

# The Digestive Tract

## Does feedyard efficiency translate to cow efficiency?

by Dan Shike, University of Illinois



Feed efficiency continues to be a very popular topic among cattle producers and researchers. However, this is not a new concept. Researchers have been studying feed efficiency for decades.

Still, changing dynamics in agriculture have brought more feed efficiency research to the forefront. The combination of decreasing acres available for crop production, an increasing world population, increased utilization of grain for fuel, increased input costs (fuel, transportation and fertilizer) and an increase in feed costs (grain and forage) are some of the key factors that highlight the changing dynamics of agriculture.

Additionally, the recent drought in much of the United States has further reduced the available feed supply, driving feed costs dramatically higher.

Historically, feed costs have represented 50%-70% of the cost of production for beef enterprises. As corn prices approached and exceeded \$7 per bushel, feed costs accounted for nearly 80% of the costs at many feedlot operations.

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### Measures

There are a few different ways to measure feed efficiency.

**Feed conversion ratio (FCR):** Feed conversion ratio is the ratio of dry-matter intake (DMI) to liveweight gain. Typical feed conversions range from 4.5:1 to 7.5:1, with a lower number being more desirable, as it would indicate a steer requiring less feed per pound of gain.

FCR is a good measure for monitoring or describing feedlot cattle performance. However, it may not be great to select for in the cow herd, as it is correlated to growth. Selecting for improved FCR would result in increased growth, which would lead to increased mature cow size, which would ultimately increase the feed costs for the cow herd.

**Residual feed intake (RFI):** Residual feed intake is an alternative measure of efficiency. It is the difference between actual intake and predicted intake based on an animal's body weight, weight gain and composition. A negative value for RFI is desirable, as it would indicate that a

steer consumed less feed than was predicted for his weight, gain and composition.

A potential advantage of RFI as a selection tool is that it is intended to be independent of growth and mature size. However, cattle can have "good" RFI for different reasons, so it is unclear what you may be selecting for.

**Residual gain (RG):** Residual gain is the difference between actual gain and predicted gain based on an animal's body weight, intake and composition. A positive value for RG is favorable, as it would indicate that a steer gained more than was predicted for his weight, intake and composition. This measure is correlated to growth. Thus, it may be better suited for identifying superior feedlot cattle and not as good for selecting replacement females.

### Current status

Although feed efficiency has been studied for decades and feedlot profitability is clearly influenced by feed efficiency, the beef industry is well behind the competition.

Feedlot cattle typically have an FCR at or above 6:1, while swine are at <3.5:1, poultry are at <2:1, and catfish are at nearly 1:1. The poultry industry has improved feed efficiency by 250% in the last 50 years. The beef industry has made minimal to no improvement during the last 30 years.

Why are cattle less efficient? Unfortunately, beef cattle will never be as efficient as monogastric animals. Ruminant animals consume a higher-fiber diet and, through rumen fermentation, energy is lost as methane. Also, because of their larger size, cattle have a much higher maintenance requirement.

However, this does not explain why we have made little to no improvement. The answer to that is simple: We have not selected for feed efficiency as aggressively as the swine and poultry industries have.

Identifying superior individual cattle requires that cattle be fed individually. This requires expensive, labor-intensive facilities, and feeding cattle individually removes the social interaction that cattle experience when fed as a group in a large pen. Also, it is difficult to compare cattle that are at varying compositions.

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### Tech advancements

Major technological advances in feed intake measurement now allow cattle to be maintained in a pen environment, yet have individual intake recorded. These feeding systems utilize radio frequency identification (RFID) tags and a bunk that is on scales. Only one animal at a time is able to eat. An antenna in the bunk reads the RFID tag and records the weight of the feed in the bunk when the animal puts its head in the bunk and when it removes its head from the bunk.

Several universities and private operations now have technology similar to this to record individual feed intake. The use of ultrasound allows repeated measurements of 12th-rib backfat, rump fat, marbling and ribeye area. This allows for body composition to be taken into consideration when identifying feed-efficient animals.

### Cow efficiency

Much of the research thus far has focused on identifying cattle that are efficient in feedlots on high-energy (grain) diets. However, identifying efficient females to retain in the herd may deserve as much or more attention.

Approximately 70% of feed resources used in the beef industry are for the cow herd, and about 70% of that feed is for maintenance. This means that nearly half of all the feed

used in the beef industry is used just to maintain the cow herd.

Several definitions have been proposed for cow efficiency. Beef cow efficiency measures often include pounds of calf weaned and intake. Reproductive success and longevity can have a dramatic effect on the bottom line of a cow-calf operation. More work is needed to evaluate the effects of selecting for various feed efficiency measures on reproductive success, cow productivity and longevity.

### Feedlot vs. cow efficiency

Although cow-calf operations and feedlots are often considered separate entities, we can't have one without the other. Both cow-calf managers and feedlot operators are interested in improved efficiency.

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Feedlot cattle consume high-energy, grain-based diets, and the cow herd consumes

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moderate- to low-energy, forage-based diets. Intake is not regulated by the same mechanisms for these different diet types.

There are factors related to maintenance energy requirements that are similar in both the growing/finishing steer and the mature cow. At the University of Illinois, we have evaluated the relationship of DMI and feed efficiency on a forage-based diet and on a grain-based diet in consecutive test periods in a feedlot. We found both DMI and feed efficiency on a forage-based diet to be moderately correlated ( $r=0.58$  and  $0.40$ , respectively) to DMI and feed efficiency on a grain-based diet.

We also recently evaluated the relationship of postweaning DMI on a moderate-roughage growing diet and DMI on a high-roughage diet prebreeding in replacement heifers. Even with several months between the evaluations and different diet types, DMI was moderately correlated ( $r=0.47$ ).

However, we still have more questions than answers regarding how DMI on various diets in growing cattle relates to actual grazing intake and performance in the cow herd.

## Summary

Limited feed supplies and high feed prices continue to

increase producer awareness of input costs and feed efficiency. Feed efficiency has been studied for decades, yet minimal progress has been made in the beef industry. Recent advances in technology now allow for individual feed intakes to be recorded on cattle fed in large groups. Research has largely focused on identifying superior cattle during the finishing phase when cattle are fed grain-based, high-energy diets. However, the cow herd consumes a lower-energy, forage-based diet.

Despite the differences in intake regulation among different diet types, intake does appear to be moderately correlated across different diet types and stages of production. Yet we still know very little about the relationship of harvested forage in a pen setting and actual grazing intake and performance.

Feed prices and input costs are driving selection pressure on growth and feed efficiency. However, it is important to understand the ramifications of selecting for feed efficiency on cow herd reproduction, productivity and longevity. **ABB**

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Editor's note: "The Digestive Tract" is a regular column in the *Angus Beef Bulletin* focused on nutrition for the beef cattle life cycle. Dan Shike is associate professor in animal sciences at the University of Illinois.