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## Managing for Today's Cattle Market and Beyond

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March 2002

# *The Costs of Raising Replacement Heifers and the Value of a Purchased Versus Raised Replacement*

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Numerous sheets of notebook paper have been trashed, considerable barnyard door space has been used, and many brain cells have been drained by ranchers, bankers and agricultural economists in an attempt to determine the cost (or value) of a replacement heifer. On the surface, it appears rather straight forward to determine this value: assign a dollar value to a weaned heifer calf; calculate the winter feeding costs and the summer grazing and breeding costs; add these together and the total is the cost of the replacement heifer. However, this is only the beginning; a very basic starting point. Adjustments must be made to the cost of the replacement heifer when one realizes that varying the replacement rate changes the number of calves and cull cows available to sell. Production from a replacement heifer (calf weaning weights and percent calf crop weaned) is typically less than that of a mature cow and the management of the replacement heifer will effect her level of production. Is it possible to adjust the value of the heifer to account for these issues? What about the type of bull used on the heifer, the amount of calving problems, and the subsequent reproduction of the second calf heifer?

As one begins to account for the above mentioned factors, the cost of the raised replacement heifer generally increases. In addition one finds many different opinions as to what that cost actually is. This adds fuel to the age old debate of rather it is better to

raise your own replacement heifers or buy bred replacements from others.

There probably isn't one best answer for all producers all of the time. The correct decision for each individual rancher will depend upon their own costs, management practices, and the current and expected market prices for calves, replacement heifers and cows.

Cattle type should also be considered as some types of cattle are well suited for the slaughter market but have poor maternal traits.

The intent of this paper is to evaluate the economics of various heifer management practices by accounting for the biological production realities associated with the cow herd, and particularly the replacement heifer. Once the appropriate costs of a replacement heifer are established, the raising versus purchasing decision can be analyzed.

### ***Realities of Herd Replacements***

The first issue that needs to be addressed is the actual replacement rate needed to maintain the cow herd. It is not uncommon to hear of replacement rates varying from 10% to 30%. Many individuals probably underestimate the actual number of replacements required when they are preparing budgets. Over the long term, an average replacement rate of 15% to 25% is probably required for most herds.

The size of the cow herd, the resources available,

and the degree of management will all affect the required replacement rate. Table 1 contains a sensitivity analysis when the expected death loss and conception percentages are changed. For example, with only an 84% conception rate and a 3% annual death loss, a 28.3% replacement rate is required. A replacement level that high would require more than 50% of the heifer calves to be kept as replacements.

However, with improved management (94% conception rate and 1% death loss) only a 15.5% replacement rate is required. Clearly, management aimed at increasing the overall herd conception rate, could have some positive effects on ranch returns. The first place to start improving herd conception rates is with replacement heifers.

**Table 1. Sensitivity Analysis -- Weaned Replacement Heifers Needed as a Percent of the Number of Cows to Calve.**

Death Loss	Conception Rate Percentage					
	84%	86%	88%	90%	92%	94%
1.0%	25.9	23.5	21.2	19.1	17.2	15.5
2.0%	27.1	24.5	22.2	20.0	18.1	16.3
3.0%	28.3	25.7	23.3	21.0	19.0	17.1

### **Heifer Management Options**

Having determined the number of replacements required, one can begin to look at alternative strategies for raising replacement heifers. A very crucial factor in determining the average cow herd conception rate is the management of the replacement heifer. Research consistently has shown that management of the replacement heifer as a yearling not only effects reproductive performance as a 1st calf heifer, but also has an effect on subsequent reproductive performance as a 3 and 4 year old cow. A heifer that has adequate size, is bred early in the season, and doesn't have major calving problems is likely to breed back earlier and consistently wean a heavier than average calf. On the other hand, a heifer that has not had adequate growth likely will conceive later, experience greater calving difficulty, and have a greater tendency to be late re-breeding or be open.

At what age or at what size will a heifer reach puberty and be ready to breed? Research has shown that size is more important than age, and that size needs to be a relative measure. English breeds will reach puberty at lighter weights than will larger continental

breeds. Animal scientists generally recommend that a heifer be at 65% of mature cow weight prior to the breeding season. To reach this objective the heifer probably will need to be fed to gain at least one pound per day through the winter. Lower rates of gain can decrease substantially the reproductive potential of the heifer.

