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Grass-finished beef pilot project: Cattle performance and welfare

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Abstract

The study compared growth results for Angus cattle raised under feedlot conditions and under a grass-finishing regimen. Outcomes used to answer this question included growth and carcass characteristics, behavior and animal welfare parameters for weaned cattle that were raised using grain feeding or pasture management systems.

Keywords

Veterinary Diagnostic and Production Animal Medicine, Niche meat dairy and poultry

Disciplines

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Budget:
$9,971 for year one

Q Can cattle fed forages produce USDA Quality Grade Choice beef as readily as grain-fed animals?

A Eleven of 12 feedlot cattle and six of 10 grass-finished cattle were ultimately graded Choice by an experienced USDA Quality grader at the same commercial packing plant where the feedlot cattle were harvested. This project demonstrated that it is possible to produce high-value beef on forage alone by combining young cattle with high-marbling potential and plentiful forage supplies.

Background

Consumer interest in grass-finished beef is high, but adoption by Iowa farmers has been limited. Consistently producing a high-value carcass from forage-fed cattle is challenging for a producer. Intramuscular fat or marbling is a major factor in the quality grading of beef and marbling is heavily influenced by cattle genetics and energy concentration within the diet. Finishing cattle on grain is a proven approach to consistently produce high-value beef carcasses. But, forage quality can be manipulated through management, ultimately influencing cattle growth and performance.

The purpose of this project was to examine the feasibility of producing USDA Quality Grade Choice beef —without grain-based finishing—through genetic selection and pasture management. Specific objectives were to:
1. Compare growth and carcass characteristics of high-marbling potential beef cattle, finished either on high-quality pastures or grain-based feedlot rations.
2. Assess the behavior and welfare of feedlot- and pasture-raised beef cattle in terms of morbidity, heat stress, social behavior and hide cleanliness.
3. Disseminate information from the study through Extension publications and public events.

Approach and methods

Researchers at Iowa State University have pioneered the use of ultrasound measurements to help select Angus cattle with high-marbling potential. Digital ultrasound scans of intramuscular fat in young cattle can be used to predict the likelihood of a particular animal achieving a particular quality grade at harvest. In late April 2012, 22 yearling Angus heifers were sorted into two groups—very likely to Grade Choice and less likely to Grade Choice—based on their scanned intramuscular fat content. Cattle from each group were randomly assigned to one of two finishing strategies—pasture or feedlot. All cattle were finished at the ISU Armstrong Research Farm near Lewis. The cattle finishing trial began on May 1, 2012 and ended when cattle on each treatment plan reached market weight.

Results and discussion

Heifers utilizing shade on pasture.

Twelve heifers were finished on feedlot. These animals were housed in a cattle hoop barn and fed a complete mixed ration of 16 percent ground hay, 36 percent corn, 46 percent modified distillers grains, and 2 percent supplement on an as-fed basis. Start weight for feedlot cattle was 291 kg. After 91 days of finishing, feedlot cattle were marketed at 453 kg, achieving an average daily gain of 1.78 kg x d^{-1}. All cattle on feedlot increased their scanned intramuscular fat content. Cattle were harvested at a commercial packing plant, with carcasses being assigned a USDA Quality grade by an experienced grader. Eleven of 12 feedlot cattle were ultimately graded Choice.

Ten heifers were finished on a 10.4 hectare grass-legume pasture. The pasture was subdivided into paddocks and cattle were moved to a fresh paddock every three to four days. One stationary water source was provided to grazing cattle as well as a 3 x 9 m portable steel shade (3 m high). In addition to the grazing, more than 36 metric tons of surplus forage was harvested from the pasture to maintain high-quality forage. Grazing cattle reached market weight (449 kg) after 170 days of finishing. Thus average daily gain was 0.94 kg x d^{-1}, which was statistically less (P < 0.001) than feedlot cattle. Cattle on pasture also increased their scanned intramuscular fat content but not as dramatically as feedlot cattle. Six out of ten grass-finished cattle were ultimately graded Choice by an experienced USDA Quality grader at the same commercial packing plant where the feedlot cattle were harvested.

Conclusions

This project demonstrated that it is possible to produce high-value beef on forage alone by combining young cattle with high-marbling potential and plentiful forage supplies. Cattle finished on feedlot did grow faster than grass-finished cattle. More cattle on feedlot rations graded Choice than cattle finished on grass. Sixty percent of grass-finished cattle graded Choice and all grass-finished cattle were marketed within 20 months of birth. As expected the grain-based feedlot diets supported more rapid growth and uniform finish. However, the grass-finished cattle also grew at rates generally considered acceptable and all cattle finished on pasture increased intramuscular fat content. The use of digital ultrasound to scan feeder cattle as a sorting mechanism prior to finishing may have more benefits for grass-finished cattle than feedlot-raised beef.

 Although this was a limited pilot study, results suggest that digital ultrasound is a powerful tool that could be used to sort groups of cattle based on their likelihood to grade Choice under different dietary regimes. Without the grain-based (high-energy) diets typically fed on feedlots to serve as a buffer, those hoping to sell grass-finished cattle that will grade Choice in conventional markets must pay closer attention to the animal's genetic propensity for depositing intramuscular fat.

USDA Quality Grade is determined by visual inspection of the carcass. After five months of grazing, the fat cover on the grass-finished cattle was very yellow. This was expected, but may have affected the number of cattle that graded Choice. Most U.S. cattle are finished on diets that result in white fat color. Based on the age of

Carcasses showing yellow fat associated with pasture grazing.

animal and scanned intramuscular fat content, 10 feedlot cattle and seven grass-finished cattle were expected to grade Choice. Ultimately 11 feedlot cattle and six grass-finished cattle were awarded the Choice quality grade. Although this pilot study is not an adequate sample to evaluate the degree to which the human grader's expectations of carcass fat color may influence quality grade determination, the results suggest that it may play a role.

There were no differences in cattle welfare as assessed in this project, and condition of the animals was very good. Cattle on both treatments were managed by the same experienced, highly skilled stockman; differences in animal welfare between two systems of management can result from stockmanship, animal and environment interactions. Grass-finished cattle were more active than cattle on feedlot. This likely increased the amount of energy they expended on locomotion versus growth. Providing a mobile water source for grass-finished cattle is worth exploring for its potential to reduce this energy drain. In this study, cattle finished on a feedlot seemed to be less affected by temperature and weather conditions. The feedlot treatment was a beef-hoop barn in which cattle had continuous shade, feed bunk and water source available. A follow-up study comparing finishing cattle on either an open feedlot or managed pasture with a mobile water source may better highlight differences in finishing cattle activity and welfare.

Impact of results

Results of this study have been communicated with students, farmers, and resource specialists as well as the scientific community. The results from this study generated interest and discussion in each of these audiences. Although accessing the quantitative impact this study may have on adoption of grass-finishing is beyond the scope of the project, this work does add an important piece of information to the discussion—that it is possible for grass-finished cattle in Iowa to achieve a USDA Quality Grade of Choice.

Education and outreach

Findings from this project were published in the 2014 ISU Extension Animal Industry Report and were featured at a 2013 ISU Research and Demonstration Farms Field Day with about 20 attendees. Information from this study has been incorporated into three different agriculture courses taught by the investigators. Study results were presented to the 2013 Joint Annual Meeting of the American Society of Animal Science and American Dairy Science Association (Lammers et al., 2013). A full-length manuscript is currently in preparation and will be submitted for publication in a peer-reviewed scientific journal.

Leveraged funds

Additional funds for this project were provided by Dr. Millman's animal welfare discretionary account to support technical assistance by part-time undergraduate and veterinary students, and research staff.