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## REPLACEMENT BEEF HEIFER ECONOMICS

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### CATTLE 91-22

#### Summary

The nutritional management of weaned heifer calves affects not only the conception rate of yearling heifers but also their subsequent conception rate as 2-year-old cows and the weight of their first weaned calf. The costs involved in raising the replacement heifer and the value of cull heifers, 2-year-old cull cows and weaned first calves all need to be considered when determining the least cost method of raising replacement heifers. The effects of raising replacement heifers to prebreeding weights of 50%, 62.5% and 70% of expected mature weight are evaluated from an economic perspective. If replacement heifers are only evaluated for one year (1st conception), then raising replacement heifers to only 50% of mature weight is the most economical. However, if the replacement heifer is evaluated through calving, rebreeding and weaning the first calf, then it is most profitable to raise the replacement heifer to 62.5% of expected mature weight.

(Key Words: Replacement Heifers, Nutritional Management, Economics.)

#### Introduction

Proper development of replacement beef heifers is essential to the economic viability of beef cattle producers. What constitutes proper development of the replacement heifer is an often debated subject by producers, animal scientists and agricultural economists. The extreme views range from barely maintaining the heifer through the winter and counting on compensatory gain in the summer, to creep-feeding heifer calves and then placing them on full feed after weaning. Neither of these two extreme heifer development programs are very desirable for achieving

high conception rates. Animal science research has shown that both result in decreased reproductive performance and milking ability.

The nutritional program of weaned heifers not only affects their conception rate as yearlings but also their conception rate as 2-year-old cows. Failing to account for the reproductive performance of the replacement heifer beyond first conception can result in poorly developed replacement heifers from both a biological and an economical perspective.

The objective of this article is to use data relating the nutritional development of heifers to their subsequent reproductive performance as yearlings and 2-year-old cows to establish the costs and returns associated with different nutritional programs.

#### Materials and Methods

Animal scientists generally recommend that a yearling heifer reach 61 to 65% of her expected mature body weight prior to breeding for maximum reproductive performance. It is not uncommon, however, to find heifers being bred at weights ranging from 50 to 70% of their expected mature weight.

Three alternative replacement heifer management programs are evaluated to determine the associated costs and returns. Under the first alternative, replacement heifers are fed 10.75, .55, and .85 lb per day of prairie hay, alfalfa/grass hay, and corn to reach a prebreeding weight of 50% of their mature weight. Alternative II involves raising the replacement heifers to a prebreeding weight of 62.5% of mature weight by feeding 7.50, 2.65, and 5.10 lb per day of prairie hay, alfalfa/grass hay, and corn. Under the third

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alternative, the heifers are fed 4.40 lb of prairie hay, 3.60 lb of alfalfa/grass hay, and 8.45 lb of corn per day to reach a prebreeding weight of 70% of their mature weight. All of the rations contain trace minerals and vitamin supplements as needed.

The heifer calves were assumed to be of average condition and had a frame score of 4 or 5 with an estimated mature weight of 1,135 pounds. The weight gains for the heifers, their conception rates, the weight of their first calf, and their conception rate as 2-year-old cows are all adjusted to reflect the differences in prebreeding weights.

The cattle prices used in the analysis are 1990 average level prices as reported at Sioux Falls. Feed and other variable costs are also at 1990 levels.

### Results and Discussion

The weight and weight gains of the heifers and their subsequent reproductive performance are summarized for each of the three alternatives in Table 1. The weight gains for the first summer take into account the concept of compensatory gain. A compensatory gain of 50% is assumed, so that half of the May weight difference is made up by November.

TABLE 1. WEIGHTS, WEIGHT GAINS AND REPRODUCTIVE PERFORMANCE OF REPLACEMENT HEIFERS UNDER THREE DIFFERENT MANAGEMENT ALTERNATIVES<sup>a</sup>

Date	Description	Alternative		
		I	II	III
01 Nov	Initial weight	450	450	450
	ADG, winter feeding period	.35	1.20	1.70
01 May	Weight going onto grass	512	667	758
	ADG, 1st month on grass	1.75	1.35	1.17
01 Jun	Weight at start of breeding	568	709	794
	Percent of mature weight	50.0	62.5	70.0
	ADG, summer and fall grazing	1.67	1.25	1.00
01 Nov	Bred replacement heifer weight	823	900	947
	Percent pregnant	72.3	92.5	89.3
	ADG, second winter	.90	.90	.90
01 Mar	Precalving weight	931	1008	1055
	Postcalving weight	801	878	925
	ADG, March 1-November 1	.77	.70	.66
01 Nov	Weight of weaned calf	410	435	445
	Bred second calf cow	990	1050	1087
	Percent pregnant	77.0	93.3	92.1

<sup>a</sup> The conception rates and weight of first weaned calf were estimated from data by Patterson et al., Fleck et al., Lemenager et al., and Short and Bellows.

Yearling conception rates are 72.3, 92.5, and 89.3% for the three alternatives. The weights of the first weaned calf vary from 410 to 445 pounds. The rebreeding performance is 77.0, 93.3, and 92.1% under each of the three alternatives.

The market prices for calves, yearlings and cull cows used in this analysis are presented in Table 2.