Four different heifer management programs were analyzed by varying the average daily gain through the first winter to arrive at various prebreeding target weights. The daily gains and the performance of these heifers are contained in Table 2. The beginning weight of the heifers is assumed to be 500 pounds and the normal mature cow weight is 1175 pounds. A six month winter feeding period also is assumed and allowance is made for compensatory gains in the summer for animals gaining less through the winter.

It is apparent from the data in Table 2 that both the conception rate of yearling heifers and their subsequent conception rate after their first calf are effected by the prebreeding target weight. The weight of the first weaned calf also is effected by the size of the heifer. One can also notice

**Table 2. Four Different Replacement Heifer Management Programs and the Subsequent Productivity of the Replacement Heifers (Based on an 1175 Lb Mature Cow Weight and a 180 Day Winter Feeding Period).**

Date	Description	Program			
		I	II	III	IV
01-Nov	Initial wight	500	500	500	500
	ADG winter feeding period	0.55	0.90	1.25	1.63
01-May	Weight going onto grass	600	663	726	795
	ADG 1 <sup>st</sup> month on grass	1.50	1.35	1.20	0.90
01-Jun	Weight prior to first breeding	646	705	763	823
	Percent of mature weight	55%	60%	65%	70%
	ADG summer and fall grazing	1.30	1.10	0.90	0.70
01-Nov	Bred replacement heifer weight	845	873	901	930
	Percent pregnant	84%	91%	93%	89%
	ADG 2 <sup>nd</sup> winter	0.95	0.95	0.95	0.95
01-Mar	Pre-calving weight	959	987	1015	1044
	Post-calving weight	829	857	885	914
	ADG Mar1 - Nov 1	0.75	0.75	0.75	0.75
01-Nov	Weight of first weaned calf	445	460	475	485
	Bred 2 <sup>nd</sup> calf cow weight	1013	1041	1069	1098
	Percent pregnant	86%	92%	94%	92%

that the advantages, in terms of productivity, are quite small or negative in going from program III to IV. This suggests that there may not be much advantage to feeding heifers to reach prebreeding weights in excess of 65% of the mature weight.

***Cost of Raising Replacements Heifers***

By looking at the economics of these four different programs, i.e. the costs and the returns, one can gain additional insight into the overall replacement

heifer enterprise. Table 3 contains 1999 level prices for cattle and feed used in evaluating the economics of the various heifer management programs.

A 63 day breeding season is assumed and yearling heifers are bred one month earlier than mature cows. All open heifers and cows are assumed to be sold. Based on these assumptions, replacement heifer budgets were developed for each of the four different management programs. The results are displayed in Table 4.

**Table 3. Livestock Weights and Prices and Feed Costs Used to Evaluate the Alternative Replacement Heifer Management Strategies.**

Item		Price/Cost
Steer calf	540 lbs	\$ 92.00 per cwt.
Heifer calf	500 lbs	87.50 per cwt.
Yearling heifer	845-930 lbs	75.00 per cwt.
Cull two yr. cow	1013-1098 lbs	47.00 per cwt.
Cull cow	1100 lbs	33.00 per cwt.
Grass hay	11.0% CP	50.00 per ton
Alfalfa-grass hay	15.0% CP	60.00 per ton
Alfalfa hay	17.0% CP	70.00 per ton
Corn grain		\$2.00 per bu.
Soybean meal		160.00 per ton
Summer pasture		16.00 per AUM
Fall pasture		10.00 per AUM

Least-cost winter feed rations were developed that satisfied the nutritional requirements for the various rates of gain presented in Table 2. Summer range was valued at \$16 per animal-unit-month (AUM) and the weight of the yearling heifers were considered when accounting for the required number of AUM's. Other variable expenses included such items as: veterinary, supplies, breeding, machinery costs, etc.. Interest was charged on the value of the animal and half the value of the variable expenses and feed costs. The fixed costs include insurance and depreciation on livestock

buildings and equipment. The value of the heifers culled and sold is subtracted from the total costs to arrive at the net cost value. Since it takes more than one heifer calf to end up with one bred heifer (due to death loss and culls) the net cost figure is adjusted to show the total cost of getting one bred yearling heifer (Table 4)<sup>1</sup>. This number represents what one could afford to pay to obtain one bred heifer and just break-even with the cost of raising the bred heifer. Also, selling surplus bred heifers for more than this amount would be net profit.

