



BEEF CATTLE RESEARCH UPDATE

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Performance and Carcass Quality of Steers Fed Different Sources of Dietary Fat

Recent Missouri research¹ looked at the effect of different dietary fat sources on the performance and carcass quality of 976 lb large-frame crossbred yearling steers over a 76 day feeding period. Four dietary treatments were evaluated: a corn/soybean meal-based diet (control), two diets containing 16% (DM basis) whole raw soybeans and a corn/soybean meal-based diet containing 3.93% (DM basis) choice white grease. Soybeans used in the diets were either a standard variety or a variety high in oleic acid. The calculated fat content of the three fat treatments was 7.91% (DM basis).

Feeding supplemental fat did not alter daily gain, hot carcass weight, ribeye area or yield grade in this trial. Dry matter intake tended to decrease by 4% with added fat (29.26 vs 28.09 lb) and efficiency was significantly improved by 8.7% with added fat (0.126 vs 0.137 lb gain/lb DM). Feeding additional fat increased marbling scores by one-fourth of a marbling score grade with no effect due to source (4.66 vs 4.91 where 4.0 to 4.99 = select). The additional fat also tended to increase backfat thickness (0.48 vs 0.53 in). The use of whole raw soybeans compared with choice white grease increased that amount of unsaturated fat and total vitamin E deposition in the tissue. Loin tissue samples from steers fed whole raw soybeans were higher in total tocopherol (vitamin E) than were tissues from steers fed choice white grease (1.28 vs 0.91 ppm).

In summary, these researchers concluded that the addition of fat to feedlot diets can improve feed efficiency and marbling scores. In addition, dietary fat source can alter the composition of the beef carcass by altering fatty acid composition and vitamin E content. Additional tissue vitamin E may play an important role in protecting the additional deposited unsaturated fatty acids from lipid oxidation. These changes may have further implications for the shelf life of beef products as well as the diet of the consumer.

Morbidity Effects on Stocker Cattle Production

Texas researchers² conducted three experiments to determine the effect of morbidity, castration, and grazing environment on weight gain, performance, and cost in stocker cattle. In experiment 1, 468 male calves (mix of bull and steers) initially weighing 550 lb were run on native range for approximately 100 to 140 days. In this experiment, 17% of the cattle were treated for bovine respiratory disease for less than 8 days, 6% for 8 to 14 days, and 8% for more than 14 days. Morbid cattle gained less than healthy cattle (1.32 vs 1.56 lb/day). The combined cost of antibiotic treatment and loss in gain resulted in a cost of morbidity ranging from \$11.05 per head to \$66.74 per head or \$2.27 to \$12.73/cwt initial weight of cattle.

In experiment 2, 279 bulls and steers (average initial weight of 475 lb) were used to look at the effect of castration on health and performance. The calves ran on native range for 7 to 8 months. The gain of steers was greater than that of bulls castrated after arrival (1.63 vs 1.41 lb/day). Castration after arrival led to a 13.5% loss in daily gain and 10.3% loss on season-long gain. More bulls castrated after arrival (60%) were morbid compared with steers (28%). Castration alone led to a \$19.60 per head loss in healthy bulls. The value of gain for a healthy steer was \$23 more than for a morbid steer, \$22 more than for a healthy bull, and \$48 more than for a morbid bull.

In experiment 3, 633 heifers running on native range for about 9 months (initially weighing 552 lb) were used to test the effects of morbidity on weight gain and reproduction. Heifers requiring more

than 8 days of antibiotic treatment gained less than healthy heifers (0.68 vs 0.75 lb/day) and had lower pregnancy rates (66 vs 81%). The pregnancy rate of heifers treated less than 8 days was intermediate to the other groups (76%). Pregnancy adjusted gross return per heifer, including antibiotic therapy costs, was \$19.98 less in heifers treated less than 8 days and \$51.57 less for heifer treated more than 8 days compared with healthy heifers.

These experiments illustrate the big impact that castration and respiratory infection have on the productivity and profitability of stocker cattle grazing native pasture.

Feedlot Feed Efficiency

For many years, it was generally assumed that feedlot feed efficiency (feed to gain ratio) was positively related to feed intake. Based on this theory; the animal that consumes the most, in relation to body weight, gains more and is more efficient. The theory was that the more an animal ate the more energy that was left, after taking care of body maintenance, to meet production. It was also thought that there was little difference in efficiency of utilizing feed for maintenance or gain. However, research³ has shown that feed conversion ratio is more related to growth, body size, composition of gain and appetite than to the energy required for maintenance. It appears that the beef industry selected for faster, larger animals with increased appetites, but with no improvement in feed efficiency.

A look at recently collected actual feedlot data supports this contention. To determine the relationship of mean feed intake to steer daily gain and efficiency, intake and closeout records from 231 pens of 650 to 750 lb steers

(24,426 head) fed in 2004 and 2005 at Hitch Feeders I at Hooker, OK were analyzed. The average initial weight on this group of steers was 704 lb with an average dry matter intake of 20.07 lb, an average daily gain of 3.37 lb and an average feed conversion ratio of 6.01. Figure 1 presents a plot of mean feed intake vs daily gain and feed efficiency of these pens.

There is a high positive correlation between intake and gain of 0.72.

