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FINANCIAL AND PRODUCTION ANALYSIS OF HEIFER DEVELOPMENT

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RESEARCH SUMMARY

Producers consigned 245 heifers to be developed from weaning to the following fall as herd replacements over a two year period at the Dickinson Research Extension Center as part of a project sponsored by the NDBCIA. Growth, reproduction, health, and costs were monitored in documentation of recommended heifer management practices.

The spring born heifers representing a variety of breeds and crosses were grouped on arrival in November into feeding groups based on needed gains to reach an unshrunk target breeding weight of 70% of projected mature weight based on frame score. One-hundred-thirty heifers were grouped into light, medium, and heavy groups in 1993-1994 averaging 535, 636, and 737 pounds respectively on test start November 15. Average daily gains over the wintering period averaged 1.9, 1.9, and 2.0 respectively for the L, M, and H groups for an average daily feed cost of $.65, $.66, and $.72. Performance and pre-breeding weights exceeded targets for the M and H groups averaging 829, 940, and 1046 pounds; and 69%, 75%, and 79% of projected mature weight for the L, M, and H groups. One-hundred-fifteen heifers in 1994-1995 were grouped into high gain, low gain, and experimental groups averaging 571, 690, and 607 pounds respectively on test start November 21. The experimental group received a ration of long hay and block supplements in contrast to other feeding groups which were fed a balanced forage based mixed ration containing varying amounts of grain depending on gain target. Average daily gains, average daily feed cost, pre-breeding weights, and percent projected mature weight at breeding averaged: 1.7, 1.5, 1.4; $.46, $.46, $.68;

876, 967, 883; and 69%, 75%, 70% respectively for the HG, LG, and E groups.

Averaged over both years, heifers weighed 929 pounds with a body condition score of 7.0 pre-breeding, representing 72% of the average 6.1 frame score projected mature weight of 1257 pounds. Pre-breeding pelvic areas ranged from 129 sq. cms. to 224 sq. cms. averaging 173 sq. cms. Heifers in both years were synchronized with MGA-prostaglandin (with the exception of the E group in the second year in which heifers were synchronized with a double prostaglandin injection) to facilitate AI breeding beginning May 20. Ninety-one percent of heifers responded to synchronization and were inseminated on detected heat over a three day period with an average AI conception rate of 61%. Following AI, heifers were exposed to natural cleanup sires for a breeding season limited to 48 days in 1994 and 49 days in 1995. A total of 95% of heifers were diagnosed pregnant by ultrasound over the two-year project.

All sires utilized were selected for calving ease based on breed and birth weight EPDs, with Angus and Red Angus, AI and cleanup sires ranking in the top 12% and 33% respectively for birth weight.

Heifers received in the project were vaccinated prior to delivery for IBR, BVD, BRSV, PI_3, 7-way clostridial, Haemophilus Somnus, and Pasteurella Haemolytica. On arrival heifers received booster viral and clostridial vaccinations, and were poured for parasite control. Heifers not vaccinated prior to delivery also received Brucellosis vaccinations, and all heifers received a pre-breeding vaccination for IBR, BVD, PI_3, Vibriosis, and Leptospirosis. One heifer died each year of the project for a death loss of .9%, and a total of 24 heifers (9.8%) received antibiotic treatments over the duration of the two years, primarily in the receiving period for respiratory infection.

Final weights averaged 1039 for heifers in the first year of the project taken on August 9, 1994 representing a total gain, overall average daily gain and % mature weight of 403, 1.5, and 83% respectively. Final weights averaged 1101 for heifers in the second year of the project on October 23, 1995 representing a total gain, overall average daily gain, and % mature weight of 470, 1.4, and 88% respectively.

Total development costs excluding interest and death loss for the 365 day November to November period averaged over feeding groups were $282.05 in 1993-1994 and $254.11 in 1994-1995. Costs included by first and second

years respectively were: feed $124.54, $94.55; pasture $52.50, $55.20; yardage $55.60, $49.59; breeding (synchronization, semen, technician, bulls, ultrasound) $36.13, $35.27; health (vaccination, parasite control, treatments) $9.83, $9.66; miscellaneous (ear tags, trucking) $3.45, $9.84.