**Table 4. The Total Direct and Indirect Costs of Raising Replacement Heifers Under Four Different Management Practices (Weaned Heifer Through 31 Months).**

Description	Program			
	I	II	III	IV
Opportunity cost of the heifer	\$438	\$438	\$438	\$438
Feed costs: Winter	80	87	96	107
Summer	77	80	84	87
Aftermath	10	10	10	10
Other variable expenses	60	60	60	60
Interest @ 10%	55	56	56	57
Fixed expenses	<u>15</u>	<u>15</u>	<u>15</u>	<u>15</u>
Total 1 <sup>st</sup> year's costs	735	746	759	774
Less: value of cull heifers	<u>113</u>	<u>72</u>	<u>63</u>	<u>89</u>
Net 1 <sup>st</sup> year's costs	622	674	696	685
Net cost for 1 bred yearling heifer adjusted for death loss and culls	\$776	\$775	\$785	\$804
Cost of a bred heifer	\$776	\$775	\$785	\$804
Feed costs: Winter	120	123	125	127
Summer	96	96	96	96
Aftermath	10	10	10	10
Other variable expenses	70	70	70	70
Interest @ 10%	92	92	94	96
Fixed expenses	<u>26</u>	<u>26</u>	<u>26</u>	<u>26</u>
Total 1 <sup>st</sup> & 2 <sup>nd</sup> year's costs	1190	1192	1206	1229
Less: value of cull 2 year old cows	89	57	46	59
value of weaned calf	<u>359</u>	<u>380</u>	<u>396</u>	<u>409</u>
Net 1 <sup>st</sup> & 2 <sup>nd</sup> year's costs	742	755	764	761
Net cost for 1 bred 2 year old cow adjusted for death loss and culls	\$888	\$846	\$838	\$852

It should be noted that through this stage of the analysis the cheapest program is to feed the heifers to reach only 60 percent of mature weight at breeding. Unfortunately, many analyses of replacement heifers stop here and recommend program I or II. But, the next year of the replacement heifers life is very important in determining her true value to the cow herd.

The feed cost, variable expenses, interest, and

fixed expenses are almost identical under each of the four management alternatives through the second year of the replacement heifers life. The total 2nd years costs include the value of the bred replacement heifer at the start of the second year. The next section of Table 5 is very critical to accurately valuing the replacement heifer. Sales of cull 2 year old heifers are considerably larger under programs I, due to a greater number of

heifers being open after a 63 day breeding season. However, due to lower calf weights, the value of calves sold from heifers kept under programs I and II is less. The net costs still appear to favor program I. However, the net cost must be adjusted to obtain the cost of having one bred 2 year old cow (accounting for death loss and cull 2 year old sales)<sup>2</sup>. Then, the bottom line value shows it is optimal to feed the replacement heifers under program III, to reach 65 percent of mature weight prior to breeding.

### ***Purchasing versus Raising***

Once the cost of raising a replacement heifer from a weaned calf to a bred yearling heifer and to a bred 2 year old cow has been determined, one can begin to evaluate the decision of raising versus purchasing replacements. The decision to raise replacements or buy bred yearling heifers would appear to be relatively straight forward to evaluate. One simply compares the cost of buying bred yearling heifers with the adjusted cost of raising one bred yearling heifer in Table 4. If feed costs and other marketable resources were valued at their market value, and if the same number of cows are being run, then one could pay the same amount as the adjusted raised cost and just break-even. However, purchases of bred yearlings do not need to occur in November. Based on the variable costs in Table 4, each additional month should be worth about \$30 more per head.

There is another possibility also to consider: if the replacements were purchased, rather than raised, additional resources would be available on the ranch. This is apparent by looking at animal units (AU) compared to cow units. If one doesn't include horses and bulls in the calculation, then raising replacement heifers requires about 1.15 AU's for each cow expected to calve. So if a ranch had the resources to calve out 100 cows plus raise the replacements, it would be able to calve out 115 cows if the replacements were purchased. These additional resources could be used to retain calves and sell them as yearlings or run additional cows on the ranch. The amount of profit from the retained calves or additional cows would then increase the value of a purchased bred heifer compared to the cost of raising the bred heifer.