Linear regression between intake and gain showed that intake explains 52% of the variation in daily gain ($r^2 = 0.52$).

Whereas, the correlation between intake and feed efficiency is low (-0.14) with regression analysis showing that intake only explains 2% of the variation in feed efficiency. The results of this analysis were very similar to that previously observed in commercial feedlot data collected at Hitch Feeders I in the early 1980's⁴. In this earlier data set, feed intake explained 50% of the variation in daily gain but only 0.9% of the variation in feed efficiency.

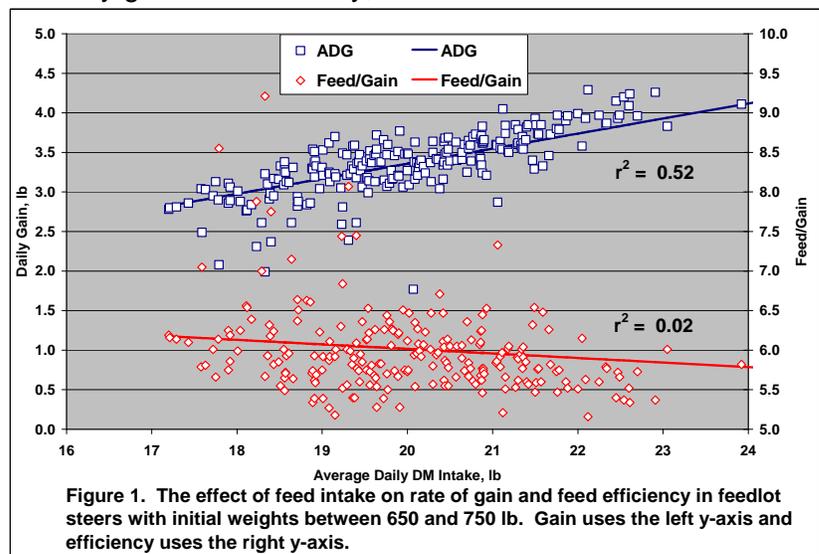


Figure 1. The effect of feed intake on rate of gain and feed efficiency in feedlot steers with initial weights between 650 and 750 lb. Gain uses the left y-axis and efficiency uses the right y-axis.

Recent research has shown that a better means of evaluating efficiency is by using the concept of residual feed intake (RFI). RFI is defined as the difference between an animal's actual feed intake and its expected intake based on body weight and growth rate. Positive RFI animals eat more than expected in relation to their weight and gain, so they are less efficient. A negative RFI value is better and indicates a more efficient animal. Recent Canadian research⁵ studied the relationship of feedlot feed efficiency, performance, and feeding behavior with metabolic rate, digestion, and energy partitioning in beef cattle ranked by RFI.

High, medium, and low RFI steers (average weight of 1116 lb) were selected from a group of 306 animals that had been used in recently completed feedlot tests. These steers were then used in metabolic and digestion trials. During the digestion trial, feed intake did not differ among the three RFI levels. However, digestibility of dry matter (75.3 vs. 70.9%) and crude protein (74.7 vs. 69.8%) were greater for low RFI steers than high RFI steers. In addition, methane production was 28 and 24% less in low RFI steers compared with high and medium RFI steers, respectively. Daily heat production and energy retention were also significantly associated with feedlot RFI. Heat production was 21 and 10% less by low RFI steers than by steers with high or medium RFI, respectively. Consistent with this result, energy retention was 79 and 30% greater in low RFI steers compared to high and medium RFI steers, respectively. Interestingly, during the feedlot test conducted prior to RFI digestion trial, low RFI steers made significantly fewer trips top the feed bunk and spent less time eating than medium RFI steers, which made significantly fewer trips and spent less time eating than high RFI steers.

These researchers concluded that these results have practical implications for the selection of animals that eat less at a similar body weight and growth rate and for the environmental sustainability of beef production.

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- ¹ Felton, E.E.D. and M.S. Kerley. 2004. Performance and carcass quality of steers fed different sources of dietary fat. *J. Anim. Sci.* 82:1794-1805.
 - ² Pinchak, W.E., D.R. Tolleson, M. McCloy, L.J. Hunt, R.J. Gill, R.J. Ansley, and S.J. Bevers. 2004. Morbidity effects on productivity and profitability of stocker cattle grazing in the Southern Plains. *J. Anim. Sci.* 82:2773-2779.
 - ³ Basarab, J.A., M.A. Price, and E.K. Okine. 2003. Net feed efficiency and its commercial applicability. Plains Nutrition Council Spring Conf. Pub. No. AREC 03-13:79-91.
 - ⁴ Gill, D.R., F.N. Owens, and R.B. Hicks. 1986. Impact of feed intake on performance of grazing and feedlot cattle. In: Owens, F.N. (Ed.) Symposium Proceedings: Feed Intake by Beef Cattle. Okla. Agric. Exp. Sta. Misc. Publ. MP-121:360-368.
 - ⁵ Nkrumah, J.D., E.K. Okine, G.W. Mathison, K. Schmid, C. Li, J.A. Basarab, M.A. Price, Z. Wang, and S.S. Moore. 2006. Relationships between feedlot feed efficiency, performance, and feeding behavior with metabolic rate, methane production, and energy partitioning in beef cattle. *J. Anim. Sci.* 84:145-153.

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