

FINANCIAL AND PRODUCTION ANALYSIS OF HEIFER DEVELOPMENT

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SUMMARY

Management invested into the selection, health, feeding, and breeding of beef heifers being developed for herd replacements contributes to greater potential maternal productivity. A group of 130 spring born heifers representing a variety of breeds and crosses were developed from weaning through pregnancy confirmation with growth, reproduction, health, and costs monitored in a demonstration project at the Dickinson Research Extension Center.

Heifers, consigned to the project by members of the North Dakota Beef Cattle Improvement Association, were selected to have the potential to be above average replacements, with average CHAPS production records of 598 pound, 205 day weaning weight, and a 102 average nursing ratio.

At test start, November 15, the heifers were grouped by weight into light (L), medium (M), and heavy (H) feeding groups, averaging 535, 636, and 737 pounds respectively, and fed a high forage mixed ration containing the ionophore lasalocid. Through the 157 day wintering period in which heifers were housed in open wind protected lots, gains exceeded expectations. This was largely due to feed intakes greater than projected, averaging 1.87, 1.93, and 1.97 for L, M, and H groups respectively for an average daily feed cost of \$.65, \$.66, and \$.72 for the groups.

At realized gains, body condition of heifers increased from a score of 6.0 (1-9 scale) to 7.1. As expected, average

frame scores calculated from hip height measurements collected on heifers at project start, mid winter, and prebreeding remained similar at 5.6, 5.8, and 6.1; tending to increase slightly during the wintering period. All heifers averaged 940 pounds prebreeding on April 19 representing 75% of their average frame score projected mature weight of 1238 pounds and had an average pelvis area of 164 sq. cm.

A high cycling rate was observed in the heifers prior to breeding which contributed to good results from single service AI breeding following synchronization with MGA-prostaglandin in which 124 heifers were inseminated over a three day period. Following a two week lag, heifers were exposed to cleanup bulls for 30 days. Using ultrasound diagnosis, 60% of 111 heifers AI bred on detected heat were determined to have settled to AI service, where as only 1 of 13 heifers not showing heat and time bred on the third day settled to AI service. An additional 37 heifers (29%) were identified to have settled in the first cycle of cleanup service, and 18 (14%) in the second cycle of cleanup service for an overall pregnancy rate of 93% over a breeding season limited to 48 days.

All sires utilized were selected for calving ease using birth weight EPDs, as both sire and heifer development contribute to minimizing calving difficulties and economic consequences associated with calf death loss and rebreeding.

In addition to greater accuracy associated with AI sires for birth weight, selected sires also represented superior genetic merit for combining transmitted growth and milk along with calving ease as reflected by average within breed ranking for birthweight, yearling weight, and milk of AI versus cleanup sires of being within the top 12%, 41%, and 34% versus top 33%, 93% and 88% respectively.

Contributing to efficient gains and high reproduction was the high health status of the heifers in the project. Health treatments (9 heifers treated with antibiotics) and death loss (1 heifer died) were minimized by requiring all heifers to be prevaccinated prior to delivery, giving a booster on arrival, and again vaccinating prebreeding. In addition, heifers were treated with a pour-on for internal and external parasites.

At pregnancy testing on August 9, heifers averaged 1039 pounds (83% of projected mature weight) and a slight loss of prebreeding body condition (6.7) reflecting minimal gains of .9 pounds/day through breeding and while on pasture. Total gain per heifer over the entire 268 day project averaged 403 pounds (1.5 lb/day) and cost totaled

\$241.95 including: feed \$148.64, yardage \$48.65, veterinary \$15.20, and breeding \$29.46. Non breeding costs excluding death loss and interest contribute to a \$.54 cost per pound of gain for heifers on the project. Breeding costs including estrus synchronization, semen, cleanup bulls, and technician fees averaged \$29.46 per pregnancy.

Herd replacements and their development represents a significant cost to cow-calf producers. Costs can be minimized through an investment in management to feed balanced rations to achieve targeted growth, high reproduction, and minimize health and calving problems to increase the productivity of heifer entering the cow herd.