INTRODUCTION

North Dakota herd production records indicate about one third of heifer calves raised are developed for herd replacements. The management of replacement heifers can significantly affect lifetime productivity and can be considered the foundation upon which profitable cow herds are built. In recognition of the importance of heifer selection and development, the North Dakota Beef Cattle Improvement Association in conjunction with the NDSU Extension Service and Dickinson Research Extension Center initiated a Heifer Development Project in the fall of 1993. The project involved developing producer consigned heifer calves in a central test from weaning through breeding to demonstrate existing recommendations related to the feeding, breeding, health, and management of replacement heifers and document associated costs.

MATERIALS AND METHODS

North Dakota Beef Cattle Improvement Association members utilizing the CHAPS production testing program were invited to enter home raised heifers born between February and May into development projects conducted in both 1993-1994 and 1994-1995. Consigned heifers were delivered in November to the Dickinson Research Center Manning Ranch unit accompanied with individual CHAPS information, a $50 entry deposit credited to development costs, and a signed entry form certifying health management and conveying consigned heifers as security against development charges. Consignors retained ownership of heifers entered and were responsible for all incurred development costs over the period of the test, taking back heifers on test completion the following November and settlement of outstanding charges, with the exception of an experimental group in the second year of the project. The experimental group included heifers purchased by the Dickinson Research Extension Center on delivery based on weight and appraised market price to provide a comparable group for a low input feeding demonstration. Producers retained the option to purchase back heifers in the experimental group at test completion for cost.

Heifers were required to be dehorned and vaccinated at least two weeks before delivery with IBR, BVD, BRSV, PI_3, haemophilus somnus, pasteurella haemolytica, and 7-way clostridial products. On arrival heifers received an intra nasal vaccination, a pour-on for ectoparasite control, and booster IBR, BVD, BRSV, PI_3, and 7-way clostridial vaccinations. Heifers not vaccinated prior to arrival were also vaccinated for brucellosis, and all heifers received a pre-breeding vaccination for 5-way lepto, vibrio, IBR, BVD, and PI_3. As sickness was diagnosed, veterinary recommended treatments were administered.

Heifers were given an adaption period in which they were fed a receiving ration and brought on feed. On test start, November 15 in the first year and November 21 in the second year, heifers were weighed on test, body condition scored, frame scored, disposition scored, and allocated to feeding groups based on weight and target gain. Target gain was determined by calculating the needed gain to achieve 70% of a frame score projected mature weight at the start of breeding. Mature weight was projected by the following formula: mature weight = (frame score*75) + 800. In the first year heifers were assigned to light, medium and heavy feeding groups. In the second year heifers were assigned to high gain, low gain, and experimental feeding groups. Weight gains and body condition were periodically monitored and occasional heifer grouping adjustments were made.

Heifers were wintered in open, wind board protected, straw bedded drylot pens. With the exception of the experimental group in the second year, heifers were fed a mixed ration in fence line bunks formulated by NRC guidelines using feed analysis for established average daily gain targets. Rations were periodically adjusted based on heifer performance and condition. High roughage rations consisting of corn silage, chopped hay, along with limited amounts of oats or barley were supplemented with commercially prepared vitamin-mineral supplements and soybean oil meal when additional protein was needed. The ionophore Bovatec was included in the ration at the rate of 360 mg/heifer per day. Heifers in the experimental group were fed free-choice high quality long hay in bale rings and supplement blocks containing additional protein, vitamins, minerals, and the ionophore Bovatec. The group also received a limited amount of oats and pelleted commercial feed in the initial week on-test. All heifers were pastured following AI breeding.

