Brood Cow Efficiency Study

By

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The long term brood cow efficiency study is designed to evaluate diverse crossbred cow types under the environmental conditions of southwestern North Dakota. This investigation is designed to measure the energy necessary under winter drylot and summer grazing conditions to allow those breeds being evaluated to succeed reproductively and also to document the cost of production. There are three major interactions of importance in the investigation which include the interaction between nutrition and reproduction, the interaction between nutrition and total beef production, and the interaction between grazing intensity and plant density change.

Breed combinations selected represent a cross section of the cattle breeds found in North America, and were categorized according to their expected mature body weight and lactation potential. The Hereford breed serves as the foundation and control breed in the study. The breeding scheme and breed combinations used in this terminal crossing system are shown in the following table:

Cow Breed	**X**	**Sire Breed**	**=**	**Calf Breed**
Hereford (Control)		Hereford		Hereford
Hereford		Charolais		Charolais x Hereford
Angus x Hereford		Charolais		Charolais x Angus x Hereford
Milking Shorthorn x Angus x Hereford		Charolais		Charolais x Milking Shorthorn x Angus x Hereford
Simmental x Hereford		Charolais		Charolais x Simmental x Hereford

The evaluation contains two distinct phases: a drylot wintering phase and a summer grazing phase. During the wintering phase each cow's gestation and lactation feed intake is monitored since body condition and plane of nutrition during the wintering period has a significant impact on rebreeding performance. TDN levels that will promote optimum rebreeding efficiency are utilized. Body weight is measured weekly and used to determine the need for adjustments in TDN levels in the last trimester of pregnancy and during the subsequent lactation period following calving but before turnout on pasture.

During the grazing season, stocking rate, estimated milk production, pregnancy rate and pounds of beef produced per acre are recorded for each breed. Native pastures, representative of mixed grass prairie, consist of three dominant grass species, blue grama (Bouteloua gracilis), western wheatgrass (Agropyron smithii), needle and thread (Stipa comata), and threadleaf sedge (Carex filifolia). Range sites were selected for similar vegetation, soil, slope and position of slope and are representative of three major soil types: sandy, shallow and silty. Data collected from these sites includes herbage production sampled by clipping the vegetation to ground level inside a 0.25 meter square frame both inside and outside exclosure cages. Herbage is separated into grass, forb and shrub components and oven dried at 80 degrees centigrade prior to weighing. Herbage production for each component and total production for each range site is then determined.

Milk production is estimated using the weigh-suckle-weigh method at selected dates during the grazing season. Dates selected for this milking ability evaluation correspond to the varying stages of pasture maturity.

The breeding season begins June 1st of each year and continues for sixty days. The cows are pregnancy tested 45 days after bulls are removed.

Pre and post-calving gain, feed consumption and economics have been summarized for 1986 and 1987 in Tables 1 and 2. Several of the production parameters depicting their relationship to economic efficiency have been summarized in Table 3. The milking ability estimates for each breed have been summarized in Table 4, and herbage production for the various breeds and pastures has been summarized in Table 5.

Summary:

Two production cycles have been completed.

Efficiency in beef production is measured as the feed energy input per unit of beef produced, where the energy input is expressed in terms of megacalories per kilogram of liveweight. In this report digestible energy for each cow type is expressed in terms of megacalories consumed per pound of calf weaned. To date, the average digestible energy consumption in megacalories for each breed has been 7.0 for the Milking Shorthorn x Angus x Hereford (MS x A x H), 7.4 for the Angus x Hereford (A x H), 7.5 for the Simmental x Hereford (S x H), 8.0 for the Hereford (H), and 8.5 for the Hereford control (H-control) group.

Wintering costs represent one of the most important expenses in a cow/calf enterprise. The average wintering cost per head for the two years completed has been $119.38 for the H, $132.11 for the A x H, $135.66 for the MS x A x H, and $144.20 for the S x H. When the cost of wintering is divided by the pounds of calf weaned the picture changes somewhat. The two year average wintering cost per hundred pounds of calf weaned is $22.27 for the MS x A x H, $22.39 for the H, $22.90 for the A x H, $23.63 for the H-control, and $24.48 for the S x H.

