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To Retain or Cull Open Cows: Age and Price Factors to know

Producers typically follow several rules of thumb to manage their cow herds. These rules include but are not limited to, culling all open females or giving first-calving heifers a second chance if found open. In addition to visually assessing a female, the female's future value could also be considered when managing a cow herd and making individual culling decisions.

A producer's cow herd is more than just livestock—it's a portfolio of assets, each valued like stocks in a market. By applying capital asset valuation strategies, cattle can be assessed with the same precision as financial investments. Applying capital asset valuation principles allows producers to move beyond traditional culling methods and incorporate the future value of each animal into their management decisions.

Tymko (2023) and Johnson et al. (2024) outlined the value of an open cow compared to its replacement heifer counterpart, to inform culling decisions. This accounted for cow depreciation, net present value (NPV) of the breeding female in both high- and low-production cost systems and in both high- and low-price environments. This shows how culling strategies will vary between operations depending on their cost structure and the market environment they face.

BEEF COW DEPRECIATION

Beef cows, like any piece of the operation, are an asset that can depreciate on an annual basis. The three components of straight-line depreciation include the initial investment (either of a home-raise heifer or a purchased bred heifer), the salvage value (when the female is culled), and the years of use (total production years the cow is expected to raise a calf starting at the age of two).

$$Annual\ Depreciation = \frac{Initial\ Value\ of\ Replacement\ Bred\ Heifer\ -\ Salvage\ Value}{Years\ of\ Production}$$

Producers who choose to give younger open females ages two through four a second chance may have a fair argument to help reduce the annual depreciation cost of that female.

Table 1 Assumed Values:

- Initial Purchase Price of Bred Heifer: $3,000
- Salvage Value at D1/2 cull price and a mature cow weight of 1350 lbs: $1,700

Table 1. Annual Cow Depreciation During Progressing Production Years

Production Year	1	2	3	4	5	6	7	8	9
Annual Depreciation	$1,299	$650	$433	$325	$260	$217	$186	$162	$144

Shown in Table 1, as the cow has more production years, the annual depreciation decreases, encouraging producers to retain females with greater longevity in their cow herd. As it is cheaper to keep her than replace her with a more expensive heifer. ***But what is the comparison with a younger heifer?***

NET PRESENT VALUATION (NPV)

The valuation of a beef breeding female can be calculated using a Net Present Value (NPV) approach, which reflects her future potential earnings adjusted for the time value of money. However, first calf heifers are often considered riskier assets because there is a chance they may become "open"—not conceiving during the breeding season—leading to no calf sales revenue the year they turn three. To accurately value a beef-breeding bred female, it's crucial to consider both her earning potential and the unproductive risks involved. The following equations take these unique factors into account, helping producers make more informed financial culling and retention decisions.

To factor in the risk of the female becoming unsound, open, or death loss can be factored in as a weighted NPV. However, the weighted NPV of the replacement

female and mature cows can not be directly compared. The projected future values can be compared by converting them into an Equivalent Annual Annuity (EAA).

$$EAA(beef\ female) = i \times \frac{NPV(beef\ female)}{(1 - (1 + i) - (P))}$$

Where,

i = interest rate

P = total productive years left

From Tymko (2023) and Johnson et al.'s (2024) model, using ten production years, it was found that all open females should be culled within the four simulated ranches in a **high-price environment** (assuming a price average from 2018 to 2022). In a **low-price environment** (assuming a historically low-price average from 2008 to 2012), it may be tempting to unload more open females to invest those dollars into new replacements or downsize the herd. Results within the researchers' model have shown that culling opens is the more profitable decision in both a high and low-price environment. However, for the **High Cost-High Production** (operations with a higher level of production such as higher weaning weights) ranch in a **low-price environment**, the younger open replacement females (ages 2 to 4) are more financially desirable to retain if the only replacement option is a home-raised bred heifer (Tymko, 2023; Johnson et al., 2024). This also aligns with allowing the annual depreciation to be distributed over a greater number of production years. However, each ranch should assess these scenarios' financial gain and loss due to the diversity of Canadian ranches' financial structures. Later, for example, using different price assumptions demonstrates slightly varied outcomes.

