Determining the value of processing corn

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In the competitive business of cattle feeding, it is important to strive for the highest quality product at the lowest possible cost. As nutritionists consider ways to make our customers more competitive, we continually look to improve efficiencies. Using projection tools that take the economics of the fall of 2016 into account, profitability improves by $40 per head when a 10 percent improvement in feed-to-gain is realized. One of the most frequent areas cattle producers consider to improve efficiency is processing their corn.

Effect of different processing methods

A variety of methods have been used to process corn with the goal of improving starch availability. The degree to which the corn is processed influences the availability of the starch and the rate at which it is fermented. We consider starch availability to be ranked in certain types of corn as follows, from lowest to highest: whole-shelled corn, cracked/rolled corn, high-moisture corn and steam-flaked corn.

Reducing grain particle size through processing effectively increases the surface area of the starch available for bacterial adherence. This enhanced bacterial activity speeds up the process of fermentation and volatile fatty acid production. The same outcome is realized when high-moisture grain is fed, which reduces the lag time required for bacteria to infiltrate and break down the starch component. In finishing diets, increasing the fermentation rate can make cattle more prone to bouts of acidosis, thereby risking digestive upsets and lost efficiency as well as potentially negating any advantage achieved from processing the grain. Feeding processed corn requires more consistent and careful bunk management in order to minimize the risk and incidence of acidosis.

Processing grain shows a tendency to improve feed efficiency, which is most often the result of a reduction in dry matter intake (DMI) without changing average daily gain (ADG). However, this is not always the case, as the response can be modified by other factors, such as forage type, forage amount and moisture content of the diet.

Another aspect of corn processing is that it can lead to either positive or negative associative effects. As ruminal starch becomes more available, there is a greater opportunity to utilize non-protein nitrogen in the diet, enhancing fermentation activity and increasing bacterial protein flow to the intestine. However, fiber-digesting bacteria are more effective at a neutral rumen pH. Adding highly fermentable carbohydrates, which makes a more acidic rumen environment, results in lower fiber digestibility and forage intake.

The extent of corn processing and moisture content can also interact with the roughage source and influence the value of harvesting and processing methods. Understanding how different types of processing behave in the presence of unique ingredients is an important part of the decision. A review by Owens et al. (1997) of cattle finishing diets described the response from different processing methods with varying moisture levels of the roughage. They observed that feeding dry-rolled corn resulted in a 6.1 percent increase in ADG when fed with wet roughages compared to dry. Conversely, high-moisture corn was 7.9 percent less efficient in the presence of wet roughages versus dry. Whole corn did not respond significantly to either roughage type.

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In regards to formulating rations, we should be considerate of how corn processing influences mixing quality and eating behavior in cattle. When corn is processed, physical characteristics like particle size and density are changed. It is important to consider how these factors interact with the other dietary ingredients and in conjunction with other factors that influence mixing variation, like moisture content. Processing will produce more fine particles, which typically separate out of dryer rations and are unpalatable to cattle. This could potentially result in both wasted feed and lower DMI.

Observing corn in manure is a red flag for cattle feeders and fuels concern that energy is either being lost or underutilized. Gorocica and Loerch (2005) looked at the recovery of whole corn kernels and found that in both high (18.2 percent corn silage) and low (5 percent corn silage) forage diets, 1.2 to 1.5 percent of corn fed was in the manure. The visual appearance of bright yellow kernels can therefore be deceiving and should not be the primary driver of the corn processing decision.

Economics
Despite the fact that enhanced animal performance associated with corn processing has been recognized under certain circumstances, the important question should be: Does processing provide a positive return on investment?

Like so many variables we deal with in biological systems, the answer to this is that it depends. There are several factors to consider, including the cost of processing, the price of corn and changes in efficiency.

It is important to evaluate that decision at variable prices for corn. A typical commercial price for cracking corn in the Upper Midwest is $0.20 per bushel. If corn is $3 per bushel, a 6 to 7 percent improvement in Net Energy for Gain (NEg) is needed to cover that cost. However, if corn is $6 per bushel, that improvement only needs to be a little over 3 percent, as the cost to process becomes a lesser part of total cost at $6 per bushel.

Making a plan
The decision to process is not one that should be made at the last minute. Once the corn is processed or ensiled, it’s been committed to a specific outcome and will have limited marketing possibilities.

In addition to limitations on marketing, proper management and storage of high-moisture grains require planning. The first consideration is the moisture content of the corn at harvest. It has been demonstrated that as the percent of moisture increases, so does the resulting efficiency, with the maximum level being from 30–31 percent moisture. Additionally, how corn is processed will influence how well it packs and consequently the quality of the fermentation. These details should be considered well in advance of harvest.

In conclusion, processing grain increases the availability of starch and changes the rate and extent of digestion, but there are several factors that influence the decision producers make on whether or not to process corn. Each situation is unique, as factors like processing method, roughage source, rumen degradable protein and dietary moisture will all influence the outcome. In addition, as greater processing is utilized, greater bunk management is required. Finally, economic return on investment must be evaluated with a focus on corn price in order to understand the cost-benefit ratio of this optional input.

Sources