OBJECTIVES

North Dakota herd production records indicate about one third of the heifer calves raised each year are needed for herd replacements. Heifer selection, management, and development decisions can significantly affect lifetime productivity and bottom line profitability.

The Heifer Development Project was initiated with input from livestock production specialists, veterinarians, and producers to demonstrate recommended feeding and health management to get heifers to target weights for desired breeding and calving performance; use of frame scores, body condition scoring, and pelvic measurement to monitor development; use of synchronization to facilitate a concise breeding season and use of superior A.I. sires; the costs associated with raising heifers and the potential for commercial heifer development services, and the relationship between heifer selection and development to future productivity.

MATERIALS AND METHODS

North Dakota Beef Cattle Improvement members utilizing the CHAPS performance recording system were invited to enter home raised heifers born between February 1, 1993 and May 1, 1993. A suggested heifer for the project was a moderate framed crossbred heifer with the potential to make an excellent replacement with a minimum in-herd weaning ratio of 95, out of a dam with an MPPA over 95.

Consigned heifers were delivered in early November to the Dickinson Research Extension Center Manning Ranch Unit accompanied with individual CHAPS information including: calf ID, dam ID, breed, weaning date, and weaning weight, and a certificate of health indicating types and dates of pre-delivery vaccinations and management.

Heifers were required to be pre-vaccinated at least two weeks prior to delivery with IBR, BVD, BRSV, PI₃, haemophilus somnus, and 7-way clostridial. On arrival, heifers received an intranasal vaccination, Iomec for parasite control, and a booster IBR, BVD, PI₃, and BRSV vaccination. Heifers not bangs vaccinated prior to arrival were vaccinated on January 11, and all heifers received a prebreeding vaccination for 5-way Lepto, vibrio, IBR, PI₃, and BVD.

Heifers were given an adaption period in which they were fed a receiving ration and brought on feed. On November 15 the heifers were weighed on test and allocated to three feeding groups based on weight (light, medium, heavy) and placed in open wind board protected, straw bedded drylot pens.

Heifers were fed a mixed ration in fence bunks formulated initially by NRC guidelines using feed analysis for average daily gains of 1.75 pounds per day for large frame heifers and 1.5 pounds per day for small frame heifers. Based on heifer condition, weight, and performance the rations for L, M, H groups were periodically adjusted.

A high roughage ration was fed based on corn silage and chopped hay, along with limited amounts of oats and barley. The ration was supplemented with commercially prepared vitamin-mineral supplements and initially with soybean oil meal to insure it was balanced for mineral, vitamin, and protein requirements. The ionophore Bovatec was included in the ration at the rate of 360 mg/ heifer per day. MGA was included in the prebreeding ration for a 14 day period for estrus synchronization.

Estrus activity was monitored by observation and the use of KMAR patches prior and after feeding MGA. Seventeen days following MGA feeding, all heifers were injected with prostaglandin for estrus synchronization and then inseminated on detected estrus over a four day period. Heifers not detected in estrus were time bred on the fourth day with the exception of several heifers determined not to have a follicle present by ultrasound scanning. A.I. detection and breeding was contracted to Select Sires and ABS. Consignors were given a choice of A.I. service sires available from participating breeding companies, with a list of recommended proven calving ease sires provided.

Following A.I. breeding May 24, heifers were moved to pasture where they remained through pregnancy diagnosis

on August 9. Fifteen days following the end of A.I. service, Red Angus cleanup bulls selected for calving ease were placed with heifers for a 30 day natural service cleanup period.

At approximately 80 days following A.I. breeding, heifers were pregnancy examined using ultrasound scanning to determine pregnancy and breeding cycle confirming A.I. versus natural service sires.

Heifers were weighed, frame scored, body condition scored (1-9), and disposition scored (1-5) at test start, mid-winter, prebreeding, and at pregnancy diagnosis. In addition, prebreeding pelvic measurements were collected and additional periodic weights taken to monitor performance. Frame scores were used to project mature weight (projected mature weight = frame score x 75 + 800) which provided a means to express heifer weights as a percentage of mature weight. It was targeted for all heifers to achieve a minimum of 65% of their projected mature weight prior to breeding.

