AN231

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Assessing Efficiency for the Beef Cow[1]

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Introduction

Measuring efficiency can be as simple as creating a ratio of outputs to inputs. However in the commercial beef herd determining which inputs and outputs to use can be challenging. Historically, producers have been able to increase income by selecting for increased production (i.e., increased weaning weights), increased reproduction (i.e., the culling of open cows, monitoring calving intervals), and matching cow nutrient requirements to available feed resources (i.e., such as supplementing feed at strategic points or altering the calving season to match production needs). These practices have been successful at increasing production, but in a large part due to relatively inexpensive feed. Feed is the greatest expense associated with the production of beef. Seventy-two percent of all feed utilized in beef production is fed to cows and calves prior to weaning (Ferrell and Jenkins, 2002), yet much of what we know about feed efficiency relates to fed cattle. As feed costs become a greater expense, it will become important for beef producers to better understand what drives efficiency for the beef breeding herd.

Measuring Efficiency in Beef Cows

What measures of efficiency are useful to the beef producer will depend on the type of operation, enterprise, and specific class(es) of cattle. Figure 1 illustrates inputs and outputs of a beef cow. For decades scientists have been investigating beef cattle efficiency, in fact, as early as 1911 Armsby and Fries observed that cattle "type" lent itself to the ability of that animal to convert feed into weight gain. As the knowledge of beef cattle energy expenditures and nutritional needs expands, a more complete understanding of the efficiency of the beef production system is now understood. While there are several ways to evaluate the efficiency of cows, all of them are based on weaning a calf with minimum inputs, most importantly feed. Two areas stand out with regards to measuring efficiency in beef cattle; reproductive efficiency, or the ability for cows to become pregnant and produce a live calf on an annual basis; and feed efficiency, the conversion of feed into energy used for maintenance, weight gain, milk production, and to support reproduction.

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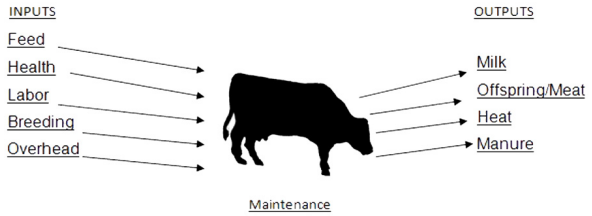

Figure 1. A simple outline of inputs and outputs that can be utilized when measuring efficiency in beef cattle (adapted from Ostergaard et al. (1990)).

Nutrition's Role in Reproductive Efficiency

The primary objective of beef cattle production is for each cow to produce one live calf each year (Lamb et al., 2008). When there is reproductive failure, the result is an open cow that is using inputs without producing any saleable product. Many factors contribute to reproductive failure, but nutritional deficiencies can play a major role. Cows that do not have access to adequate dietary energy will lose condition and can quit cycling. Confounding this issue is that the cowˇs greatest nutritional need (i.e., late pregnancy and lactation) can come at a time when forage availability and quality are at their lowest. When this is the case, supplementation may be needed. However, providing the required amount of nutrition without overfeeding cows can be difficult, especially if the nutritional status of the cows is not clearly defined. Producers can manage this by evaluating a few simple things. Phase of production (stage of pregnancy and lactation) defines the basic nutritional needs of the cow. Secondly, the type and availability of forage resources will determine if energy and/or protein supplementation is necessary, and if so, at what level. Lastly, evaluating the body condition score (BCS) of the cowherd is an excellent way for beef cattle producers to analyze the nutritional status of cows (Kunkle and Sand, 2003) and determine the cows dietary needs. Understanding these factors will lead to efficient management that doesnˇt sacrificing pregnant cows or wasting valuable feed resources.

Feed Efficiency

Calculating feed efficiency of cows is difficult because determining feed intake, even as an estimate, is very challenging. Performance can be difficult to determine as well, as weight changes can be related to status of pregnancy and lactation and not necessarily feed or forage intake. However, a more practical method of selecting for feed efficiency in beef cows may be coming in the form of residual feed intake, or RFI. Residual feed intake is the difference between actual intake and the predicted or expected intake, which is calculated based on animal weight and performance. The key to RFI is that it is highly heritable, yet is not highly correlated to performance traits, meaning selecting for RFI should have very little impact on other traits of interest. Several breed associations are already collecting RFI data and some seedstock producers are using RFI to calculate feed efficiency indexes and using feed efficiency markers to make breeding decisions. Ultimately, this will lead to commercial producers being able to incorporate feed efficiency into their selection criteria when purchasing seedstock.

Most often RFI is calculated in growing and developing cattle post-weaning, but limited research has been conducted on RFI in mature breeding cattle. There is evidence that selection of replacements for RFI will increase beef cow herd feed efficiency. Meyer et al. (2008) measured dry matter intakes before and after calving in Hereford cows sorted previously post-weaning into highly efficient (low RFI) and less efficient (high RFI) groups. The highly efficient cows consumed 21% less feed before calving and 11% less feed after calving than less efficient cows. In a separate study, two herds of cattle selected by RFI status (high or low efficiency) over a 5-year period had average daily feed intakes of -0.70 (highly efficient) and +0.86 (less efficient) compared to expected intakes (Arthur et al., 2001). During the trial period however, there was no difference in calf or cow performance, only a difference in feed intake. It would appear that selection for RFI will decrease feed intake without an adverse effect on saleable output.

As an example, a 10% increase in feed efficiency, which is similar than what preliminary research has reported when selecting for RFI, can have a potentially significant impact on producers in Florida. State cow/calf enterprise reports estimate that the cost of feed can range from $170 to $330 (average $250) per cow. ***Therefore, a 10% decrease***

in feed cost could result in a $25 per cow annual savings.

Measuring Overall Efficiency

There are several measures of efficiency in the commercial beef cow herd that have been proposed that incorporate both feed and reproductive efficiencies. Common selection indexes include:

1. Pounds of calf weaned per cow exposed to breeding
2. Pounds of calf weaned per pound of cow exposed to breeding

When adopting a selection index, it should be noted that due to lower maintenance demands small framed cows with low milk production may appear to be more efficient if calf performance is not taken into account (Tedeschi et al., 2004). The following two example herds have 100 cows each, but have different mature cow weights, weaning weights, and number of calves weaned.

	Herd	
	A	B
Cows Exposed	100	100
Average Cow Weight	1275	1175
Calves Weaned	90	92
Weaning Weight	525	485
Pounds Weaned/Cow Exposed	451.5	437.0
Pounds Weaned/Pounds Cow Exposed	0.37	0.38

When comparing pounds of calf weaned per number of cows exposed to breeding, Herd A appears to be more efficient. However, if cow weights are included into the analysis, then Herd B has a slight advantage. This is due to the added weaning weight form Herd A compensating for the decrease in number of calves weaned. Typically, a 100 pound increase in mature weight will result in an additional 500 – 550 pounds of feed intake (dry matter) per year (NRC, 2000), so calf prices and feed costs will ultimately determine which of these herds is more financially efficient.

Conclusion

The efficiency of the beef herd is a subject of great interest for many researchers and purebred producers. There are many ways to measure efficiency, including different selection indexes, but each producer has to be aware of what to measure in order to present a clear picture of the efficiency of their specific operation. Producers that understand the nutritional needs of the beef herd relative to reproductive status and stage of production will be able to make sound decisions that will increase efficiency and ultimately, profitability.

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