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Analyzing the Economics of Raising versus Buying Beef Replacement Heifers

Gayle S. Willett
Donald D. Nelson
ANALYZING THE ECONOMICS OF RAISING VERSUS BUYING BEEF REPLACEMENT HEIFERS

by
Gayle S. Willett and Donald D. Nelson

INTRODUCTION

Successful cow-calf operators constantly look for ways to improve business net income. They often focus attention on ways to reduce costs while maintaining or increasing production. A major cost is obtaining an adequate supply of genetically acceptable replacement heifers that calve at 23-25 months. Although most producers raise herd replacements, purchasing them sometimes can be an attractive alternative. Selecting the most economical source of replacement animals has major implications for effectively using resources, cost control and long-run business viability. The objective of this bulletin is to briefly review the pros and cons of raised versus purchased beef replacement heifers and to present a budgeting procedure that ranchers and others can use to compare the economics of these two alternatives.

POTENTIAL ADVANTAGES OF RAISING REPLACEMENTS

1. More Genetic Control

Your breeding program may involve several generations of selecting for maternal traits (calving ease, milk production, mothering ability, fertility, etc.) that would be difficult to purchase elsewhere. It may not be possible to purchase crossbred heifers with the breed makeup you desire. In addition, insuring that heifers reach their critical minimum breeding weight at 14 to 15 months of age and selecting bulls with calving ease characteristics will result in a higher percentage of calves born without difficulty. National sire summary data (expected progeny differences or EPD’s) for specific breeds help identify bulls that sire calves with low levels of calving difficulty and still possess growth genetics. By effectively using this information in raising your own heifers, you can avoid buying someone else’s calving problems.

2. Better Understanding of Replacement’s Background

Replacement heifers raised on your ranch may be better acclimated to your ranch’s environment (climate, terrain, feed resources, diseases, parasites and overall level of management).

*Respectively, the authors are Extension Economist, Department of Agricultural Economics, and Extension Beef Specialist, Department of Animal Sciences, Washington State University, Pullman, WA.*
By raising your own replacement heifers, you are in a better position to evaluate their temperament. You can also accustom the heifers to the manner in which they will be handled when added to your cow herd.

3. More Control Over Disease

It is possible to introduce venereal diseases, such as vibriosis and trichomoniasis, into your herd if you purchase heifers bred via natural service. This is unlikely to be a problem if you purchase artificially inseminated heifers.

4. Cost Less to Raise Than Buy

You may be able to raise your own replacement heifers more cheaply than buying heifers, if you have a cheap source of feed or if you will have a large expense to transport heifers to your ranch. However, to determine this, you need good replacement heifer enterprise records so you know actual production costs for a bred replacement heifer.

POTENTIAL ADVANTAGES OF BUYING REPLACEMENTS

1. Free-up Resources for Alternative Uses

Purchasing replacement heifers eliminates the need for a group of weaned to 2-year old heifers that consume resources but produce no calves. Feed consumed by growing heifers might be used more productively by females that will produce a calf. This would spread fixed costs over more productive units, thereby reducing costs per cow.

2. Can Expand Herd or Change Breeding Program in Less Time

Purchasing replacement heifers might let you acquire particular breed crosses so that all cows in the herd are crossbreds. Then you could fully exploit the benefits of heterosis or hybrid vigor which requires using crossbred females. Heterosis (hybrid vigor) is the degree to which crossbred calves deviate from the average of calves of the parental breeds. Crossbreeding may result in relatively small levels of heterosis for each trait, but these effects tend to accumulate so that there can be large increases (25%) in overall productivity.

Keeping a straightbred herd to produce first-cross females (a herd of Hereford cows bred to Angus bulls to produce black-baldy females) reduces the potential benefits from heterosis on a whole-herd productivity basis. Purchasing crossbred replacement females would allow you to use terminal sire breeds selected for growth to maximize pounds of calf produced per cow. In the terminal sire system, mature cows are bred to the terminal sire and all calves are sold. This system also allows you to change sires rapidly so that calves can be changed according to market demands or resources.
Purchasing replacement females reduces the number of breeding groups required to produce the desired crossbred females. This helps simplify management during the breeding season and may reduce the number of bulls you need to own.

