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The Economics of Raising Replacement Heifers: Estimating Direct Costs Using the Replacement Heifer Calculator[1]

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The purpose of this publication is to provide a guideline of what direct costs cattle producers should be estimating when considering the option of developing yearling heifers as replacements to be bred at 14 months of age. While other important external factors should be considered, the purpose of this publication is to specifically address how to estimate the direct costs associated with developing yearling heifers as replacements. In doing so, the publication highlights and walks through how to use the Replacement Heifer Cost Estimation Tool.

A common question asked each year by cattle producers is, "What should I do with my heifers?" Heifers can be sold at weaning each year, or they can be raised as replacement heifers to be bred at 14 months of age. When the goal is to build or rebuild a herd, raising replacement heifers becomes a possible answer to the question about what to do with heifers. However, there are underlying questions within the question of what to do with heifers that should be addressed when considering expanding a herd. "Can high-quality heifers be found outside of my herd?" "Would outside heifers cause setbacks or improvements in the genetics of the herd?" "How severe are the biosecurity risks of bringing in new heifers?" and "What are the costs associated with developing my own replacements?" are some of the common ones. These questions are crucial to consider when making the decision on how to rebuild a herd. Whether bringing in outside heifers or raising replacements, the long-term success and profitability of the herd will be affected.

While each of these questions are of equal importance, this publication is solely focusing on the last question, "What are the direct costs associated with developing replacement heifers?" These direct costs include the current value of weaned heifers (opportunity cost), variable costs, breeding costs, fixed costs, and absorption costs. The Replacement Heifer Cost Estimation Tool discussed in this publication aims to serve as a guide in organizing each of these costs. It can be used as an estimation tool to calculate what it may cost to develop heifers on a specific operation and whether it is economical to do so. The calculator includes estimations for the costs enumerated below.

1. **Opportunity costs**. "What revenue will I lose if I decide to raise these weaned heifers rather than selling them now?" Understanding the opportunity costs allows for comparisons at the end of the estimation process to see which option is the most economical for an operation.

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Table 1. Opportunity Cost of Raising Replacement Heifers.

Opportunity Cost	Unit	Quantity	$/Unit	$/Heifer
Current value of weaned heifer	**pounds**	500	$ 2.70	$ 1,350.00
TOTAL				**$ 1,350.00**

2. **Variable and fixed expenses.** Variable expenses such as mineral, supplement, and pasture management costs and fixed expenses such as land rent, labor, and interest costs, are important for calculating what each heifer needs so that she will be 65%–70% of her mature body weight at the time of breeding. A way to remember what costs will go into these sections is to ask: "What is needed for the health and nutrition of the heifer?" Variable expenses (Table 2) will vary across operations and from year to year due to fluctuating input costs. Fixed costs (Table 3) should remain roughly the same year to year but will vary across different operations. Interest is included to account for the time between the opportunity to sell cattle as weaned heifers until they are developed. Land and labor quantity should be entered on a per-heifer basis when using the tool.

Weaning weights and ages will vary across operations, but the example in Table 2 estimates the costs for supplementing weaned heifers weighing 600 pounds and of 270 days of age (nine months). The concentrate supplement (90% DM, 75% TDN, 22% CP) is fed daily at 1.5 percent of the heifer's body weight for 180 days, starting at weaning up until 15 months of age. For more information on supplementing beef heifers, see *Effects of Post-Weaning Growth Rate and Puberty Induction Protocol on Reproductive Performance of Bos indicus-Influenced Beef Heifers* (Moriel et al. 2017); and *Supplementation Frequency and Amount Modulate Post-Weaning Growth and Reproductive Performance of Bos indicus-Influenced Beef Heifers* (Moriel et al. 2020).

Pasture management is highly important for heifers to receive the proper nutrients from grazing forage. Soil and tissue testing should be performed for proper fertilizer recommendations. For more information on soil and tissue sampling, contact your local county Extension agent and/or see the Ask IFAS publications SS186, *Producer Soil Test Form*; SS597, *Nutrient Testing Form for Bahia Pastures*; and SS475, *Tissue Analysis as a Nutrient Management Tool for Bahiagrass Pastures*. For more information on fertilizing Bahiagrass, see the Ask IFAS publication AG342, *Bahiagrass (Paspalum Notatum Flugge): Overview and Pasture Management*. Weed management is crucial because weed growth can diminish forage availability for heifers to graze. For more information on weed management, see the Ask IFAS publication WG006, *Weed Management in Pastures and Rangelands–2023*.

