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Net Present Value of Beef Replacement Females

efore decisions regarding purchasing or retaining replacement females are made, producers should consider the economic value of replacements entering the herd. Just like any other capital investment, replacement females are only worth the sum of all the cash they can earn over their lifetime, which includes their salvage value as cull cows, less all the expenses they create. The net cash flows the replacement females can generate over their life time depend on the future prices of calves, cost structure, and the eventual salvage value of the cull cows. Not only do the size of the cash flows impact the value of the replacement females, the timing of when the replacements generate income and expenses is important in determining the replacements' value because money has earning power of its own.

Inputs

When it comes to calculating the economic feasibility of an investment in replacement females, a number of key inputs and assumptions about the future must be made. These include:

- Purchase price of replacement females
- Number of calving opportunities
- Annual cow costs
- Annual heifer development costs (if any)
- Annual cow cull rate
- Percent marketable calves
- Weaning weights of marketable calves
- Sale prices of marketable calves
- Weights of cows when culled
- Sale prices of cull cows
- Discount rate

Considering these factors can determine the difference between an acceptable or unacceptable investment. Therefore, producers must be flexible and capable of modifying herd replacement strategies as needed to take advantage of changing conditions.

Outputs

The primary economic analysis tool to determine the value of replacement females is the capital budget. There are several methods of capital budgeting that are commonly used such as payback period, internal rate of return, and net present value. An extension of the net present value called the maximum bid price can also be calculated.

Payback Period

The payback period estimates the number of years that are required for the replacement females to pay for themselves. The payback period is calculated by finding the year in which the accumulated net cash flows, calves plus cull cows less expenses, equals the initial investment in the replacement females. An investment alternative with the shortest payback period is preferred.

Internal Rate of Return

The internal rate of return calculates the discount rate that equates the initial investment in the replacement females with the sum of the discounted cash flows. The investment alternative with the highest internal rate of return is preferred, and if that investment has a higher internal rate of return than the required rate of return (discount rate), it is acceptable.

Net Present Value

Net present value is a means of taking into account the fact that a time value of money exists (i.e., a dollar tomorrow is worth less than a dollar today) and discounts future returns such that all results are in "today's dollars". The net present value is calculated by subtracting the initial investment from the sum of the discounted cash flows. If the net present value is positive, meaning that the discounted future earnings are greater than the initial investment, then the investment has earned a rate of return greater than the discount rate and is acceptable to pursue. If the net present value is

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Lee Schulz, extension livestock economist lschulz@iastate.edu, 515-294-3356 Patrick Gunn, extension beef cow-calf specialist pgunn@iastate.edu, 515-294-3020 negative it means that future earnings discounted back to the time of the investment are less than the investment. The investment will earn a rate of return less than the discount rate, and it is not acceptable. If the net present value is zero, the rate of return on the investment equals the discount rate.

Maximum Bid Price

The maximum bid price calculates the initial investment value that equates the net present value to zero given the required rate of return (discount rate) or opportunity cost of capital. The maximum bid price provides a benchmark to compare to current market prices. If current market prices are below the calculated maximum bid price, then purchasing replacement females would likely be in order. If current market prices are above the calculated maximum bid price, purchases of replacement animals should likely be delayed.

Risk (uncertainty) can be introduced into the net present value (maximum bid price) analysis in several ways, with discount rate adjustment and sensitivity analysis being two common approaches. Discount rate adjustment involves increasing the discount rate used in the net present value calculations. This increased discount rate reflects not only the opportunity cost of money that is not received until the future but also the return for the assumption of added risk. Higher expected returns will be required to accept an investment alternative with a higher discount rate, thus forcing the investment to compensate for the increased risk.

Sensitivity analysis is carried out by calculating net present values (maximum bid prices) for not only the expected outcome of the investment, but also optimistic and pessimistic outcomes. For example, the analysis could be re-calculated using alternative calf crop, price, weaning weight, annual cow cost, or cow culling rate assumptions in order to determine "best case" and "worst case" outcomes. The alternative investments can then be ranked under each scenario and subjectively weighted.

Decision Aides

Two Ag Decision Maker tools have been developed to aid in calculating payback period, internal rate of return, net present value and maximum bid price of potential purchased, or retained replacement females. The first spreadsheet, B1-74, Net Present Value of Beef Replacement Females (single replacement), specifies input and output variables outlined above on a per-head basis over the period of time between the decision to purchase or retain a replacement female and when the replacement female is projected to be culled from the herd. The second spreadsheet, B1-74, Net Present Value of Beef Replacement Females (group of replacements), specifies input and output variables on a group of replacements over the period of time between the decision to purchase or retain replacement females and when the last replacement female(s) from the group is projected to be culled from the herd.

These two decision tools differ in the number of inputs required and complexity of the models. The <u>single replacement</u> decision tool works off of a greater number of assumptions, primarily impacted by the user needing to project the number of calving opportunities and marketable calves for a single replacement. This model is useful for analyzing the single replacement case.

Many times replacement females are purchased or retained as a group. As such, accounting for the biological production realities associated with the particular group of replacements is important to the investment decision. The group of replacements decision tool allows users to input more management variables, such as cow death loss and cow culling rate, allowing the model to account for fall-out of animals from a contemporary group over time. The key aspect of this model is that the productive life of replacement females, resulting from the user inputted magnitude and timing of death loss and culling, influences the investment decision.

Summary

Using capital budgeting analysis to determine the value offered by purchased or retained replacement females allows producers to properly reflect upon the economic opportunity presented by alternative investments in replacement females. Due to differences in enterprise goals and, perhaps most importantly their own costs, management practices, and expectations about future market prices, each producer should make this decision independent of other local operations.

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