3. May Cost Less to Buy Than Raise

Growing heifers from weaning to breeding requires feed inputs which may be more costly to you than if they were provided by someone else who has cheaper feed sources. Further, if heifers are grown poorly from weaning to breeding, puberty will be delayed, conception rate reduced, calving season extended and cost per pregnant heifer increased.

Extended calving season, coupled with a large number of females calving late, reduces average calf age at weaning. The net result is reduced weaning weights. A 20-day reduction in age at weaning has almost the same effect on the average weight per calf weaned as a 10% reduction in calf crop.

If you do not have feed resources and facilities to grow heifers properly from weaning to breeding and then get them bred efficiently, you may be money ahead buying replacement heifers from someone who can. A heifer should reach 65% of her mature weight by breeding time and 85% of her mature weight at first calving for optimum herd fertility. If all heifers reach this weight at the onset of the breeding season, you can expect about an 84% conception rate when using a 45-day breeding season.

4. May Be Able to Buy Genetically Superior Heifers

You may be able to purchase heifers from someone who specializes in producing replacement heifers on a contract basis. It might even be possible to specify the breed cross, or crosses, of the heifers purchased and the breed and individual sire within that breed to which you want heifers bred. Using heat synchronization and artificial insemination eliminates the potential for disease transmission through breeding and the heifers purchased could have all conceived in a two heat cycle breeding period.

FACTORS TO CONSIDER

According to the National Cattlemen’s Association, you must consider a number of factors to determine optimum herd replacement policy. Even when you simply market calves at weaning, you should consider the following variables:

- Interest rates on savings or other alternative uses of capital
- Interest rates on borrowed capital
- Cash flow needs
- Feed costs
- Labor availability and costs
- Relative price difference between cull cows and heifer calves
- Reproductive rates
- Forced culling rates (those cows that must be culled each year)
Environmental restrictions on growth to weaning
Genetic improvement potential
Price and availability of bred replacement heifers
Tax implications

Considering these variables can determine the difference between profit and loss in any given year. Therefore, you must be flexible and capable of modifying herd replacement policy as needed to take advantage of changing conditions.

ANALYZING YOUR ALTERNATIVES

It is inappropriate to generalize about raising or purchasing replacement heifers. Each rancher has different resource situations and goals. Only by analyzing costs and benefits on a case-by-case basis can you determine the most economical method to acquire replacements.

An effective economic analysis is based on the availability of complete and accurate information and using an appropriate analysis tool. Your first step should be to estimate the costs of raising a heifer between the time the decision is made and when a replacement heifer would be purchased. For example, if you make the retain or sell decision at weaning time when the heifer is 9 months old and the replacement heifer is purchased just before calving at 24 months of age, 15 months is the relevant period over which the costs of raising a heifer should be estimated. You must also consider the loss in revenues from not selling the weaned heifer kept as a replacement. Costs incurred after the arrival of the purchased heifer should be the same as those for the raised heifer and, therefore, need not be included in the analysis.

Cost estimates based on your records will generally be the most accurate. However, if you do not have complete and accurate records, budgets published by Cooperative Extension, Washington State University, should be helpful. Market reports indicating current prices for feeder and replacement heifers are available from many sources.

Once you have the relevant information, select and use an analysis procedure that identifies the effect of buying, rather than raising, replacements on ranch net income. The partial budget is probably the best tool for analyzing this proposed adjustment. Only those cost and return variables that will change if you purchase rather than raise heifers are considered by this tool. The budget is typically organized into two major sections--positive effects and negative effects. Positive effects include income-increasing variables categorized as either added returns or reduced costs. Negative effects include income-reducing items which may be added costs or reduced returns. If the positive effects exceed the negative effects, the proposed adjustment (buying replacements) will increase income. Negative effects that exceed positive effects will reduce income. Worksheet I will help you conduct a partial budget analysis. Directions about information required and necessary calculations are on the worksheet.
An Example Analysis