Heifers were estrus synchronized to facilitate a single service AI service followed by natural clean-up service to begin calving March 1. With the exception of the experimental group, synchronization involved feeding MGA in the

ration for 14 days followed by an injection of prostaglandin seventeen days later. Estrus activity was monitored and breeding heat detected with the use of KMAR patches. A four day AI period followed the prosta-glandin injection with heifers bred on detected heat with heat detection and breeding contracted to Select Sires and American Breeders Service. Heifers in the experimental group received two prosta-glandin injections 11 days apart for synchronization, as they were not being bunk fed. Consignors were given the choice of high accuracy calving ease bulls for AI service selection from participating breeding companies. Heifers not AI serviced were placed with cleanup bulls following the AI period. Cleanup bulls were placed with AI serviced heifers after a 10-day lag period. Cleanup bulls were removed in early July to limit the total breeding season to 48 days in the first year and 49 days in the second year. Natural service sires were calving ease selected Angus and Red Angus bulls using birth weight EPDs.

Heifers were measured for pelvic area pre-breeding and ultrasound pregnancy diagnosed in early August.

Consignors were billed on a quarterly basis for heifer development costs. Feed costs were determined by group feed consumption records and the market or purchase cost of feeds. Yardage was accrued on a per head per day basis to cover labor, facilities, equipment, utilities, fuel, and management set at a rate of $.20/day in the drylot and $.10/day on pasture. The actual costs of veterinary, breeding and miscellaneous supplies and services were incurred by consignors. The annual ownership cost of cleanup bulls was shared by heifers in the project. In the event a heifer died, the loss was borne by the consignor.

Periodic reports were issued to consignors providing growth, health, and reproductive performance.

RESULTS AND DISCUSSION

Ten consignors participated in the first year of the project consigning a total of 130 heifers and 8 consignors participated in the second year's project consigning a total of 115 heifers. A wide variety of breeds and breed crosses were represented in both years with heifers displaying above average herd performance as indicated by weaning performance reported in Table 1. In the first year of the project, heifers were primarily grouped into feeding groups by on-test weight. Due to higher feed intakes than projected, heifer performance exceeded expectations and heifers exceeded winter gains, pre-breeding weight, and percent mature weight at breeding targets. In the second project year, heifers were more closely grouped by gain targets and rations monitored and adjusted to control feed

intake and costs to more closely achieve targets. Drylot heifer growth and development by feeding groups is presented in Table 2. Average rations by feeding groups are presented in Table 3. Not all feeds were fed over the entire feeding period, with ration adjustments made periodically. The ionophore Bovatec was included in all rations for improvement in feed efficiency and because of the evidence that feeding an ionophore can hasten the onset of puberty in replacement heifers.

Heifers in the second year experimental group performed adequately on the simple hay and block supplement ration which minimizes labor and feed equipment requirements. Tame grass hay utilized was of high quality, testing 9.9% CP and 62% TDN on a dry matter basis. Supplement blocks used were provided by Moorman Feeds and contained approximately 40% CP along with supplemental vitamins, minerals, and the Bovatec ionophore. Due to supplement costs and intake, the daily feed cost was higher than other feeding groups which is at least partially offset by lower labor and equipment costs. Different block formulations of varying hardness were used to control intake.

Similar AI and overall breeding success was achieved in both years and reflective of high overall pregnancy rates of 93 and 98% in the limited 48 and 49 day breeding seasons in first and second project years as indicated in Table 4. It appears heifers may have carried greater flesh than was optimal for reproduction in the first year. A reasonable expectation for a single service synchronized AI breeding for heifers developed to a gain target of 70% of expected mature weight at breeding would be for 90% of heifers to display synchronized estrus with 60% of AI serviced heifers becoming pregnant.

Considering heifers were commingled from a number of ranches and had the additional stress of trucking to the project site, health problems and losses were minimal with only 13% of heifers treated and a death loss of .9% over both years of the project. The preventive health-preconditioning management was considered cost effective in consideration of costs to treat sick cattle.

Project costs are summarized in Table 5. significant difference between years occurred primarily due to controlling winter feed costs in the second year by more closely matching performance to target gains.

Interest in the project suggests opportunities for commercial heifer development services in the state. Producers

participated for a variety of reasons including access to AI, lack of on-farm resources to develop heifers, obtainment of additional information on heifers, and the ability to divert limiting feed and pasture to additional income generating cows.