In this example of using the Replacement Heifer Cost Estimation Tool, the cost of fertilizing and spraying Bahiagrass is estimated in the "Grazing" section. This cost for each heifer is calculated based on each heifer grazing two acres. Fertilizing Bahiagrass twice a year using urea at $534 per ton at a rate of 50 pounds of nitrogen (N) per acre is used ($58/acre). The cost of using chemicals to control weeds is estimated using the price of paraquat at $35 per gallon at a rate of 2 pints per acre ($8.74/acre).

Table 2. Variable Expenses of Raising Replacement Heifers.

Variable Expenses	Unit	Quantity	$/Unit	$/Heifer
Mineral (intake per heifer)[1]	**bag**	.90	$ 45.00	$ 40.50
Supplement[2]	**ton**	0.90	$ 325.00	$ 292.50
Hay (if applicable)	**bale**		$	$
Grazing[3]	**acre**	2	$ 66.74	$ 133.48
TOTAL				**$ 466.48**

[1] 4oz/hd/day for 180 days = 720 oz (45 lbs)/heifer at $45 per 50 lb bag
[2] 1.5% x 600 lbs = 9 lbs of daily DMI / 90% DM = 10 lbs/hd/day for 180 days = 1,800 lbs or 0.9 tons at $325/ton
[3] fertilizer and herbicide cost for pasture that heifers will be grazing

Table 3. Fixed Expenses of Raising Replacement Heifers.

Fixed Expenses	Unit	Quantity	$/Unit	$/Heifer
Land rent or payment	**acre**	2	$ 21.00	$ 42.00
Labor[9]	**hour**	2	$ 12.50	$ 25.00
Interest	**dollars**	$ 1,350.00	5%	$ 67.50
Other			$	$
TOTAL				**$ 134.50**

[9] Only includes labor dedicated to heifer development.

3. **Breeding costs**. "What is it going to cost to breed each heifer?" Bulls and artificial insemination (AI) each have associated costs, and determining which of the two is the most feasible is not as straightforward as it may seem. If a producer intends to use AI, a clean-up bull is recommended, if it is feasible to maintain the bull. If the producer does not own a bull already, they will use the purchase cost of a bull or bulls to calculate the bull's depreciation cost, which is the annual cost of owning the bull. If the producer does own a bull, then the bull's depreciation cost should already be calculated. The depreciation cost is determined using the following formula: (purchase cost – useful years in the herd)/value at culling. When using the Replacement Heifer Cost Estimation Tool, the annual bull cost is automatically calculated after inserting the bull's purchase price, production expectancy

of the bull, and his expected cull revenue. A bull's maintenance cost is his total variable costs, which is similar to a heifer's variable cost: "What are the costs associated with maintaining the health of a bull?" The depreciation cost plus the maintenance cost is the bull's total cost. After entering the number of bulls owned, the total cost per bull is then automatically multiplied by the number of bulls owned, and then divided by total number of heifers to calculate the breeding cost of each heifer.

Table 4. Breeding Expenses of Raising Replacement Heifers: Bulls.

Breeding Cost: Natural Service (Bull)[4a]	Unit	Quantity	$/Unit	$/Heifer
Bull purchase price	**head**	1	$ 5,000.00	
Production expectancy of bull	**years**	5		
Heifers serviced per bull per year	**head**	20		
Cull revenue	**head**	1	$ 2,400.00	
Annual bull cost	**head**	1	$ 520.00	
Maintenance cost per bull[5]	**head**	1	$ 600.00	
Total per bull	**head**	1	$ 1,120.00	$ 56.00
TOTAL[6]		**1**	**$ 1,120.00**	**$ 56.00**

[4a] Insert zeros for breeding cost of alternative method if not used.
[5] Feed, grazing, mineral, vet, etc.
[6] For "TOTAL (for all bulls needed)," insert the number of bulls owned in the quantity column.