To illustrate using a partial budget (Worksheet I) to analyze whether to continue raising replacements or purchase them, consider the following example: A rancher has 100 beef cows and needs about 20 replacement heifers annually to maintain the herd. Traditionally, necessary replacements were raised on the ranch. These heifers are selected at weaning time (9 months), bred when they reach 65% of their mature weight (15 months) and drop their first calf at 24-25 months. Recently, the rancher noticed that good quality springer heifer replacements (about 24 months old) can be purchased for about $750. To improve ranch income, the producer is considering selling raised heifer calves at weaning time and buying the 24-month old pregnant heifers. The rancher identified the following information and assumptions:

1. Heifers normally kept for replacements would be sold at weaning time. These heifers average 535 pounds per head and can be sold for 80¢ per pound, net of selling costs.

2. Money is worth 11% to the rancher. This rate is based on the returns realized from the investment of funds on hand in ranch operations. Also, the rate was selected because interest on an operating capital loan for the ranch would be about 11%. Thus, money on hand would reduce borrowing and save 11% interest.

3. The feeding program and feed prices assumed for a heifer raised during the 15-month period between weaning and the arrival of a purchased springer heifer on the ranch are:

   • Hay, 1.82 tons at $75 per ton.
   • Leased range, 5.143 animal unit months (AUM) at $8 per AUM.
   • Owned wheat and barley stubble, 2 AUM's at $7 per AUM.
   • Salt, 62.8 pounds at 19¢ per pound.
   • Mineral, high phosphorous, 11.5 pounds at 35.1¢ per pound.
   • Protein supplement, cottonseed meal (41%), 122 pounds at 9.5¢ per pound.

Hay and grain stubble are ranch-produced forages which the rancher intends to continue producing, even if replacements are purchased. It is assumed that this feed will either be sold or transferred to another ranch use. Current market prices are used for the feed.

4. Veterinary and medicine expenses for the raised heifer during the 15 months are estimated to be $5 per head.

5. Labor and management used to support the raised heifer during the 15-month growing period is estimated to be 8 hours. The rancher places a value of $10 per hour on that time.
6. The annual cost of the bull used to breed raised replacement heifers is estimated to be $840. Items included in this figure are feed, nonfeed operating costs (veterinary, medicine, repairs, power, fuel, labor and interest), bull depreciation and interest (11%) on the bull investment.

7. Other nonfeed costs for raised heifers are placed at $50 per head. This estimate includes repairs, maintenance, fuel and oil. No projections are made for the ownership costs on buildings, facilities, equipment and vehicles (depreciation, interest, property taxes and insurance). These costs will be experienced whether heifers are raised or purchased and are irrelevant to the analysis.

8. It is assumed that calf weaning weights will be the same for raised and purchased replacement heifers.

9. Heifers retained and experiencing breeding difficulties are assumed to be sold at a price equaling their production cost. Thus, these heifers do not have an economic effect and are not considered in the budgeting analysis.

Using this information, the rancher can now complete Worksheet I to determine if buying the replacement heifers will increase ranch net income. Note that the worksheet is designed to identify the change in net income occurring if a rancher switches from retaining heifer calves to buying replacements. Economic effects are specified on a per-head basis over the period of time between the decision to retain or sell a weaned heifer calf and when a purchased replacement heifer would arrive at the ranch.

Looking first at the positive effects, the example rancher expects to realize $486.85 of added returns (line 3) if the heifer calf is sold and a replacement heifer is purchased 15 months later. Those returns stem from the sale of the heifer calf at weaning ($428, line 1) and interest earned or saved on that amount, assuming an annual rate of 11% and 15 months ($58.85, line 2).

Another source of positive effects is reduced costs. By purchasing a replacement, the rancher eliminates the cost of raising a heifer replacement during the 15-month development period. As indicated on line 13, these cost reductions sum to $423.44 per head. Included in the cost savings are feed, veterinary-medicine, operator labor and management, bull, repairs, fuel and interest on these outlays.