Heifers completing the project and confirmed pregnant, with an average disposition score of 3 or less, body condition score of 5 or greater, weighing at least 80% of projected mature weight, with a frame score of at least 4 and carrying the service of a recommended calving ease sire will be identified by the NDBCIA as "ND Choice" bred replacements.

Upon project completion and payment of all incurred development costs, consignors may take heifers home or in the case of heifers identified as "ND Choice" bred replacements, may choose to leave the heifers in the care of the Dickinson Research Extension Center for delivery and consignment to the Stockman's Livestock Thanksgiving Special Bred Heifer Sale.

Consignors are responsible for all costs in developing their heifers including: yardage, feed, veterinary products and services, and breeding fees including semen, technician, and cleanup bull costs. Yardage is assessed on a per head per day basis to cover charges for labor, facilities, equipment, utilities, fuel, repairs, and management at a rate of \$.20/day in the drylot and \$.10/day on pasture. Feed is charged at market price based on the average as fed per heifer per day within feeding group. Semen, veterinary supplies, and professional services will be at actual cost. Cost of cleanup bulls are shared by all heifers on test during the breeding period to cover estimated annual ownership cost. Death loss is borne by the consignor.

A \$50 entry fee was collected at time of entry with consignors billed quarterly for incurred costs. Entry fees were credited to final period charges with all fees paid in full prior to release of heifers.

Table 1. Description of Consigned Heifers		
Number of Consignors		9
Number of Heifers		130
Number Per Consignment		3-32
	Average	Range
Heifer Birthdate	March 17	Jan 25-May 4
Heifer Brithweight	83	50-116
Heifer Calving Ease Score	1	1-5
Heifer 205 Day Weight	610	477-773
Heifer Weaning Ratio	103	83-123
Dams MPPA	101.6	93.2-114.7
Heifer 365 Day Weight	911	706-1132
Heifer 365 Pelvic Area	158	116-210
Breeds and Breed Crosses Included: Angus, Gelbvieh, Simmental, Limousin, Hereford, Polled Hereford, Amerifax, Charolais, Salers		

