual**	**Adj.**
Angus Calves:								
No. Head	10		12		17		11	
Total Wt., lbs.	4524	4916	5323	5977	6951	7599	5019	5868
Avg. Wt., lbs.	452.4	491.6	443.5	498.1	408.9	477	456.3	533.5
Longhorn Calves:								
No. Head	13		13		11		10	
Total Wt., lbs.	4632	5411	4580	6084	4051	4646	3188	3814
Avg. Wt., lbs.	356.3	416.2	352.3	468	368.3	422.4	318.8	381.4
Economics:								
Angus Bulls @ 65¢, $	2,940.60				4,518.15			
Angus Heifers @57¢, $	3,034.11				2,860.83			
Longhorn Bulls @58¢, $	2,686.56				2,349.58			
Longhorn Heifers @55¢, $	2,519.00				1,753.40			
Gross Return, $	11,180.27				11,481.96			
Deduction for Semen + Lutalyse, $	-1,027.00				-1,641.00			
Net Return, $	10,153.27				9,867.96			
Difference Favoring Single Injection, $	285.31							

[1/] Heifer weights are adjusted to bull basis.

USE OF MONENSIN SODIUM IN RATIONS FED TO REPLACEMENT HEIFER CALVES DURING THE WINTERING PERIOD

J.L. Nelson and D.G. Landblom

The North Dakota Agricultural Statistics Bulletin Number 52 for 1983 indicates there were 133,000 replacement beef heifers in the state. Management and feeding of these heifers so they will grow and mature into useful productive cows is of prime concern to North Dakota cattlemen. Since feed makes up a large percentage of the cost of raising replacement heifers, anything that will reduce the feed cost without reducing or impairing reproductive performance should be incorporated into the overall management system.

The feed additive, Monensin Sodium, has been shown to be effective in reducing feed intake by 6-10% without affecting gains under feedlot conditions. With a six month wintering period, and heifers consuming approximately 17 pounds of feed per day, an 8% saving in feed would amount to some 245 pounds. At four cents per pound of feed this would amount to $9.79 per heifer wintered, or approximately 1.2 million dollars in feed savings across the state.

Steer feeding trials reported in the 28th and 29th Annual Livestock Research Roundup indicate a feed savings and cost advantage when Monensin was fed at levels of from 150-300 mg per head per day.

Numerous research reports from across the United States have shown both a feed savings and a cost advantage when Monensin is fed. However, information on how Monensin might affect reproductive performance in heifers is rather limited.

In December, 1981, a trial was started to study the effects of feeding 150-250 mg of Monensin Sodium to replacement quality beef heifers kept for breeding. The trial was designed to monitor feed intake, feed efficiency, weight gain, time of first estrus and overall reproductive efficiency.

In 1982-83 the trial was repeated using good quality Angus X Hereford crossbred heifer calves weighing 550 pounds. In January, all heifers were vaccinated for Brucellosis, given a booster vaccination of 7-way vaccine, wormed with Nematel^{R} (Morantel Tartrate), branded and ear tagged. The heifers were then weighed and allotted, 12 heifers per pen, to either a control ration or a similar ration containing Monensin Sodium. There were two control lots and two treatment lots. Each lot had a slotted board fence on the north and west sides for wind protection, a mounded area with straw bedding for resting and heated automatic watering fountains. Both ration types were fed as complete mixed rations in bunk line feeders designed so that the heifers were actually self-fed. The rations were formulated to promote gains of 1.5 to 1.7 pounds per head per day. The drug, Monensin Sodium, was added to the ration in a carrier called GTA Beef Mix 600^{R} so that each heifer would receive between 150-250 mg per head per day. All heifers were checked daily and were weighed every 28 days.

On March 11, 1983, sterilized detector yearling bulls were added to each group of heifers to help identify estrus activity. The bulls wore Chin-Ball[R] marking halters and were with the heifers continuously until the trial ended on May 9, a period of 59 days. A daily breeding record was kept of all heifers showing estrus. In June, the heifers were synchronized and artificially inseminated to Milking Shorthorn bulls. Following the A.I. period, fertile Milking Shorthorn bulls were used for clean-up breeding. The bulls were removed on July 28, 1983, giving a 47-day breeding period. All heifers were palpated for pregnancy in September, 1983.