The total positive effect from buying rather than raising replacements is the sum of the added returns and reduced costs, $910.29 per head (line 14).

Turning to the negative effects, the only added cost projected by the rancher is the $750 purchase price for the springer heifer (line 15). Further, the rancher estimates there will be no reduced returns; thus, total negative effects are projected to be $750 per head (line 19).

As indicated in the financial analysis section of the worksheet, subtracting total negative effects ($750) from total positive effects ($910.29) shows a net income increase of $160.29 per replacement if the rancher switches from raising to buying replacement heifers.
# WORKSHEET I--CHANGE IN NET INCOME IF REPLACEMENT HEIFER IS PURCHASED RATHER THAN RAISED

## POSITIVE EFFECTS

<table>
<thead>
<tr>
<th>Added Returns:</th>
<th>$ Per Head</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Enter net returns from sale of raised heifer calf (535 lbs. x 80 c)</td>
<td>$429.00</td>
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<tr>
<td>2. Enter interest on net returns from heifer calf sale ($428 line 1 x .11)</td>
<td>$58.85</td>
</tr>
<tr>
<td>3. Total Added Returns (line 1 + line 2)</td>
<td>$486.85</td>
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## Reduced Costs:

<table>
<thead>
<tr>
<th>Reduced Costs:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Enter value of hay fed to raised heifer calf (1.82 tons x 75 $/ton)</td>
<td>$136.50</td>
</tr>
<tr>
<td>5. Enter value of pasture grazed by raised heifer calf</td>
<td>$53.14</td>
</tr>
<tr>
<td>6. Enter value of salt and minerals for raised heifer calf</td>
<td>$15.99</td>
</tr>
<tr>
<td>7. Enter other feed costs for raised heifer calf</td>
<td>$11.59</td>
</tr>
<tr>
<td>8. Enter veterinary-medicine expenses for raised heifer calf</td>
<td>$5.00</td>
</tr>
<tr>
<td>9. Enter value of labor and management for raised heifer calf (8 hours x 10 $/hour)</td>
<td>$80.00</td>
</tr>
<tr>
<td>10. Enter raised heifer calf's share of bull costs ($840 annual bull cost ÷ 25 females per bull x 15/12)</td>
<td>$43.00</td>
</tr>
<tr>
<td>11. Enter other nonfeed costs for raised heifer calf</td>
<td>$50.00</td>
</tr>
<tr>
<td>12. Enter interest on feed and nonfeed costs for raised heifer calf (396.39 sum of lines 4-11 ÷ 2 x .11 interest rate x 15/12)</td>
<td>$27.24</td>
</tr>
<tr>
<td>13. Total Reduced Costs (sum of lines 4-12)</td>
<td>$423.41</td>
</tr>
<tr>
<td>14. Total Positive Effects (line 3 + line 13)</td>
<td>$910.29</td>
</tr>
</tbody>
</table>

## NEGATIVE EFFECTS

<table>
<thead>
<tr>
<th>Added Costs:</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>15. Enter cost of purchased replacement heifer</td>
<td>$750.00</td>
</tr>
<tr>
<td>16. Enter other costs for purchased replacement heifer</td>
<td>$0</td>
</tr>
<tr>
<td>17. Total Added Costs (line 15 + line 16)</td>
<td>$750.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reduced Returns:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>18. Enter reduction in returns experienced if replacement heifer is purchased</td>
<td>$0</td>
</tr>
<tr>
<td>19. Total Negative Effects (line 17 + line 18)</td>
<td>$750.00</td>
</tr>
</tbody>
</table>

## FINANCIAL ANALYSIS

<table>
<thead>
<tr>
<th>Financial Analysis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20. Change in net income per heifer replacement (line 14 - line 19)</td>
<td>$160.29</td>
</tr>
<tr>
<td>21. Change in annual net income for herd ($160.29 line 20 x 20 number of heifer replacements required per year x 12/15)</td>
<td>$2,464.41</td>
</tr>
<tr>
<td>22. Average annual rate of return ($160.29 line 20 ÷ $750 line 15 x 12/15 x 100)</td>
<td>17.1%</td>
</tr>
</tbody>
</table>

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* The numerator (lines 2, 10, 12) and denominator (lines 21, 22) should equal the number of months between the sale of the heifer calf and the purchase of the replacement heifer.