Non-Monetary Decision Factors

When comparing the future potential discounted cash flow generated by varying aged open females to a replacement with her whole production life ahead of her, a few considerations that are not reflected within a net present valuation emerge.

1. Younger open females ages one to four may be worth keeping if they are from superior genetic lines and the death of her calf was due to unforeseen events.
2. Older open females ages seven and up should often be culled due to nearing their end of production, which may be a sign of their final year of production.
3. Cull animals, although their estimated future cashflows show a positive outcome, her confirmation from visual inspection does not indicate structural longevity.

CULLING DECISION TOOL

Tools to help: Use the Replacement Heifer Calculator to help calculate your home raise replacement bred heifer costs. Participate in the Canadian Cow-Calf Cost of Production Network to compile data.

Within the culling decision tool, producers need to enter ten numbers (go to the Variable Inputs tab):

1. Replacement bred heifer purchase price or cost to raise a bred heifer
2. Average price of weaned calves
3. Average weight of weaned calves
4. Annual winter feed costs per cow
5. Annual grazing cost per cow
6. Annual breeding cost per cow
7. Annual total other variable costs per cow
8. Average cull cow weight
9. Average cull cow price
10. Interest rate

Producers should consider both high and low costs and prices relative to their estimates when using the calculator. After these values are entered, the age of the open cow and total expected production years can be selected. These values will calculate the EAA for the open cow and replacement bred heifer.

By comparing the EAA, an answer of "Yes" or "No" will be displayed by replacing the open cow with a home-raised heifer and/or replacing the open cow with a purchased heifer. This represents whether the future valuation of the open female is greater or less relative to a replacement bred heifer and can act as an aid for unsure culling decisions after an open female has passed any visual assessment from the producer. If

they both say "Yes", replacing the open cow with either option provides a greater future valuation compared to the cull cow, and should be replaced by either a home-raised or purchased replacement heifer. If the EAA valuation of one of the heifers is greater than that heifer should be chosen as the replacement.

Cost Structure and Price Environment Effect

Using the Culling Decision Tool, two farms and price environments were simulated, as shown in Table 2, to see the impact of operation costs (high and low) and price environments (high and low) on the valuation of open females and replacement-bred heifers. The year 2020 is considered a relatively low-price environment year, and 2023 for a high-price environment year when looking at recent historical feeder calf prices. It is assumed that cows have 10 production years, from ages 2 to 11, after which they are culled. The interest rate was assumed to be 5% across all scenarios. However, it should be noted that the interest rate will impact the females' EAA valuation and the culling or retention decisions.

For operations with both high and low production costs, there are similarities in beef females' valuation trends between high and low-price environments.

- In an operation with high production costs, within a low-price environment, younger replacement females (ages 2 to 3) should be retained as they are valued similarly to replacement home-raised bred heifers.
- In the high price environment, open cows should be culled if replaced by a home-raised heifer; however, if the replacement female is purchased, open 2 and 3-year-olds should be retained. This is shown in Charts 1 & 2, with the open cow and purchased replacement heifer lines running parallel till age 4.
- Similar to the low production cost operations, open cows should be culled if replaced with a home-raised heifer; however, if the replacement female is purchased, open 2 to 5-year-olds should be retained. As the cull cow ages and the lines cross, the valuation gap widens significantly (Charts 1 & 2).
- Home-raised heifers are preferred in both operations and price environments.
- Females in operation with lower production costs (Chart 1) are typically valued higher as more revenue is received from reducing costs.