The costs of feeds used in the rations and the cost for summer and aftermath grazing also are contained in Table 2. The livestock prices and feed costs displayed in Table 2 are combined with the biological and reproductive data in Table 1 to create enterprise budgets for each of the three management alternatives. These budgets are contained in Table 3.

TABLE 2. PRICES FOR CALVES, YEARLINGS AND CULL COWS AND COSTS OF FEED AND PASTURE USED IN RATIONS

Description	Unit	\$/unit
Steer calves	cwt	99.22
Heifer calves	cwt	92.50
Cull yearling heifers	cwt	80.47
Cull 2-year-old cows	cwt	51.21
Prairie hay (9% crude protein)	ton	48.00
Alfalfa-grass hay (15% crude protein)	ton	60.00
Corn grain	bu	2.50
Soybean meal	ton	225.00
Dical	ton	320.00
Vitamin A supplement	ton	800.00
Trace mineral supplement	ton	160.00
Summer pasture	AUM	10.00
Fall aftermath (1 month)	head	5.00

The total costs for the first year range from \$645 under Alternative I to \$703 under Alternative III. All of the heifers that are open after a 63-day breeding season are culled and sold in the fall. The value of these cull heifers is subtracted from the total first year's cost. The final step to evaluating the first year's cost is

to adjust for the actual number of bred yearling heifers. Both the number of cull heifers and death loss of heifers enters this equation. A 1% death loss is assumed for all three alternatives. The equation for the net cost of one bred yearling heifer is:

$$\text{Net Cost for 1 Bred Yearling} = \frac{\text{Net 1st Year's Cost}}{\text{Yearling Conception Rate} - \text{Percent Death Loss}}$$

TABLE 3. NET COST OF RAISING REPLACEMENT HEIFERS--WEANED HEIFER  
THROUGH 31 MONTHS OF AGE UNDER THREE DIFFERENT  
NUTRITIONAL MANAGEMENT ALTERNATIVES

	Alternative		
	I	II	III
Opportunity cost of heifer	\$416	\$416	\$416
Feed costs			
Winter	58	85	105
Summer	46	51	54
Aftermath	5	5	5
Other variable expenses	55	55	55
Interest at 10%	50	51	53
Fixed expenses	<u>15</u>	<u>15</u>	<u>15</u>
Total 1st year's costs	645	678	703
Less value of cull heifers	<u>183</u>	<u>54</u>	<u>82</u>
Net 1st year's costs	462	624	621
Net cost for 1 bred yearling heifer adjusted for death loss and culls	<u>\$648</u>	<u>\$682</u>	<u>\$703</u>
Cost of a bred heifer	\$648	\$682	\$703
Feed costs			
Winter	90	89	91
Summer	72	72	72
Aftermath	5	5	5
Other variable expenses	65	65	65
Interest at 10%	76	80	82
Fixed expenses	<u>26</u>	<u>26</u>	<u>26</u>
Total 1st and 2nd years' costs	982	1019	1044
Less value of cull 2's	117	36	44
value of weaned calf	<u>366</u>	<u>396</u>	<u>401</u>
Net 1st and 2nd years' costs	499	587	599
Net cost for 1 bred 2-year-old cow adjusted for death loss and culls	<u>\$657</u>	<u>\$636</u>	<u>\$658</u>

With the prices used for this analysis, the net cost for one bred yearling are \$648, \$682, and \$702 for the three alternatives.

If replacement heifers are only evaluated for 1 year (7 to 19 months), then it appears that the most cost effective method for raising bred yearlings is to follow a rather low nutritional development program. Additional heifers must be retained under this alternative to make up for the number of open heifers, but they can be sold as yearlings to go into a feedlot. However, the second year of the replacement heifer's life, which involves calving, rebreeding, and weaning the

$$\text{Net Cost for 1 Bred 2-year-old cow} = \frac{\text{Net Cost for 2 Years}}{2\text{-year-old Conception Rate} - \text{Percent Death Loss}}$$

The net cost for a bred 2-year-old cow under Alternatives I, II, and III is \$657, \$636, and \$658, respectively. When the replacement heifer is evaluated for the second year, Alternative I is no longer the least cost alternative. Alternative II, raising the heifer to a prebreeding weight of 62.5% of mature weight, is the least cost alternative. After the second year is evaluated, there is little difference in cost under Alternatives I or III.

In conclusion, failing to account for the reproductive differences and the economic costs and returns of the replacement heifer beyond first conception as a yearling can lead to improper replacement heifer development from both a biological and economic perspective. The least cost method of raising bred 2-year-old cows is to nutritionally manage heifers so that they reach approximately 62.5% of their expected mature weight prior to breeding.

Several other factors also influence the biological productivity and economic value of replacement heifers such as breed type, climate, ranch topography, etc. However, these factors were not considered in this analysis.

first calf, is very critical to the overall profitability of the replacement heifer and the entire cow herd.

The feed costs and other variable costs are similar for all three alternatives through the second year. The total costs are \$982, \$1,019, and \$1,044 for Alternatives I, II, and III, respectively.

All of the open 2-year-old cows are culled and sold and this value, along with the value of the weaned calves, is subtracted out to arrive at the net cost for the 2 years. The net cost for a bred 2-year-old cow is arrived at by the following equation:

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