The ration formulation fed in 1983 is shown in Table 1.

Table 2 shows the results of the 1983 winter feeding period.

Table 3 shows the estrus detection records.

Table 4 shows the pregnancy test data.

Table 5 shows the calving record of the heifers bred in 1982.

Discussion:

In 1983, heifers fed rations containing Monensin Sodium gained an average of 230 pounds while control heifers gained 242 pounds during the 115-day feeding period. The mild weather conditions allowed the heifers to make excellent gains averaging about 0.3# per day more than predicted. The Monensin fed heifers consumed 6.5% less feed (19.38 vs. 20.72) than control heifers. However, due to the cost of the carrier feed, the actual feed cost per heifer was $1.56 higher than the control.

There did not appear to be any difference in time of first estrus between groups. Approximately 37% of the heifers showed estrus in March and another 46% cycled in April in both groups.

Based on actual calving records of heifers fed Monensin Sodium in 1982 and calving in 1983, it appears that the treatment heifers calved about six days earlier (March 18th vs. March 24th) than did control heifers.

The estimated stage of pregnancy, gathered on September 14, 1983, indicates no advantage in early pregnancy rates were obtained by feeding Monensin Sodium, since about 12% more control heifers were 85 or more days pregnant.

In summary, it appears that including Monensin Sodium in rations for wintering replacement heifers at levels of 150-250 mg/hd./day has improved feed efficiency from 2.6% in 1982 to 6.4% in 1983. However, this improvement in feed efficiency failed to improve weight gains or overall economics in 1983. Winter feed costs averaged $1.56 higher ($95.80 vs. $94.24) for the Monensin Sodium fed heifers over the controls.

Feeding Monensin Sodium did not appear to change the number of heifers that conceived early in the breeding season. However, the treatment heifers fed Monensin Sodium in 1982 actually calved an average of six days earlier in 1983. More years' data will be necessary to see if the trend toward earlier calving will become reality.

The trial will continue for several more years.

Table 1. Ration Formulation – 1983 Trial

	Lots 1 – 3 Monensin	Lots 2 – 4 Control
Initial Ration:		
Mixed Hay, lbs.	600	600
Alfalfa, lbs.	93	93
Barley, lbs.	265	300
Beef Mix RM 600, lbs.	35[1/]	--
TM Salt, lbs.	5	5
Di-Calcium Phosphate, lbs.	2	2
Total	1,000	1,000
[1/] Contains 10.5 mg Monensin per pound of complete feed, fed at 16 lbs/hd./day. Monensin consumed per hd./day = 168 mg.		
2nd Ration – Jan. 25, 1983:		
Mixed Hay, lbs.	400	400
Alfalfa, lbs.	93	93
Barley, lbs.	450	500
Beef Mix RM 600, lbs.	50[1/]	--
TM Salt, lbs.	5	5
Di-Calcium Phosphate, lbs.	2	2
Total	1,000	1,000
[1/] Contains 15 mg Monensin per pound of complete feed, fed at 16.5 lbs/hd./day. Monensin consumed per hd./day = 247.5 mg.		
3rd Ration – March 28, 1983:		
Mixed Hay, lbs.	400	400
Alfalfa, lbs.	93	93
Oats, lbs.	460	500
Beef Mix RM 600, lbs.	40[1/]	--
TM Salt, lbs.	5	5
Di-Calcium Phosphate, lbs.	2	2
Total	1,000	1,000
[1/] Contains 12 mg Monensin per pound of complete feed, fed at 20.3 lbs/hd./day. Monensin consumed per hd./day = 240 mg.		

