



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 [single replacement](#) 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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Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Cathann A. Kress, director, Cooperative Extension Service, Iowa State University of Science and Technology, Ames, Iowa.

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