Table 2. Assumed Price Environment, Operation Cost, and Probability Values

Assumed Prices	**Low Price Environment**	**High Price Environment**
Purchased Replacement Bred Heifer Price (per head)	$2500	$3000
Avg 550 lb Hfr and Str Price	$2.00 per lb	$3.15 per lb
Avg D2 Cull Cow Price Per lb	$0.80 per lb	$1.20 per lb
Avg D3 Cull Cow Price Per lb	$0.60 per lb	$1.05 per lb
Assumed Costs	**Low Production Cost**	**High Production Cost**
Home-Raised Replacement Bred Heifer Cost	$1,500	$2,000
Winter Feed Cost Per Cow/Year	$150	$350
Grazing Cost Per Cow/Year	$70	$150
Breeding Cost Per Cow/Year	$30	$50
Total Other Variable Costs Per Cow/Year	$200	$400
Assumed Production Probabilities		
Open Rate	5%	
Unsound Rate	2%	
Death Rate	1.5%	

Each operation should assess its culling decisions with its unique cost structure and varying pricing for both weaned-calved and purchased females, as these variables will affect the outcome of estimating future discounted values of both open females and their replacements.

Chart 1. EAA of Beef Females for an Operation with Low Production Costs

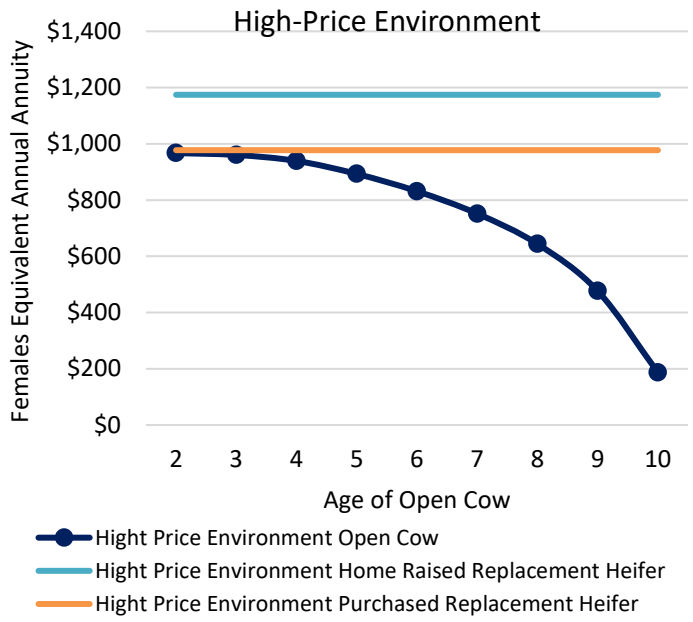
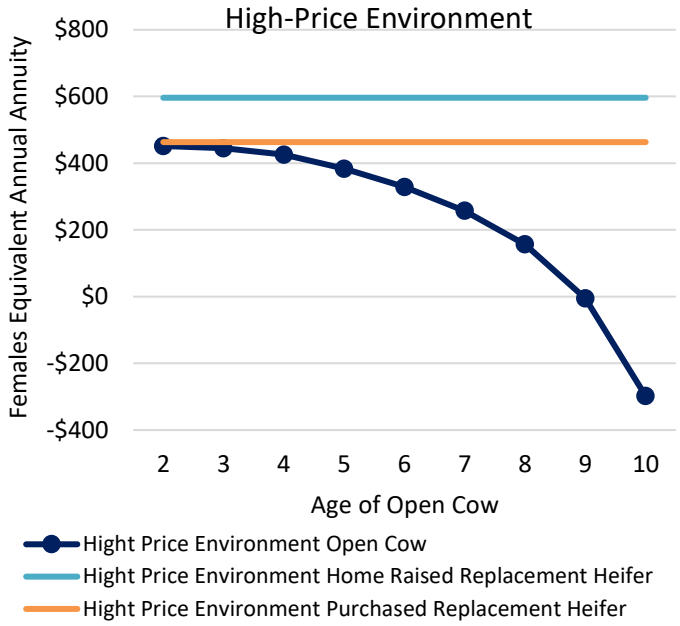
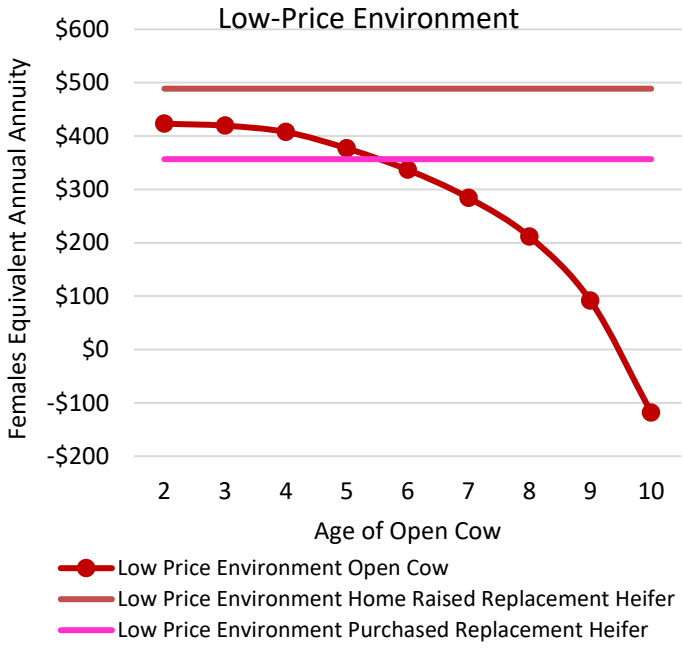
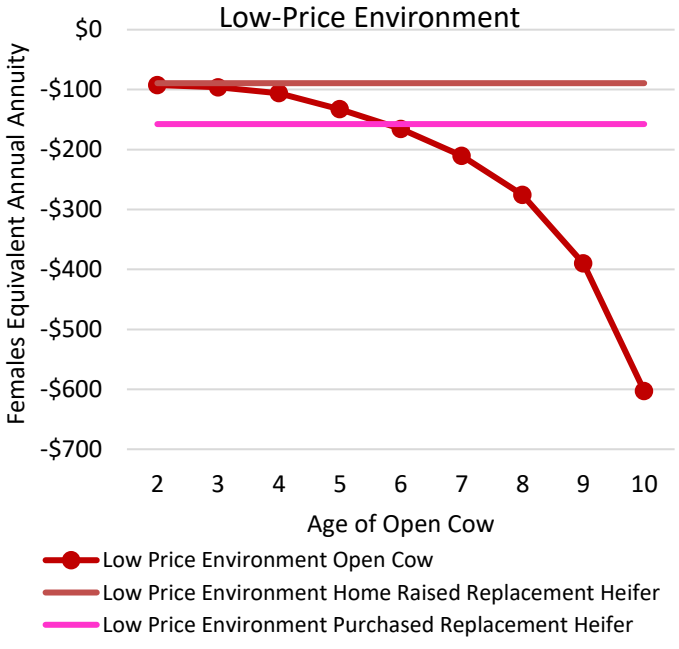


Chart 2. EAA of Beef Females for an Operation with High Production Costs







References:

Johnson. Heidi. R., Larson. Kathy. A., Micheels. Eric. T., (2024). Financial Impact of Beef Cow Culling: Canadian Analysis. Journal of Applied Farm Economics. 7(1). https://docs.lib.purdue.edu/jafe/vol7/iss1/2

Tymko. Heidi. R., (2023). Financially Optimal Culling Strategies for Western Canadian Cow-Calf Operations. (Master's Thesis), University of Saskatchewan. *https://harvest.usask.ca/server/api/core/bitstreams/77448dc6-d474-4051-a5c9-f25b95563159/content*