* Enter only the effects occurring during the period between the sale of the heifer calf and the purchase of the replacement heifer.

* May include repairs, utilities, fuel, insurance, etc.
Assuming 20 replacements are needed each year, the increase in net income for the ranch is $2,565 (line 21). Computing the average annual rate of return on investment in the purchased heifer provides a measure of relative profitability. A comparison between alternative uses of capital may be easier when based on rates of return rather than absolute dollars. As noted on line 22, the average annual before-tax rate of return on the $750 investment is 17.1%. Since this exceeds the 11% return from an alternative use of capital, purchasing heifers is a profitable use of capital.

The above analysis assumes a market return on surplus home-grown forages, operating capital, operator labor and management and no return on the existing investment in buildings, equipment and facilities made available for use when heifers are no longer raised on the ranch. To the extent these resources can be diverted to an alternative use (for example, herd expansion) whose return exceeds these assumed levels, the analysis understates the economic benefits of buying heifers.

What About the Risks?

Ranchers analyzing the profitability of buying versus raising replacements will want to base that analysis on the most likely assumptions applying during the future heifer development period. The resulting change in income may then be evaluated in relation to the risks associated with not being able to precisely predict the future. Variables that are difficult to accurately predict and yet are very important to the analysis outcome include the sale price of raised heifers, price of purchased heifers, feed costs and production performance of purchased heifers relative to raised heifers.

In addition to a subjective evaluation of the risks associated with the outcome of a base analysis, ranchers may want to use two additional techniques to more fully analyze the risks associated with this important decision. One technique is to rerun the analysis (that is, complete additional Worksheet I’s) adopting more pessimistic assumptions for the key variables. For example, the earlier analysis could be redone assuming 75¢ weaned heifer prices (rather than 80¢), $800 springer heifer price (not $750) and/or $70 hay price (instead of $75). If the investment in purchased heifers is profitable under these more pessimistic assumptions, no doubt, you will be more comfortable with risks associated with buying replacements. Alternatively, if the investment is no longer profitable, you may decide to continue raising heifers because the risk of loss is too substantial.

Another method to analyze risk is to calculate the breakeven values for the more important, yet uncertain, variables. Breakeven value is that which results in no change in net income if you decide to purchase rather than buy replacements. Once you know the breakeven value, you must only decide whether the actual value will be more or less than the breakeven value. That is an easier choice than basing the decision on one or a small number of specific values for the critical variable.

Worksheet II helps compute breakeven values for three key variables: sale price of the heifer calf when the decision is made to sell her rather than retain her for breeding (weaning
time); price of the purchased replacement heifer; and difference in average weight for calves weaned from a purchased heifer relative to a raised heifer.

The first section of the worksheet (lines 1-6) provides directions about how to compute the breakeven sale price for the raised heifer calf at the time the decision is made to either sell her or keep her as a herd replacement. That computation is based on the following formula:

\[ RHP \left( RHW + \left( RHW \times i \times \frac{n}{12} \right) \right) = PHP - RC \]

Where:
- \( RHP \) = Raised heifer calf price in cents per pound
- \( RHW \) = Raised heifer calf sale weight
- \( i \) = Annual interest rate
- \( n \) = Months in period between sale of raised heifer calf and purchase of replacement heifer
- \( PHP \) = Purchased replacement heifer price
- \( RC \) = Reduced costs if replacement heifer is purchased

To solve for the breakeven raised heifer calf price \( (RHP) \), you must rearrange the above formula as follows:

\[ RHP = \frac{PHP - RC}{(RHW) + \left( RHW \times i \times \frac{n}{12} \right)} \times 100 \]

Completing lines 1-6 of the worksheet using the assumptions from the earlier example analysis results in a breakeven raised heifer price at weaning of 53.7c per pound (line 6). Thus, if you think weaned heifer calves will sell for more than 53.7c, there is an economic advantage in buying replacement heifer calves and selling raised heifer calves. The opposite strategy is more profitable if weaned heifer calf prices drop below 53.7c. This conclusion assumes that the values adopted for all the other variables proves to be true.