If a producer will be using AI, breeding expenses include the cost of semen straws, costs associated with the synchronization protocol, and the service cost. If the producer is performing the insemination, the cost of the labor should be included where the vet costs would be. There are different synchronization protocols that can be used, but this publication uses the costs associated with using the Select Synch + CIDR & TAI protocol. For more information on protocols, visit the Ask IFAS publication AN365, *Calculating Reproductive Performance in Beef Operations: The University of Florida Beef Herds' 2019 Breeding Season*(Binelli et al. 2024);and *Protocols for Synchronization of Estrus and Ovulation* (Johnson et al. 2010). When inserting values in the "Breeding Cost: Artificial Insemination" section of the tool, insert only the number needed for one heifer as seen in the example in Table 5. Totals for all heifers will automatically be calculated.

4. **Absorption costs**. These represent the cost of developing open heifers and can be estimated after opportunity costs, variable and fixed expenses, and breeding costs are totaled. The costs of developing open heifers are absorbed by the bred heifers that remain in the operation. However, absorbed costs can be offset by the revenue from selling those open heifers. Table 6 shows an example of how this is calculated in the Replacement Heifer Cost Estimation Tool based on having ten open heifers and 90 bred heifers after using AI and one clean-up bull for breeding. After totaling all expenses, the total cost to develop each heifer is $2,061.98. Insert the number of open heifers. The cost to develop each heifer will automatically be multiplied by the number of open heifers (10) and then divided by the number of bred heifers (90) to assign an additional development cost to each bred heifer (cost absorbed). The total revenue received from the sale of open heifers is $21,600 ($2,160 x 10). The total revenue received by the sale of all open heifers is then divided by the number of bred heifers. After absorption cost and revenue are automatically calculated, the example in Table 6 shows that the total cost to develop a yearling heifer to be bred at 14 months of age decreased to $2,051.09.

Table 7 combines all expense sections to serve as an example of using the Replacement Heifer Cost Estimation Tool to estimate the total direct cost of raising 100 replacement heifers with a 90 percent pregnancy rate using artificial insemination (AI) with one clean-up bull. Understanding the direct costs of developing replacement heifers allows for a way to answer one of the many questions involved with making the decision between selling weaned heifers and buying replacements or developing replacements. Even though the price for selling weaned heifers may seem higher than the cost of development in the short-term, the long-term outcome must be considered when trying to

Table 6. Absorption Costs/Revenue from Open Heifers.

Total Cost to Develop Each Heifer				**$ 2,061.98**
Absorption Cost/ Revenue[10]	**Unit**	**Quantity**	**$/Unit**	**$/Heifer**
Open heifers	**head**	10		
Bred heifers	**head**	90		
Cost absorbed by bred heifers	**head**	90		$ 229.11
Value of open heifers	**pounds**	900	$ 2.40	$ 2,160.00
Revenue absorbed by bred heifers	**head**	90		$ 240.00
Total Cost to Develop Bred Heifers				**$ 2,051.09**

[10] Bred heifers absorb the cost of developing open heifers and revenue gained from sale of open heifers.

build or rebuild a herd. If the price of bred heifers is greater than the total cost to develop bred heifers, then raising replacement heifers is a potentially profitable investment.

As previously mentioned, it is equally important to assess the economics risks involved in the decision. The accessibility of replacements for purchase, the progress of genetic development, and the biosecurity of the herd are all in play, and all involve a degree of risk. These risks must be estimated and assessed alongside the direct development costs of raising replacements. These decisions are all about the goals and risk-management strategies of each operation. Expenses can be overwhelming when looked at as a short-term lump sum, but a too-cautious approach may not take into account the potential long-term rewards. It is thus important to look at them as long-term investments when possible.

The Replacement Heifer Cost Estimation Tool is available on the author's profile page on the Range Cattle Research and Education Center website. Search for it under "calculators."

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Table 7. Raising Yearling Replacement Heifers in Florida. Example Scenario: developing 100 replacement heifers using AI with one clean-up bull.

