

Heifer Development: Think Profit, Not Just Cost or Revenues

Matthew C. Stockton
Roger K. Wilson
Rick N. Funston¹

Summary

Recent research on the economics of optimal beef replacement heifer size development reinforced the established economic principle that revenue or cost optimization are not equal to profit optimization. A modified profit function was used to analyze simulated results which demonstrated the differences among the three measures. In the case of optimizing pregnancy rates, a heifer must be heavier to optimize productivity as measured by revenue versus profit. Similarly in the case of cost minimization, the reduction in developmental expenses results in less profit except in the case where the economically optimal sized heifer equals that of the size chosen to cost minimize.

Introduction

Research at the University of Nebraska–Lincoln Gudmundsen Sandhills Laboratory (GSL), challenged the conventional wisdom that 65% of mature body weight for virgin heifers is necessary to achieve optimal pregnancy rates. The findings showed no statistically significant difference in pregnancy rates among groups developed to varying percents of mature body weight prior to first breeding, concluding that feed cost savings for heifer development regimes has an economic advantage.

The data from the above studies were reanalyzed in this study which captured the biological and economic information in a simulation model that was used to estimate profitability differences among individual heifers. This methodology used a Modified Profit Function (MPF) to determine differences among animals. A Maturity Index (MI), as described in the 2009 Nebraska Beef Cattle Report,

was a key component of the process. The MI measured several factors in addition to the heifer's weight at pre-breeding. These other factors contributed to maturity and thus pregnancy rate, dystocia, and cost of development, as well as revenue factors such as calf size and individual size.

Procedures

Interrelationships among animal characteristics and production were established using regression analysis and a loss function criteria. The loss function was helpful in identifying appropriate variables to include in the statistical models. Once created, the biological and economic interrelationships were used to evaluate the economic performance of 39,168 individual heifer simulations. These simulations used the production of heifers with the feasible trait combinations. These production results were used to calculate Total Applicable Cost (TAC),

Total Applicable Revenue (TAR), and their associated Profitability Score (PS), identified here as the results of the MPF. The MPF considered only those revenues and costs that change as MI varies, including cost differences resulting from heifer size, feed cost and intake, and dystocia. Revenue differences included the sale of the animals or their offspring during their lifetime. These sale points include cull animals, weaned calves, and pregnant retained cows. These values were sensitive to the timing of that sale, which was dependent on pregnancy status.

Results

The general results of the simulation are summarized using TAR, TAC, and PS in three separate regression analysis, a meta analysis. In all three models, the MI scores are used as the independent variables. The resulting relationships are graphed in

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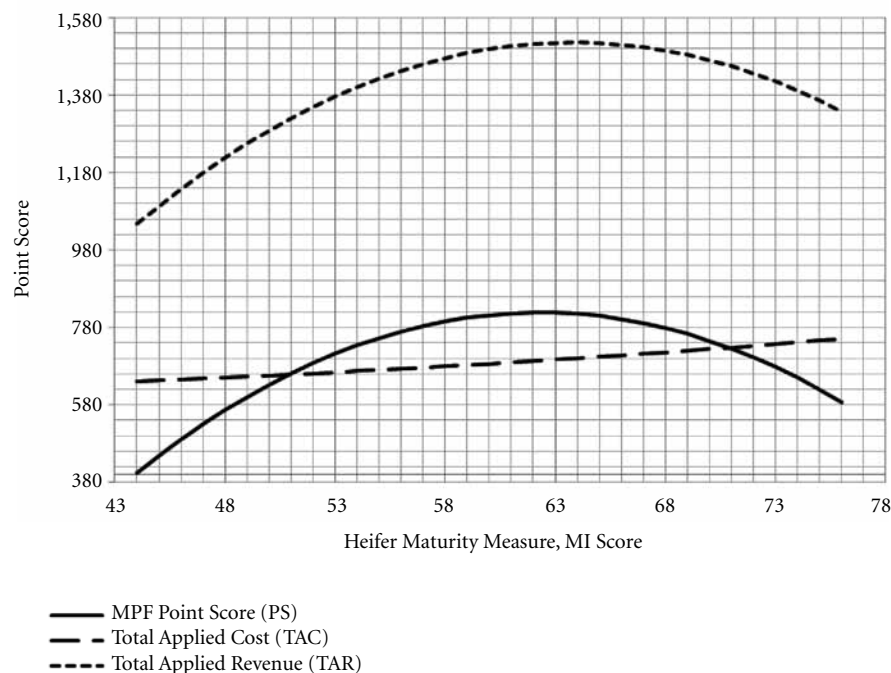


Figure 1. Modified Profit Function (MPF) Profitability Score (PS), Total Applied Revenue (TAR), and Total Applied Cost (TAC).

Figure 1. This graphic gives an overall picture of the effect that MI had on each of the three dependent variables.

The optimal MI score for PS and TAR were 62.29 and 63.80, respectively. Note that TAR was maximized at an MI greater than the PS. This point illustrated what economic theory suggests: Revenue maximization was not the same as profit maximization. As heifers approached higher maturity levels two things occurred: costs per unit increased while revenue per unit was nearly constant, resulting in costs increasing at a faster rate than revenue. At some point prior to maximum revenue, the added costs become greater than revenues, and profits decreased.

The TAC relationship was one of continual increase over the relevant

range of MI's, unlike the PS and TAR, these costs were continually increasing at an accelerating rate.

Simulations were completed using the prices for three different time periods. The results were consistent for all three periods. While the actual MI of the optimal PS and TAR varied slightly in magnitude for all periods, the MI for the optimal PS was always less than the MI for the optimal TAR.

Conclusions

Any program for developing replacement females that focuses on increasing revenue or decreasing cost may not necessarily result in increased profitability. Before adopting any new program, producers should closely study all the impacts of

their regime on profit. Cost reduction only increases profit when the resulting revenues remain unchanged or decline less than the cost savings. In the same way, production increases will raise revenues but only result in higher profits when the costs associated with obtaining the increased production are less than the increased revenues.

¹Matthew C. Stockton, associate professor, agricultural economics, University of Nebraska–Lincoln (UNL) West Central Research and Extension Center, North Platte, Neb.; Roger K. Wilson, research analyst, UNL Department of Agricultural Economics; and Rick Funston, professor, animal science, UNL West Central Research and Extension Center, North Platte Neb.