Table 2. Results of the 1983 Trial When Monensin Sodium is Added to Wintering Rations for Replacement Heifer Calves

	Rumensin	Control	Rumensin	Control
Lot Number	1	2	3	4
No. of Heifers	12[1/]	12[1/]	12[1/]	12[1/]
Initial Wt., lbs:				
Jan. 14	6,555	6,565	6,605	6,625
Avg./Hd.	546.3	547.1	550.4	552.1
Final Wt., lbs.:				
May 9	9,292	9,495	9,385	9,510
Avg./Hd.	774.6	791.3	782.1	792.5
Days Fed	115	115	115	115
Gain/Lot	2,740	2,930	2,780	2,885
Gain/Hd.	228.3	244.2	231.7	240.4
Avg. Daily Gain	1.985	2.123	2.014	2.091
Feed Fed/Lot, lbs:				
Barley	7,450	9,477	7,834	9,118
Oats	4,370	4,962	4,800	5,358
Mixed Hay	11,260	12,367	11,958	12,398
Alfalfa	2,511	2,770	2,675	2,777
Di-Cal	54	60	58	60
Trace Mineral Salt	135	149	144	149
Beef Mix RM 600	1,220	----	1,300	----
Total	27,000	29,785	28,769	29,860
Animal Days	1,439	1,439	1,439	1,439
Feed/hd./day, lbs.:				
Barley	5.18	6.59	5.44	6.34
Oats	3.04	3.45	3.34	3.72
Mixed Hay	7.82	8.59	8.31	8.62
Alfalfa	1.74	1.92	1.86	1.93
Di-Cal	.04	.04	.04	.04
Trace Mineral Salt	.09	.10	.10	.10
Beef Mix RM 600	.85	----	.90	----
Total lbs/day	18.76	20.69	19.99	20.75
% Savings	9.3		3.6	
Feed Cost/Lot, $:				
Barley	232.81	296.16	244.81	284.94
Oats	150.22	170.57	165.00	184.18
Mixed Hay	255.20	247.34	239.16	247.96
Alfalfa	52.78	69.25	66.88	69.43
Di-Cal	11.34	12.60	12.18	12.60
Trace Mineral Salt	8.10	8.94	8.64	8.94
Beef Mix RM 600	132.37	----	141.05	----
Grinding	337.50	372.31	359.61	373.25
Total Cost/Lot	1,160.32	1,177.17	1,237.33	1,181.30
Cost/hd./day	.8063	.8180	.8598	.8209
Cost/hd.	92.72	94.07	98.88	94.41
Cost/Cwt. Gain	42.34	40.17	44.50	40.94

[1/] Gomer bulls (1 per lot) placed with heifers on March 11, 1983 to aid in detection of estrus. Their weight change not included in total lot gain.

Table 3. Time of First Estrus for Replacement Heifers in Monensin Sodium Trial

	Rumensin		Control	
Time of Detection	**Number Head**	**%**	**Number Head**	**%**
March	9	37.5	9	37.5
April	11	45.8	11	45.8
May	3	12.5	2	8.33
Not Detected	1	4.2	2	8.33
Total	24	100.0	24	100.0

Table 4. Pregnancy Data Based on Rectal Palpations Made on September 14, 1983

	Rumensin		Control	
Estimated Days Pregnant	**Number Head**	**%**	**Number Head**	**%**
85+	5	20.8	8	33.3
65+	16	66.7	11	45.8
45+	1	4.2	2	8.3
Open	2	8.3	3	12.6
Total Head	24	100.0	24	100.0

Table 5. Calving Data on Heifers Fed in 1982, Calved in 1983

	Rumensin	**Control**
Total Head	34	34
No. Heifers Calving	27	28
No. Heifers Open-Sold	7	5
Aborted	0	1
No. A.I. Sired Calves	20	20
No. Natural Sired Calves	7	8
Average Date of Birth	77.4	83.0
	(March 18)	(March 24)

BRIEFS OF NEW STUDIES IN PROGRESS

D.G. Landblom and J.L. Nelson

Several new projects at the Dickinson Experiment Station are in various stages of completion, and will not be included in the Research Roundup Report until next year. However, a brief description of each trial and its objectives has been prepared for your information.