	Number of Heifers Intended for Replacement				100
Opportunity Cost	**Unit**	**Quantity**	**$/Unit**	**$/Heifer**	**$/All Heifers**
Current Value of Weaned Heifer	**pounds**	500	$ 2.70	$ 1,350.00	$ 135,000.00
TOTAL				**$ 1,350.00**	**$ 135,000.00**
Variable Expenses					
Mineral (intake per heifer)[1]	**bag**	0.9	$45.00	$40.50	$4,050.00
Supplement[2]	**ton**	0.9	$ 300.00	$ 270.00	$ 27,000.00
Hay (if applicable)	**bale**		$ 0.00	$ -	$ -
Grazing (number of acres/heifer)[3]	**acre**	2	$ 66.74	$ 133.48	$ 13,348.00
TOTAL				**$ 443.48**	**$46,648.00**
Breeding Cost: Natural Service (Bull)[4a]					
Bull Purchase Price	**head**	1	$ 5,000.00		
Production Expectancy of Bull	**years**	5			
Heifers Serviced per Bull per Year	**head**	20			
Cull Revenue	**head**	1	$ 2,400.00		
Annual Bull Cost	**head**	1	$ 520.00		
Maintenance Cost per Bull[5]	**head**	1	$ 600.00		
Total per Bull	**head**	1	$ 1,120.00	**$ 56.00**	**$ 5,600.00**
TOTAL (for all bulls needed)[6]		1	$ 1,120.00	**$ 56.00**	**$ 5,600.00**
Breeding Cost: Artificial Insemination (AI)[4b]					
Semen Straws	**straw**	1	$ 25.00	$ 25.00	$ 2,500.00
Synchronization Costs[7]	**head**	1	$ 20.00	$ 20.00	$ 2,000.00
Costs to Perform AI[8]	**head**	1	$ 10.00	$ 10.00	$ 1,000.00
TOTAL				**$ 55.00**	**$ 5,500.00**
Fixed Expenses					
Land Rent (number of acres/heifer)	**acre**	2	$ 21.00	$ 42.00	$ 4,200.00
Labor[9]	**hour**	2	$ 12.50	$ 25.00	$ 2,500.00
Interest	**dollars**	$1,350.00	5%	$ 67.50	$ 6,750.00
Other				$ -	$ -
TOTAL				**$ 134.50**	**$ 13,450.00**
Total Cost to Develop All Heifers				**$ 2,061.98**	**$ 206,198.00**
Absorption Cost/Revenue[10]					
Open Heifers	**head**	10			
Bred Heifers	**head**	90			
Cost Absorbed by Bred Heifers	**head**	90		$ 226.55	
Value of Open Heifers	**pounds**	900	$ 2.40	$ 2,160.00	$ 21,600.00
Revenue Absorbed by Bred Heifers	**head**	90		$ 240.00	$ 21,600.00
Total Cost to Develop Bred Heifers				**$2,051.09**	**$184,598.00**

	Number of Heifers Intended for Replacement				100
Opportunity Cost	**Unit**	**Quantity**	**$/Unit**	**$/Heifer**	**$/All Heifers**

*All costs do NOT include costs before weaning.
[1] 4oz/hd/day for 180 days = 720 oz (45 lbs)/heifer at $45 per 50 lb bag
[2] 1.5% x 600 lbs = 9 lbs of daily DMI / 90% DM = 10 lbs/hd/day for 180 days = 1,800 lbs or 0.9 tons at $325/ton
[3] fertilizer and herbicide cost for pasture that heifers will be grazing
[4a] insert zeros for breeding cost of alternative method if not used
[4b] insert zeros for breeding cost of method not used; does not include cost of liquid nitrogen and semen tank
[5] feed, grazing, mineral, vet, etc.
[6] for "TOTAL (for all bulls needed)," insert the number of bulls owned in the quantity column.
[7] costs for AI: PG - $2.00/dose, GNRH - $1.50/dose x 2 doses, and $15/CIDR
[8] includes trip fee and per-head cost; prices will vary based on number of head and labor/trip fees from the provider used
[9] only includes labor dedicated to heifer development
[10] bred heifers absorb the cost of developing open heifers and revenue gained from sale of open heifers