The effect of reproductive efficiency on the cow/calf enterprise is of paramount importance and is expressed as the pounds of calf weaned per cow exposed to bulls during the breeding season. When this dimension is added to the picture the outcome changes again, pointing out the differences that exist among the cow types being investigated. The pounds of calf weaned per cow exposed were 594 lbs. for the A x H, 509 lbs. for the H, 472 lbs. for H-control, 466 lbs. for the S x H, and 387 lbs. for the MS x A x H cows: due to a number of open cows among the MS x A x H and S x H cows. It Available energy may have been limiting during the early part of the breeding season for these two breeds. In 1987 the heavier milking S x H and MS x A x H breeds received a supplemental feeding of 8 pounds of rolled barley per head per day during the first three weeks of the breeding season.

Milk production has been estimated at selected dates during the growing season. As might be expected, the MS x A H cross cows produced the highest milk estimate and data indicates that they not only milk heavier, but their lactation profile has the greatest persistance. The two year average season-long milk production has been 15.0 lbs. for the MS x A x H, 14.3 lbs. for the S x H, 12.3 lbs. for the A x H, and 11.0 lbs. for the Hereford cows. It is important to note that the milk produced during the critical early part of the breeding season was substantially higher than the season-long averages depict. Production was 22.2 lbs. for the MSx A x H, 19.3 lbs. for the S x H, 18.9 lbs. for the A x H, and 15.0 lbs. per day per day for the H cows.

The affect of grazing by the various breeds is limited at this stage of the study. Preliminary data indicate that forage utilization is similar with the exception of the S x H cows, which are utilizing more grass. Data collected to date is only baseline and several more grazing seasons will be needed to identify specific changes in herbage production due to breed type.

Table 1. Pre and Post-Calving Gain, Feed Consumption and Partial Economics Summary for 1986

Breed	H	Ms x A x H	A x H	S x H
Pre-Calving:				
No. Head	7	10	10	7
Pre-calving days fed	77	79.8	70.9	77
Starting wt., lbs.	965	964	1042	1124
Final wt., lbs.	1052	1067	1120	1224
Gain before calving, lbs.	87	103	78	100
ADG, lbs.	1.13	1.29	1.10	1.29
Pre-Calving Economics:				
Pre-calving feed, lbs.	3009	2283	2131	2329
Feed/hd/da., lbs.	39.1	28.6	30.1	30.2
Feed cost/hd., $	76.62	57.97	54.17	59.13
Feed cost/hd./ day, $	1.00	.73	.77	.77
Post-Calving:				
No. Head	7	10	10	7
Days fed	50	52	54	55
Calving wt., lbs.	929	926	995	1112
Spring turnout wt. lbs.	967	943	1042	1132
Gain after calving, lbs.	38	17	47	20
ADG after calving, lbs.	.76	.33	.87	.36
Post-Calving Economics:				
Feed/hd., lbs.	2127	3138	3571	3573
Feed/hd/da., lbs.	42.9	60.3	66.1	65.0
Feed cost/hd., $	58.87	83.68	94.87	94.87
Feed cost/hd/da., $	1.17	1.61	1.75	1.73
Combined Wtr. Costs:				
Pre-calving, $	76.62	57.97	54.17	59.13
Post-calving, $	58.87	83.68	94.43	94.87
Total, $	135.49	141.65	148.60	154.00

Table 2. Pre and Post-Calving Gain, Feed Consumption and Partial Economics Summary for 1987

Breed	H	Ms x A x H	A x H	S x H
Pre-Calving:				
No. Head	10	10	10	10
Pre-calving days fed	85	92	91	93
Starting wt., lbs.	1157	1167	1239	1264
Final wt., lbs.	1285	1341	1365	1419
Gain before calving, lbs.	128	174	126	155
ADG, lbs.	1.51	1.89	1.39	1.66
Pre-Calving Economics:				
Pre-calving feed, lbs.	2163	2698	2284	2645
Feed/hd/da., lbs.	25.4	29.3	25.2	28.3
Feed cost/hd., $	65.28	82.95	69.97	82.14
Feed cost/hd./ day, $	.77	.90	.77	.88
Post-Calving:				
No. Head	10	9	10	8
Days fed	39	29	34	33
Calving wt., lbs.	1115	1157	1206	1239
Spring turnout wt. lbs.	1196	1221	1265	1300
Gain after calving, lbs.	81	64	59	61
ADG after calving, lbs.	2.08	2.21	1.75	1.88
Post-Calving Economics:				
Feed/hd., lbs.	994	1175	1252	1320
Feed/hd/da., lbs.	25.5	40.8	37.2	40.6
Feed cost/hd., $	37.98	42.69	45.65	48.24
Feed cost/hd/da., $	.97	1.48	1.35	1.48
Combined Wtr. Costs:				
Pre-calving, $	65.28	82.95	69.97	82.14
Post-calving, $	37.98	42.69	45.65	48.24
Total, $	103.26	129.66	115.62	134.40