Estrus Synchronization: Using heifers we are comparing Estrumate(R), Synchromate-B(R) and Lutalyse(R). Synchromate-B(R) and Estrumate(R) were released this spring by the FDA. It should be noted, however, that Synchromate-B(R) was cleared for use in heifers only. By comparison, our objective is to determine the relative ease of handling these compounds, as well as, economics and overall synchronization success. We are continuing synchronization studies in cows also. Although Synchromate-B(R) is not cleared for use in cows; we are evaluating it when compared to Lutalyse. Included in the Synchromate-B(R) group is a 48 hour short term calf removal, which has been shown to increase synchronization conception rate.

Worming Studies: Two worming studies are under way at this time. In one study we are merely comparing worming with no worming in a group of 84 first calves Angus X Hereford heifers with three way cross calves at side. Period fecal samples are being taken and analyzed by Dr. Myron Andrews of the Veterinary Science Dept., NDSU. Injectable Tramisol(R), manufactured by American Cyanamide Company, was selected as the anthelmentic because of its effective spectrum, and being an injectable, it was simple to administer. Our objective is to evaluate the effects of worming, re-infestation and economic returns under range conditions of Southwestern North Dakota.

In the second worming study the Dickinson Experiment Station and the Veterinary Science Dept., NDSU are working together with research scientists from Pfizer Company to evaluate a new drug that has not been released by FDA. In this study a slow release Paratect(R) bolus, manufactured by Pfizer Company, has been implanted into the second stomach (retilculum) of half of the calves being studied. The objective is to evaluate retention of the experimental bolus and to determine effectiveness of the Paratect bolus for controlling parasitic infections in grazing, suckling calves by providing the calves' direct protection from larval contamination on pasture.

Optimum Vaccination Time for Feeder Calves: This study is being conducted in cooperation with Dr. I.A. Schipper, Veterinary Science Dept., NDSU. Many investigations have been conducted and show that in order to achieve maximum antibody titer, it is necessary to administer two injections of attenuated vaccine separated by three weeks. It is also well established that the stressed animals have elevated corticosteroid levels, which interfere with the immunological activity of an animals' immune system. By design, feeder calves have been subdivided into three groups and vaccinated at either 6_3 weeks before weaning, 3 weeks before and at weaning, and one day and 3 weeks after weaning. Inactivated IBR and BVD vaccines have been used and each calf is being bled before each vaccination and blood serum antibody titers are being determined by serum neutralization at the Veterinary Diagnostic Laboratory, NDSU. Since weaning is obviously a stress period, the objective is to determine the immunological response of feeder calves following vaccination at pre-weaning, weaning and post-weaning.

Beef Cow Efficiency: This is a long-term detailed study which is designed to evaluate representative biological types of cattle with respect to body size and lactation potential. Four cow types will be used and are as follows: Straightbred Commercial Hereford, Angus X Hereford, Milking Shorthorn X Angus X Hereford and Simmental X Hereford. Our objective is to measure year round feed input and correlate it to economic return from calf production. To do this the calendar year is to be subdivided into the grazing phase with calves at side and a drylot gestation and post calving phase. Specifically, while on range, carrying capacity and lactation potential will be identified, and in drylot, winter feed levels will be identified with respect to nutritional requirements that will promote optimum reproductive efficiency. Replacement heifer development among the various breeds will be consistent with maximum reproductive efficiency.

To date, no grazing or winter feeding data have been collected. We have been building up the herds representing the different breed types. Herds of Hereford and Angus X Hereford cows have been built up to the necessary size and the first calf crop of heifer calves of Simmental X Hereford and Milking Shorthorn X Angus X Hereford breeding were born this spring. Pastures for the grazing phase were fenced this summer and corrals still need to be further developed for the handling that will be required. Winter feeding data collection will begin in 1985. Grazing data will be taken for the first time in the spring of 1986.

Calf Scours Control Using Fluorescent Lighting: In cooperation with the Department of Veterinary Science, NDSU, the effect of fluorescent lighting on the control of calf scours is being determined. In this preliminary study there was a trend favoring the use of lights when calves are confined. However, the unconfined control showed less scours by a wide margin. The study will be repeated.