Table 2. Heifer Weight, Body Condition, and Frame Score

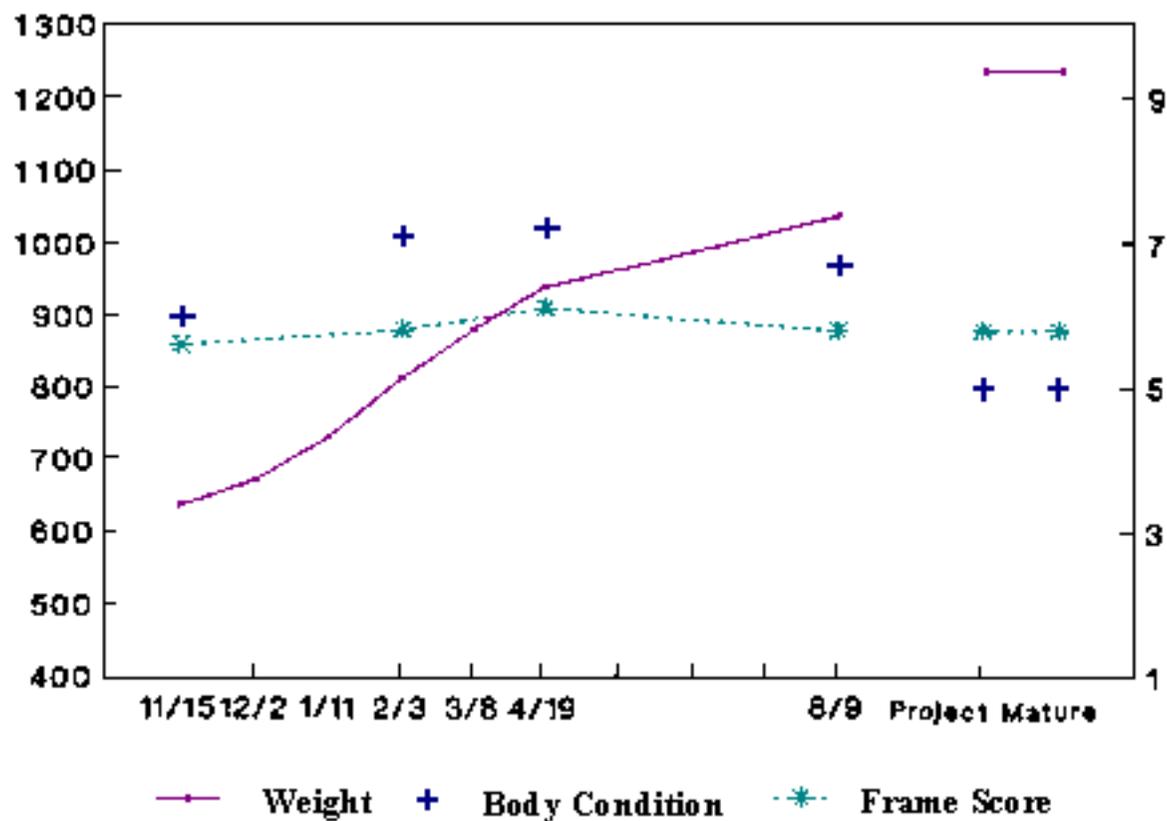


Table 3. Heifer Growth and Development by Feeding Period and Group														
Measurement Date Description	November 15 Test Start				February 3 Mid-Winter				April 19 Prebreeding				August 9 Preg. Diagnosis	
Feeding Group	L	M	H	All	L	M	H	All	L	M	H	All	All	

Weight	535	636	737	636	705	814	915	812	829	940	1046	940	1039
Body Condition	5.6	6.1	6.3	6.0	6.6	6.6	6.7	7.1	7.1	7.2	7.3	7.2	6.7
Frame Score	4.7	5.6	6.6	5.6	5.0	5.8	6.7	5.8	5.3	6.1	6.9	6.1	5.8
Disposition Score	1.7	1.5	1.4	1.5	1.3	1.1	1.1	1.1	1.5	1.1	1.1	1.2	---
Pelvic Area	---	---	---	---	---	---	---	---	163	164	165	164	---
Preceding Period ADG	---	---	---	---	2.1	2.2	2.2	2.2	1.6	1.7	1.8	1.7	.9
Cumulative ADG	---	---	---	---	2.1	2.2	2.2	2.2	1.9	1.9	2.0	1.9	1.5
Projected Mature Weight	1150	1219	1292	1220	1178	1233	1301	1236	1197	1257	1317	1257	1238
% Mature Weight	47	52	57	52	59	66	70	66	69	75	79	75	83

Table 4. Drylot Feed Consumption (Lbs/head/day) and Daily Feed Cost (\$/head/day) by Feeding Period

Feeding Period	Nov. 15-30			Dec. 1-31			Jan. 1-31			Feb.* 1-28			March* 1-31			April 1-20			Apr 21-30	May* 1-24
	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H	All	All
Feed Corn Silage	11.0	10.9	12.7	16.8	17.7	20.2	15.7	15.8	17.2	15.5	17.2	18.6	17.1	16.0	17.7	23.5	24.9	26.5	22.4	10.1
Oat Silage																				8.1
Tame	3.6	4.1	5.9	5.9	6.2	7.1	5.8	5.9	6.5	8.0	8.4	9.3	10.1	9.3	10.4	11.0	11.6	12.1	12.3	10.6