The breakeven price for a purchased heifer is computed in the second section of Worksheet II (lines 7-9). As indicated, that price is equal to the added returns from selling the raised heifer calf plus the reduced costs of raising the heifer over the period between the time of her sale and when a replacement would be purchased (line 14, Worksheet I) minus the sum of any other added costs (line 16, Worksheet I) and reduced returns (line 18, Worksheet I) during that same time period. For the example rancher, the added returns from the sale of the heifer amount to $486.85 and the costs of raising the heifer for 15 months are $423.44, a total of $910.29 per head (line 7, Worksheet II). There are no other added costs (excluding the cost of the purchased heifer) or reduced returns. Thus, the breakeven purchased heifer price is $910.29 per head. If the rancher anticipates that purchased springer heifers at about 24 months of age will cost less than $910.29, income is improved by purchasing rather than raising replacements. A higher price shifts the advantage to raising the heifers.

Producers may have a good reason to expect that weaning weights on calves will differ depending on whether they are produced by a raised or purchased replacement heifer. They may feel that their breeding program is superior to that represented by purchased replacement
heifers, resulting in heavier weaning weights for calves produced by raised heifers. The calculations in the third section of Worksheet II (lines 10-14) indicate the difference in weaning weights between the calves produced by raised and purchased replacement heifers at which there is no effect on net income; i.e., the breakeven weaning weight differential. The formula used to make this calculation is:

\[
CWW = \frac{[(AR + RC) - (AC + RR)]}{WP}
\]

Where:

- \(CWW\) = Breakeven change in average steer and heifer calf weaning weights for calves produced by a raised replacement heifer relative to a purchased one (pounds)
- \(AR\) = Added returns from sale of raised heifer calf and related interest earnings (savings)
- \(RC\) = Reduced costs if replacement heifer is purchased
- \(AC\) = Added costs if replacement heifer is purchased
- \(RR\) = Reduced returns if replacement heifer is purchased
- \(PV_{A_i,n}\) = Present value of a $1 annuity at \(i\) interest rate and \(n\) years
- \(i\) = Interest rate
- \(n\) = Number of years from decision to retain raised heifer calf to sale of last calf from that heifer
- \(PV_{A_i,1}\) = Present value of a $1 annuity at \(i\) interest rate, year 1
- \(WP\) = Average weaned steer and heifer calf price in dollars per pound received for calves produced by the purchased or raised replacement heifer during her tenure in the herd

Returning to the example analysis, the positive effects (added returns plus reduced costs) exceed the negative effects (added costs plus reduced returns) by $160.29 (line 10, Worksheet II). Since this is the advantage for buying the replacement, we know the raised replacement must wean heavier calves if she is to be as profitable as the purchased replacement. Assuming both heifers will wean five calves during the next 6 years, the question is, how much more must the calves weaned by the raised heifer weigh to equal the $160 cost disadvantage?

Since the difference in weaning weights must occur over a period of several years, it is important to take into account the effect of time on the value of money. Specifically, it is appropriate to recognize that money on hand now is more valuable than money realized in future years. This relationship follows from the effect of inflation, the added risk associated with waiting for future dollars and the additional earnings available from the immediate reinvestment of dollars in hand. You can adjust for the time value of money by using the present value of annuity interest factors appearing in the Appendix Table (page 13). This table indicates the present value of $1 received at the end of each of various numbers of years, discounted at selected interest rates.