The general level of livestock prices and feed costs were varied to determine what effect these variables would have on the cost of raising replacement heifers. Varying cattle prices and feed costs also effects the profitability of running beef cows, which changes the value of the additional resources available when replacements are purchased. The cost of raising replacement heifers under program III and the break-even purchase price for bred yearling heifers are displayed in Table 5. The top number in each cell is the cost of raising a bred yearling heifer and the bottom number is the break-even value for a purchased bred heifer in November.

**Table 5. The Cost of Raising Bred Yearling Heifers and the Break-even Value for Purchased Bred Heifers Under Various Cattle Prices and Feed Costs.**

General Level of Feed Costs	General Level of Cattle Prices		
	10% Lower	Expected	10% Higher
10% Lower	\$715 <sup>a/</sup>	\$762	\$810
	\$787 <sup>b/</sup>	\$828	\$870
Expected	\$737 <sup>*</sup>	\$785	\$832
	\$820 <sup>*</sup>	\$862	\$903
10% Higher	\$760 <sup>*</sup>	\$807	\$855
	\$853 <sup>*</sup>	\$895	\$937

<sup>a/</sup> The cost of raising a bred yearling heifer.

<sup>b/</sup> The break-even value for a purchased bred heifer in November.

<sup>\*</sup> At these prices, the replacement heifer is not profitable.

As one would expect, the cost of raising a bred yearling heifer increases with increasing feed costs and increasing cattle prices. Changing feed costs and cattle prices also effect the purchase break-even price. Depending upon the price scenario, the break-even purchase value for a bred heifer is about \$50 to \$100 higher than the cost of raising the heifer. This assumes that the additional resources are used to run 15% more cows.

There are also a couple of other considerations in this decision. What is the breeding of the raised heifers versus the purchased heifers? How will this breeding effect their subsequent performance in the cow herd? Another vary important question is knowing the management program of the purchased heifers, because, as this analysis has shown, that will greatly effect their subsequent performance and their value. The numbers contained in Table 5 assume the purchased heifers are bred and raised similar to the raised heifers and that the additional resources are used to run additional cows.

### **Summary**

Selection and development of cow herd replacements is extremely important to the overall management of the cow herd. A decision on replacements this fall will have an impact on the profitability of the cow herd for at least the next 10 years. When one considers keeping offspring of current replacements for future replacements, then herd profitability will be altered further into the future.

The first step in evaluating replacement strategies is to first identify the level of replacements required to maintain desired herd size. The replacement rate may vary from 15% to 25% depending upon herd management. The next step is to carefully evaluate the heifer management plan and attempt to identify all direct and indirect costs associated with that plan. To correctly evaluate all costs and returns associated with raising replacement heifers analysis must be done beyond first conception. Calving, re-breeding, and size of the first weaned calf are all important considerations.

Adequate feed and management must be provided to reach higher production goals. This research, along with the recommendations of many animal scientists, suggests that a replacement heifer needs to be at 65% of mature weight prior to first breeding. Only after all costs of raising replacements have been accounted for can one analyze the current market conditions and look at purchasing versus raising replacements.

If replacements are purchased rather than raised fewer resources will be required to calve the same number of cows. The assumption regarding the use or sale of the additional resources effects the break-even value for purchased replacements. Time of purchase, level of calf and cull cow prices, and feed costs all effect the break-even value for purchased replacements.

The livestock prices and feed costs presented in this analysis are used only for example purpose. They may not be very representative of your particular operation and market area. However, by following a similar budgeting approach, you should be able to identify your costs of raising bred heifers and bred two year old cows. In general, you could probably pay \$50 - \$100 more for a bred heifer, than your cost of raising the heifer.

Genetic quality differences will be important in determining the price, but were not analyzed in this paper. Producers wanting to change the type of cattle in their herd, can do this more rapidly through purchasing replacements. However, this may also add more variability into their herd, and increase the incidence of sickness or disease.

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<sup>1</sup> Net cost = Net 1st year's cost ÷ (1 - percentage culled and died)

<sup>2</sup> Net Cost = Net 1st & 2nd year's cost ÷ (1 - percentage culled and died)