Beef Cattle Feed Efficiency

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Introduction

Feed efficiency is currently a very popular topic among cattle producers and researchers. However, this is not a new concept. Researchers have been studying feed efficiency for 40 years. However, 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 were nearly 80% of the costs in many feedlot operations. In 2011, an improvement of 10% in feed efficiency in the entire feedlot sector would reduce feed costs $1.2 billion.

Measures of Efficiency

Feed Conversion Ratio (FCR): Feed conversion ratio is the ratio of dry matter intake to live-weight gain. A typical range of feed conversion ratios is 4.5 -7.5 with a lower number being more desirable as it would indicate that a steer required less feed per pound of gain. Feed conversion ratio is a good measure for monitoring or describing feedlot cattle performance; however, it is not a great measure to select for. Feed conversion ratio is correlated to growth rate. Selecting for improved FCR would result in an increase in genetic merit for 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 good as it would indicate that a steer consumed less feed than was predicted for his weight, gain, and composition. An advantage of RFI is that it is independent of growth and mature size. Because it is independent of growth, research has investigated selection based off of RFI.

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 good 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 of the Industry

Although feed efficiency has been studied for decades and feedlot profitability is clearly impacted by feed efficiency, the beef industry is well behind the competition. Feedlot cattle typically have FCR at or above 6:1, swine are < 3.5:1, poultry are < 2:1, and catfish are nearly 1:1. In fact, poultry have improved feed efficiency by 250% in the last 50 years. However, 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. 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.

Technological Advances Facilitate Efficiency Research

Major technological advances in feed intake measurement now allow cattle to be maintained in a pen environment yet have individual intake recorded. Technology, such as the GrowSafe® system, utilizes radio frequency ID 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 radio frequency ID 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 businesses 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. When calculating RFI and RG, composition is often included as it accounts for some of the variation in intake and/or gain.

Cowherd 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 utilized in the beef industry are for the cowherd and about 70% of that feed is for maintenance. This means that nearly half of all of the feed used in the beef industry is just to maintain the cowherd. Several definitions have been proposed for cow efficiency. Beef cow efficiency measures often include pounds of calf weaned and intake. Reproductive success and longevity obviously can have a dramatic impact on the bottom line of a cow-calf operation. More work is needed to evaluate the effects of selecting for various feed efficiency measure on reproductive success, cow productivity and longevity.

Feedlot vs. Cowherd Efficiency

Although the cow-calf operations and feedlot operation 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. Ideally, selection for improved feedlot efficiency will improve cow efficiency. However, this may not be the case. Feedlot cattle consume high-energy, grain-based diets and the cowherd consumes 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. Further research is still needed to determine the relationship between grain and forage efficiency and between the feedlot and cowherd.

Summary

Limited feed supplies and high feed prices have increased producer awareness of feed efficiency recently. 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 cowherd consumes a lower energy, forage based diet. Further research is needed comparing efficiency measure on high-energy, grain diets and low-energy, forage diets. It is important to understand the impacts of selecting for feed efficiency on cowherd reproduction, productivity, and longevity.