The appropriate interest factor for the example analysis is 4.230 (line 11, Worksheet II), which appears at the intersection of the 11% interest row and the 6-year column. Eleven percent interest is used because that is the assumed value of money to the rancher. The
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WORKSHEET II--BREAKEVEN ANALYSIS FOR RAISING VERSUS PURCHASING REPLACEMENT HEIFER

BREAKEVEN SALE PRICE FOR RAISED HEIFER Calf

1. Enter sale weight of raised heifer calf .................................................. 535 lbs.
2. Enter total reduced costs (line 13, Worksheet I) .................................. $423.44
3. Enter total negative effects (line 19, Worksheet I) .................................. $250.00
4. Enter \( \frac{535 \times \text{interest rate } \times \left(1 + \frac{1}{12}\right)}{\text{interest rate } \times \left(1 + \frac{1}{12}\right)} \) ........................................... $72.6
5. Enter line 1 plus line 4 ........................................................................... 608.6
6. Breakeven price \[\left(\frac{\text{line 3} - \text{line 2}}{\text{line 5}} \times 100\right)\] ........................................... $53.7 /lb.

BREAKEVEN PRICE FOR PURCHASED REPLACEMENT HEIFER

7. Enter line 14, Worksheet I ........................................................................ $910.29
8. Enter sum of lines 16 and 18, Worksheet I ................................................ $0

BREAKEVEN CHANGE IN WEANING WEIGHTS FOR RAISED HEIFER

10. Enter line 20, Worksheet I ................................................................. $160.29
11. Enter interest factor (Appendix Table, interest rate, 6 years from decision to retain heifer to sale of last calf from that heifer) .......................... $423.30
12. Enter interest factor (Appendix Table, interest rate, year 1) ..................... $0.901
13. Enter average price received for steer and heifer calves weaned from raised heifer during her stay in herd ..................................................... $0.80 /lb.
14. Breakeven change in weaning weight \[\left(\frac{\text{line 10}}{\text{line 11} - \text{line 12} \times \text{line 13}}\right)\] ........................................... 60.2 lbs.

* The numerator should equal the number of months between the sale of the raised heifer calf and the purchase of the replacement heifer.

** correct time period is 6 because there are 6 years between the time when a decision is made about retaining a heifer (9 months old) and when she or a purchased replacement will produce the last weaned calf (81 months old).

Since no calf will be weaned the year following the retain versus purchase decision, it is necessary to subtract the present value of annuity interest factor for 11%, one year (0.901, line 12, Worksheet II) from the 6-year interest factor. Dividing the $160.29 cost difference by the adjusted interest factor of 3.329 gives the annual additional earnings (= $48.15) the raised heifer must produce to be as profitable as the purchased heifer. Further, let's assume an average weaned steer and heifer price over the 5 years of 80c per pound. Finally, dividing $48.15 by 80c results in a breakeven increase in weights for calves weaned from the raised heifer of 60.2 pounds (line 14). Given that the raised heifer costs $160.29 more than the purchased heifer, the raised heifer must wean five calves whose weights must exceed those realized from the purchased heifer by 60.2 pounds per head per year if both heifers are to make an equal contribution to ranch net income. If calves from the raised heifer outweigh
those from the purchased heifer by more than 60.2 pounds, the raised heifer is the most profitable. Alternatively, if the weight premium is less than 60.2 pounds, the purchased heifer has the advantage. Of course, the breakeven weight differential will be highly sensitive to the assumed average calf price. Given the high volatility of calf prices and the associated difficulty in making accurate predictions, you are well advised to redo the analysis using different calf prices. The resulting range in breakeven weight differentials will give you a better understanding of the risk associated with varying calf prices.

**SUMMARY**

Selecting the most economical source of replacement heifers may be one of the more important decisions confronting the cow-calf operator. Whether to use raised or purchased replacements can be a complex issue, since each alternative has both advantages and disadvantages. Due to differences in rancher goals and resource situations, each producer must make this decision. It is important that producers considering these choices know what it costs to grow replacements and a willingness to use an economic analysis like that outlined in this publication to compare the costs and benefits associated with each alternative.
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<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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Interest factors in Table = \$1 \left[ \frac{1-(1+i)^{-n}}{i} \right], where i = interest rate and n = years.
**WORKSHEET 1—CHANGE IN NET INCOME IF REPLACEMENT HEIFER IS PURCHASED RATHER THAN RAISED**