hay																				
Oat Hay													1.1	1.12	1.3	2.8	2.7	2.9		
Oats	2.8	2.0	2.0	3.3	3.5	4.0	3.1	3.1	3.4	3.2	3.4	3.8								
Barley				3.4	3.6	4.1	3.2	3.3	3.6	1.6	1.8	2.0	1.7	1.6	1.8	2.3	2.2	2.4	1.8	1.5
Soy Meal	.37	.39	.50	.94	.97	1.1	.81	.83	.82	.02	.06	.05							.06	
Min-Vit Mix	.11	.07	.06	.22	.23	.26	.21	.21	.23	.21	.22	.24	.22	.20	.23	.27	.29	.30	.16	.23
Vit. ADE	.04	.04	.04																	
Bovatec Supp.				.37	.38	.43	.49	.49	.55	.46	.47	.55	.55	.51	.57	.62	.64	.69	.34	.31
MGA Supp.																			1.47	.20
TOTAL	17.8	17.6	21.2	31.0	32.5	37.1	29.3	29.6	32.3	29.0	31.5	34.5	29.7	27.6	30.7	40.5	42.4	44.8	38.5	31.1
COST	.36	.34	.40	.73	.76	.87	.71	.72	.78	.62	.66	.73	.63	.60	.63	.67	.75	.76	.75	.55

*Not all feedstuffs and additives were in the ration all of the days. Values are averaged over the feeding period.

Table 5. Feed Prices and Usage		
FEED	COST	Total Fed Nov. 15 - May 24
Corn Silage	18/T	1.6 T
Oat Silage	20/T	.1 T

Tame Hay	40/T	.8 T
Oat Hay	40/T	.03 T
Oats	1.25/bu	10.5 bu.
Barley	1.40/bu	8.7 bu.
Soybean Oil Meal	249/Ton	.03 T
Min-Vit Mix	8.07/50 lbs	41.4 Lb.
ADE Supplement	15.15/50 lbs	.64 Lb.
Bovatec Supplement	8.41/50 lbs	86.1 Lb.
MGA Supplement	5.90/50 lbs	19.5 Lb.

Table 6. Service Sires Used in Heifer Development Project										
BREED	REG.#	BIRTH WEIGHT			WEANING WT		YEARLING WT		MILK	
		EPD	ACC	Percentile	EPD	ACC	EPD	ACC	EPD	ACC
AI SIRES *										
Red Angus	274272	-3.2	.72	10	23	.70	49	.68	9	.58
Red Angus	307777	-4.4	.81	5	19	.88	44	.83	10	.35
Red Angus	331945	-4.8	.48	5	15	.45	26	.42	8.7	.26
Angus	10988296	+1	.94	10	31	.93	51	.86	32	.77
Angus	11592069	-2.0	.68	1	24	.64	50	.07	28	.15

Angus	11270134	+1.4	.75	20	29	.71	52	.51	19	.15
Polled Hereford	X23300822	+3.2	.91	35	16	.87	33	.75	4.2	.56
CLEANUP SIRES **										
Red Angus	408699	-1.6	B	20	14	B	22	P+	3	B
Red Angus	408659	+.4	B	45	14	B	18	B	2	B
Red Angus	408660	-.2	B	35	13	B	18	B	3	B
Red Angus	408713	-.9	B	30	16	B	17	P+	1	B
<p>* Angus EPDs from spring 1994 analysis Red Angus EPDs from 1994 analysis Polled Hereford EPDs from spring 1994 analysis ** B calculated as non-parent backsolution P+ calculated from pedigree and individual performance</p>										

Table 7: Breeding Schedule	
MGA feed for estrus synchronization	April 21 - May 3
Heifers injected with prostaglandin	May 20
AI Service Dates	May 22 - 24
Percent Heifers Detected in Estrus	
Day 1 after prostaglandin	0
Day 2 after prostaglandin	28
Day 3 after prostaglandin	53

Day 4 after prostaglandin	6
Cleanup Exposure Dates	June 9 - July 8
Pregnancy Diagnosis	August 9 and 17
Total Length of Breeding Season	48 days
Expected Calving Dates	March 1 - April 20