Table 3. Summary of Feed and Production Measurements and their Relationship to Economic Efficiency among the Various Breeds

	Hereford (Control)	H	Ms x Ax H	A x H	S x H
No. cows/yr.					
1986	8	7	8 1/	8 1/	7
1987	10	10	10	10	10
No. open cows/yr.					
1986	1	0	3	0	1
1987	3	0	0	1	0
Average weaning wt./ hd./yr.					
1986	466	495	570	540	547
1987	544	570	647	614	631
2 yr. avg.	505	533	609	577	589
Lbs. of calf weaned/ cow exposed/yr.					
1986	----	----	----	----	----
1987	472	509	387	594	466
Lbs. feed consumed/ hd/yr.					
1986	2/	5136	5421	5702	5902
1987		3157	3873	3536	3965
2 yr. avg.		4147	4647	4619	4934
Digestible energy/lb. of calf weaned, Mcal.					
1986	9.5	8.9	7.3	7.6	8.2
1987	7.4	7.0	6.7	7.1	6.8
2 yr. avg.	8.5	8.0	7.0	7.4	7.5
Feed cost/head/yr., $					
1986	2/	135.49	141.65	148.60	154.00
1987		103.26	129.66	115.62	134.40
2 yr. avg.		119.38	135.66	132.11	144.20
Wintering cost/cwt. of calf weaned, $					
1986	29.08	27.37	24.85	27.52	28.15
1987	18.98	18.12	20.04	18.83	21.30
2 yr. avg.	23.63	22.39	22.27	22.90	24.48

1/ Ten cows were wintered in the drylot wintering phase, and eight cows were grazed in the pasture phase.

2/ Only one group of Hereford cows is being used to determine winter feed utilization.

Table 4. Yearly Milking Ability Estimates at Selected Dates and Two Year Average Seasonlong Milk Production

1986 Date Sampled	May 20	Aug. 25	Nov. 7	Average
1986:				
MS x A x H	15.9	15.8	10.1	13.9
A x H	10.1	18.1	5.9	11.4
Hereford	11.4	14.4	6.1	10.6
S x H	15.1	18.7	8.4	14.0
Hereford (Control)	----	14.1	5.9	10.0

1987 Date Sampled	May 5	June 18	Sept. 10	Oct. 30	Average
1987:					
MS x A x H	14.4	22.2	16.4	10.9	16.0
A x H	14.2	18.9	12.1	7.6	13.2
Hereford	14.8	14.8	7.8	8.5	11.5
S x H	15.6	19.3	11.9	11.4	14.6
Hereford (Control)	----	15.4	10.8	9.5	11.9

	2 – Year Average
MS x A x H	15.0
A x H	12.3
Hereford	11.0
S x H	14.3
Hereford (Control)	11.0

Table 5. Mean Total Herbage Production and Percent Difference for Each Range Site, 1986

	Herbage Production (Lbs./Acre)			
	June 26 Pregrazed	October 27 Ungrazed	October 27 Grazed	% Difference
Pasture 1 110 Acre				
Hereford (Control)				
Sandy	1934.9	3079.2	2207.4	28.3
Shallow	1228.5	1118.0	846.8	24.3
Silty	2081.2	2118.2	1045.4	50.7
Pasture 2 92 Acre				
Angus x Hereford				
Sandy	2053.0	2368.0	1857.7	21.6
Shallow	1723.3	1392.7	760.0	45.4
Silty	1943.5	2435.8	1185.8	51.3
Pasture 3 80 Acre				
Simmental x Hereford				
Sandy	1369.0	2278.8	1129.9	50.4
Shallow	995.5	1403.4	871.8	37.9
Silty	2298.9	2456.0	1094.2	55.5
Pasture 4 80 Acre				
Milking Shorthorn x Angus x Hereford				
Sandy	2179.0	2149.1	1246.4	42.0
Shallow	1122.5	763.6	363.9	52.3
Silty	2090.9	1807.8	1115.6	38.3
Pasture 5 80 Acre				
Hereford w/crossbred calf				
Sandy	2314.6	1981.4	953.9	51.9
Shallow	1309.5	685.1	559.0	18.4
Silty	1435.4	2351.3	824.2	65.0