### POSITIVE EFFECTS

**Added Returns:**

1. Enter net returns from sale of raised heifer calf (lbs. x $) .............. $ 
2. Enter interest on net returns from heifer calf sale ($ line 1 x interest rate x /12) .............. $ 
3. Total Added Returns (line 1 + line 2) .............. $ 

**Reduced Costs:**

4. Enter value of hay fed to raised heifer calf (tons x $/ton) .............. $ 
5. Enter value of pasture grazed by raised heifer calf .................. $ 
6. Enter value of salt and minerals for raised heifer calf .............. $ 
7. Enter other feed costs for raised heifer calf .................. $ 
8. Enter veterinary-medicine expenses for raised heifer calf .......... $ 
9. Enter value of labor and management for raised heifer calf (hours x $/hour). $ 
10. Enter raised heifer calf's share of bull costs ($ annual bull cost ÷ females per bull x /12) .............. $ 
11. Enter other nonfeed costs for raised heifer calf .............. $ 
12. Enter interest on feed and nonfeed costs for raised heifer calf (sum of lines 4-11 ÷ 2 x interest rate x /12) .............. $ 
13. Total Reduced Costs (sum of lines 4-12) .............. $ 

**TOTAL POSITIVE EFFECTS** (line 3 + line 13) .............. $ 

### NEGATIVE EFFECTS

**Added Costs:**

15. Enter cost of purchased replacement heifer .................. $ 
16. Enter other costs for purchased replacement heiferb .............. $ 
17. Total Added Costs (line 15 + line 16) .............. $ 

**Reduced Returns:**

18. Enter reduction in returns experienced if replacement heifer is purchasedb .............. $ 

**TOTAL NEGATIVE EFFECTS** (line 17 + line 18) .............. $ 

### FINANCIAL ANALYSIS

20. Change in net income per heifer replacement (line 14 - line 19) .............. $ 
21. Change in annual net income for herd ($ line 20 x number of heifer replacements required per year x /12) .............. $ 
22. Average annual rate of return ($ line 20 ÷ $ line 15 x /12 x 100) .............. % 

---

a The numerator (lines 2, 10, 12) and denominator (lines 21, 22) should equal the number of months between the sale of the heifer calf and the purchase of the replacement heifer.  
b Enter only the effects occurring during the period between the sale of the heifer calf and the purchase of the replacement heifer.  
c May include repairs, utilities, fuel, insurance, etc.
WORKSHEET II--BREAKEVEN ANALYSIS FOR RAISING VERSUS PURCHASING REPLACEMENT HEIFER

BREAKEVEN SALE PRICE FOR RAISED HEIFER CALF
1. Enter sale weight of raised heifer calf ........................................ lbs.
2. Enter total reduced costs (line 13, Worksheet I) ................................ $ _______.
3. Enter total negative effects (line 19, Worksheet I) ............................ $ _______.
4. Enter (_____ line 1 x _____ interest rate x 1/12) ............................
5. Enter line 1 plus line 4 ..................................................................
6. Breakeven price [(line 3 - line 2) / (line 5) x 100] ......................... ________ c/lb.

BREAKEVEN PRICE FOR PURCHASED REPLACEMENT HEIFER
7. Enter line 14, Worksheet I ................................................................. $ _______.
8. Enter sum of lines 16 and 18, Worksheet I ........................................ $ _______.

BREAKEVEN CHANGE IN WEANING WEIGHTS FOR RAISED HEIFER
10. Enter line 20, Worksheet I ................................................................. $ _______.
11. Enter interest factor (Appendix Table, _____ interest rate, ______ years from decision to retain heifer to sale of last calf from that heifer) ..........................................................
12. Enter interest factor (Appendix Table, _____ interest rate, year 1) ...........
13. Enter average price received for steer and heifer calves weaned from raised heifer during her stay in herd .......................................... $/lb.
14. Breakeven change in weaning weight [line 10 / (line 11 - line 12) / line 13] ... ________ lbs.

* The numerator should equal the number of months between the sale of the raised heifer calf and the purchase of the replacement heifer.