Table 8: Heifer Reproductive Summary							
	GROUP AVERAGES						
						% MAT	
Group	No.	%	Age	WT	FS	WT	BCS
Overall							
Hfhrs Available for Breeding	127*		432	940	6.1	75	7.2
Hfhrs Settled to AI Service	67	53	429	945	6.3	75	7.2
Hfhrs Settled to 1st Cycle Cleanup	33	26	435	913	5.8	75	7.1
Hfhrs Settled to 2nd Cycle Cleanup	18	14	435	983	6.1	79	7.3
Hfhrs Open	9	7	428	905	5.9	73	7.1
Artificial Insemination							
Hfhrs AI Serviced	124		431	941	6.2	76	7.2
Hfhrs AI Serviced on Detected Estrus	111	90	430	945	6.2	76	7.2

Detected Hfrs Settling to AI	66	60	429	946	6.3	75	7.2
Hfrs AI Serviced on 4th Day w/D.E	13	10	431	981	6.0	79	7.3
Non-Detected Hfrs Settling to AI	1	8	479	886	5.2	74	7.0
* 1 heifer died prior to breeding, 1 heifer was bred and calved, 1 heifer not checked							

Table 9. Summary of Sickness and Death Loss		
	Number	Percent
Total Heifers	130	
Number Treated	9	6.9
Number Died	1	.8

Table 10. Veterinary Procedures and Treatments	
Scheduled Procedures	Date
Prew eaning Vaccination: IBR, BVD, BRSV, Pl ₃ Haemophilus Somnus, Clostridium	minimum of 2 w ks prior to delivery
Arrival Processing: IBR, BVD, BRSV, Pl ₃ Haemophilus Somnus, Clostridium booster IBR Intranasal, ectoparasite control	1st w eek in Nov. on arrival
Bangs Vaccination	January 11
Lice Control	June - July

Prebreeding Vaccination: IBR, BVD, P ₃ Vibriosis, Leptospirosis		April 16
Prostaglandin Injection for Estrus Synchronization		May 20
Ultrasound Pregnancy Diagnosis		August 9
Problems Treated	Number	Treatment
Elevated Temperature	7	injectable antibiotic
Foot Rot	1	injectable and oral antibiotic
Pneumonia	1	injectable and intravenous antibiotics, pasteurella vaccine
Abscess	1	lanced, injectable antibiotic

Table 11. Summary of Heifer Development Project Costs			
FEED			
Feeding Period	Days	Cost/Day	Cost
November 15-30	16	36 $\frac{\text{¢}}{\text{lb}}$	5.76
December 1-31	78 $\frac{\text{¢}}{\text{lb}}$	78 $\frac{\text{¢}}{\text{lb}}$	24.18
January 1 - Feb 3	31	73 $\frac{\text{¢}}{\text{lb}}$	22.63
February 3-28	28	67 $\frac{\text{¢}}{\text{lb}}$	18.76
March	31	61 $\frac{\text{¢}}{\text{lb}}$	18.91
April 1-20	20	73 $\frac{\text{¢}}{\text{lb}}$	14.60
April 21-30	10	75 $\frac{\text{¢}}{\text{lb}}$	7.50

May 1-24	24	55 $\frac{\$}{\text{hr}}$	13.20
May 25-August 9	77	30 $\frac{\$}{\text{hr}}$	23.10
			148.64 *

YARDAGE			
Phase/Item	Days	Cost/Day	Cost
Drylot	191	20 $\frac{\$}{\text{hr}}$	38.20
Pasture	77	10 $\frac{\$}{\text{hr}}$	7.70
Trucking			2.75
			48.65

VETERINARY/TESTING	
Procedure	Cost
Bovishield	.85
Somna Shield	.23
Ivomec	3.35
Intranasal IBR	.31
Preg Guard 9	.78
Bangs	1.80
Lysoff	.30
Treatments	2.21**
Lutalyze	2.67

Pregnancy Diagnosis	2.00
Ear Tags	.70
	15.20
BREEDING	
Item	
Semen	11.46***
Technician	6.00
Clean-up Bull	12.00
	29.46
TOTAL - Test start through pregnancy diagnosis August 9 241.95	
* Feed cost by feeding groups: Light \$144.49, Medium \$147.20, Heavy \$156.52	
** Includes health treatments averaged over all heifers	
*** Average semen cost. Individual semen costs ranged from \$6.00 to \$16.00	

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