



# BEEF CATTLE RESEARCH UPDATE

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## **Effects of Corn Processing Method on Feedlot Performance**

Recent Nebraska research<sup>1</sup> evaluated five different corn processing methods on the performance of 678 lb (initial weight) crossbred steers over a 152 day feeding period. The following processing methods were tested: dry-rolled corn (DRC), fine-ground corn (GC), rolled high-moisture corn (RHMC), ground high-moisture corn (GHMC), and steam-flaked corn (SFC, 26 lb/bu). The high moisture corn was harvested at 30% moisture. The final diet contained 60% corn, 25% wet corn gluten feed (Cargill's Sweet Bran), 10% corn silage, and 5% supplement (DM basis). Gain efficiency (gain:feed ratio) was increased 3.8, 7.0, 8.7, or 11.8% for steers fed GC, RHMC, GHMC, or SFC, respectively, compared to dry-rolled corn. Calculated net energy values for gain for the corn processing methods were improved 5.1, 10.3, 10.9, and 15.4% for GC, RHMC, GHMC, and SFC, respectively, compared with dry-rolled corn. The primary goal of processing grain is to increase starch availability to improve cattle performance. However, increased starch availability increases the risk of acidosis, which may decrease animal performance. In this study, it was concluded that more intense processing improved starch availability and performance because feeding wet corn gluten feed reduced the susceptibility to acidosis.

Similar results were reported in a recent California experiment<sup>2</sup> which evaluated four corn processing methods fed to 684 lb crossbred steers over a 112 day feeding period. The following processing methods were tested: whole corn, dry-rolled corn, ground corn, and steam-flaked corn (24 lb/bu). The final diet contained 75.3% corn, 8% sudan hay, 4% alfalfa hay, 5% yellow grease, 4% molasses, and 3.7% supplement. Cattle fed steam-flaked corn had greater gain and gain efficiency than cattle fed dry corn treatments. Steers fed steam-flaked corn had a 13.6% greater gain to feed ratio than cattle fed dry-rolled corn. The net energy value of gain (NEg) for corn was increased by 19.5% with steam-flaking as compared to the dry corn treatments. The calculated NEg content of steam-flaked corn was 16.7% greater than for dry-rolled corn. Finely grinding corn did not increase the feeding value of corn over that of dry rolling. Grinding or dry rolling corn increased daily gains of steers by 7.7% over that observed with whole corn but no differences in efficiency were noted.

The results of these recent studies are in agreement with a 1997 Oklahoma<sup>3</sup> review of 419 corn processing comparisons published since 1974. In this review, feed efficiency improved 2.2 and 12.0% for cattle fed high-moisture corn and steam-flaked corn, respectively, compared to dry-rolled corn in diets that averaged 82% corn. The net energy values for gain for the corn processing methods were improved 9.9 and 21.7% for high-moisture corn and steam-flaked corn, respectively, compared with dry-rolled corn.

## **The Cost of Corn Processing for Finishing Cattle**

Recent Nebraska research<sup>4</sup> evaluated the cost of three corn processing methods (dry-rolled - DRC, high-moisture - HMC, and steam-flaked - SFC) for use in 5,000 and 20,000 head capacity feedlots. These researchers obtained economic inputs from communication with feedlot consultants, feedlot managers, and grain handling suppliers and by review of the literature. Costs considered included initial equipment (bins, buildings, roller mills, steam chests, boilers, bunkers, elevators, etc.), depreciation, interest, insurance, taxes, labor, maintenance, natural gas, and electricity. The natural gas and electricity prices used were \$5.04/mcf and \$0.056/kwh, respectively, based on a 5-yr average (1998 to 2002) of the commercial sector in Nebraska. Labor cost was input at \$15/hr.

Based on these various inputs, processing costs were calculated to be \$1.43, \$4.27, and \$8.68 per ton (DM basis) for DRC, HMC, and SFC, respectively, for the 5,000 head capacity feedlot. Processing costs were less for the 20,000 head capacity feedlot at \$0.73, \$2.79, and \$5.65 per ton for DRC, HMC, and SFC, respectively. Using these economic calculations in an 85% corn diet (DM basis with corn priced at \$2.05/bu at 15.5% moisture), improvements in feed efficiency would need to be 2.4 and 6.1% for feeding HMC or SFC, respectively, compared with DRC in a 5,000 head capacity feedlot to be of economic value. In feeding SFC, a feed efficiency improvement of 3.6% is required to cover the additional costs compared with HMC in a 5,000 head feedlot. For the 20,000 head capacity feedlot, improvements in feed efficiency would need to be 1.7 and 4.2% for feeding HMC or SFC, respectively, compared with feeding DRC. A feed efficiency improvement of 2.4% is required for feeding SFC compared with HMC in a 20,000 head feedlot.

A number of variables including corn price, feed efficiency response, energy cost, and feedlot size determine economic returns for corn processing. Based on the previously cited grain processing research<sup>1,2,3</sup>, feeding SFC appeared to generate economic returns in both sizes of feedlots compared with feeding HMC or DRC. Using an average feed efficiency improvement of 11.1% (SFC vs DRC) in an 85% corn diet (DM basis), these researchers determined that the cost of natural gas can range as high as \$16.99 and \$21.46/mfc for the 5,000 and 20,000 head feedlots, respectively, before the price becomes to great (breakeven).

Feeding HMC compared with DRC appeared to be more variable in generating economic returns. In a review of several experiments comparing feedlot performance of cattle fed either DRC or HMC (without wet corn gluten feed - WCGF), it was determined that feeding HMC improved feed efficiency by an average of 3.1% compared to DRC (adjusted to 85% corn diet, DM basis). Using this 3.1% feed efficiency improvement, these researchers calculated that corn must be priced at \$1.80/bu and \$1.57/bu (15.5% moisture) before feeding DRC is advantageous to HMC in a 5,000 and 20,000 head feedlot, respectively. In a review of trials in which WCGF was fed, feeding HMC vs DRC improved feed efficiency by an average of 5.2% (adjusted to 60% corn diet with 25% WCGF, DM basis). Using this 5.2% efficiency improvement, corn must be priced at \$0.91 and \$0.77/bu (15.5% moisture) before feeding DRC is advantageous to HMC in a 5,000 and 20,000 head feedlot, respectively.

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<sup>1</sup> Macken, C.N., G.E. Erickson, T.J. Klopfenstein, and R.A. Stock. 2006. Effects of corn processing method and protein concentration in finishing diets containing wet corn gluten feed on cattle performance. *Prof. Anim. Sci.* 22:14-22.

<sup>2</sup> Corona, L. S., Rodriguez, R. A. Ware, and R. A. Zinn. 2005. Comparative effects of whole, ground, dry-rolled, and steam-flaked corn on digestion and growth performance in feedlot cattle. *Prof. Anim. Sci.* 21: 200-206.

<sup>3</sup> Owens, F. N., D. S. Secrist, W. J. Hill, and D. R. Gill. 1997. The effect of grain source and grain processing on performance of feedlot cattle: A review. *J. Anim. Sci.* 75: 868-879.

<sup>4</sup> Macken, C. N., G. E. Erickson, and T. J. Klopfenstein. 2006. The cost of corn processing for finishing cattle. *The Professional Animal Scientist* 22: 23-32.

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