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

Table 1. Heifer Performance by Project Years

	1993-1994	1994-1995
Heifer Number	130	115
Birth date	3/17	3/20
Birth weight	83	85
205 Day Weaning Weight	610	576
205 Day Ratio	103	110
365 Day Yearling Weight	911	826
365 Day Frame Score	5.8	6.4
365 Pelvic Area	158	182
Projected Mature Weight	1238	1280

On-Test Date	11/15	11/21
On-Test Weight	636	631
On-Test BCS	6.0	6.3
% Projected Mature Weight	52	49
Pre-breeding Date	4/19	5/19
Pre-breeding Weight	940	917
Pre-breeding BCS	7.2	6.8
% Projected Mature Weight	75	71
Final Date	8/9	10/23
Final Weight	1039	1101
Final BCS	6.7	6.7
% Projected Mature Weight	83	88
Drylot ADG	1.9	1.6
Pasture ADG	.9	1.2
Overall ADG	1.5	1.4

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Table 2. Heifer Growth and Development by Feeding Groups

	1993-1994 Project Year			1994-1995 Project Year		
Feeding Group	L	M	H	HG	LG	E
On-Test Weight	535	636	737	571	690	607
On-Test BCS	5.6	6.1	6.3	5.8	6.7	6.2
Frame Score	5.0	5.8	6.7	6.2	6.6	6.4
Projected Mature Weight	1178	1233	1301	1265	1295	1276
Target Breeding Weight	825	863	911	858	889	865
Target Winter ADG	1.6	1.2	1.0	1.6	1.1	1.4
Pre-breeding Weight	829	940	1046	876	967	883
Pre-breeding BCS	7.1	7.2	7.3	6.7	7.1	6.5
Actual Gain	1.9	1.9	2.0	1.7	1.5	1.4
% Projected Mature Weight	70	75	79	69	75	70

Table 3. Average Drylot Rations by Feeding Groups (Lbs/Day/As Fed Basis)

	1993-1994 Project Year			1994-1995 Project Year		
Feeding Group	L	M	H	HG	LG	E
Silage	14.5	14.7	15.7	9.7	.3	0
Hay	7.2	7.7	8.4	9.2	15.3	21.0

Oats	1.2	1.2	1.3	3.1	2.2	.2
Barley	1.6	1.6	1.7	.4	.3	0
Soybean Oil Meal	.2	.2	.2	.1	0	0
Mineral-Vitamin-Salt	.2	.2	.2	.1	.1	0
Bovatec Supplement	.4	.4	.4	.3	.4	0
Block Supplement	0	0	0	0	0	.8
Pellet Supplement	0	0	0	0	0	.1
Cost/Day	65	66	72	46	46	68

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Table 4. Heifer Reproduction by Project Year

	1993-1994	1994-1995
Heifer Number	128	113
AI Service Date	5/22 - 5/24	5/21 - 5/23
% Heifers Displaying Estrus	87	96
% Heifers Inseminated by Days Following Prostaglandin		
Day 1	0	0
Day 2	28	18
Day 3	53	55

Day 4	6	23
% Conception of AI Service Heifers	59	63
Cleanup Breeding Dates	6/9 - 7/8	5/23 - 7/9
% Overall Conception	93	98
% Conception by Breeding Cycle		
Synchronized Cycle	53	60
1st Cleanup Cycle	27	23
2nd Cleanup Cycle	13	15

Table 5. Project Development Costs by Project Year

		1993-1994	1994-1995
FEED	Drylot	124.54	94.55
	Pasture	52.50	55.20
YARDAGE	Drylot	38.20	31.19
	Pasture	17.40	18.40
BREEDING	MGA	2.00	1.50
	Prostaglandin	2.67	2.05
	Semen	11.46	11.72

	Technician	6.00	6.00
	Cleanup Bull	12.00	12.00
	Ultrasound	2.00	2.00
HEALTH	Vaccinations	3.97	4.13
	Parasite	3.65	2.60
	Treatments	2.21	2.93
MISC.		3.45	9.84
TOTAL		282.05	254.11

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