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Grass Finished Beef Pilot Project: Preliminary Health, Welfare and Performance Assessment

Figure 1. FEED Cattle fitted with ICETag 3D Accelerometers housed in a hoop barn.

Figure 2. ICETag 3D® Accelerometer secured to the left hind leg of each heifer for a period of 7 days to record locomotion and length of time lying down.

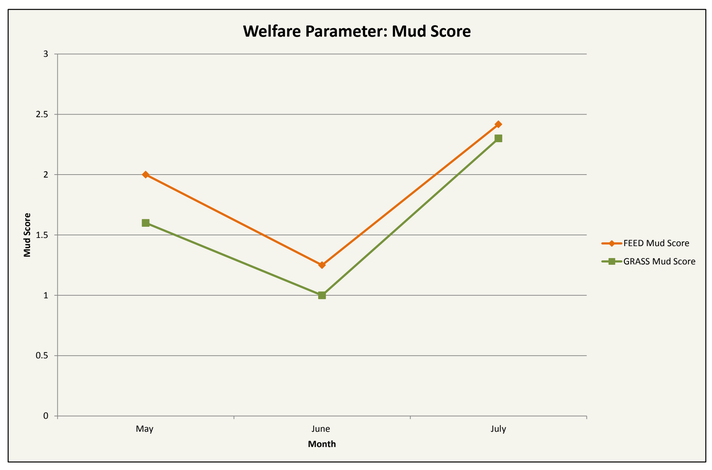

Figure 3. Mud scores recorded over a three month period. A scale of 1-5 was used (1=no mud on hide, 5=lumps of mud and manure attached to hide continuously on underbelly and side of animal).

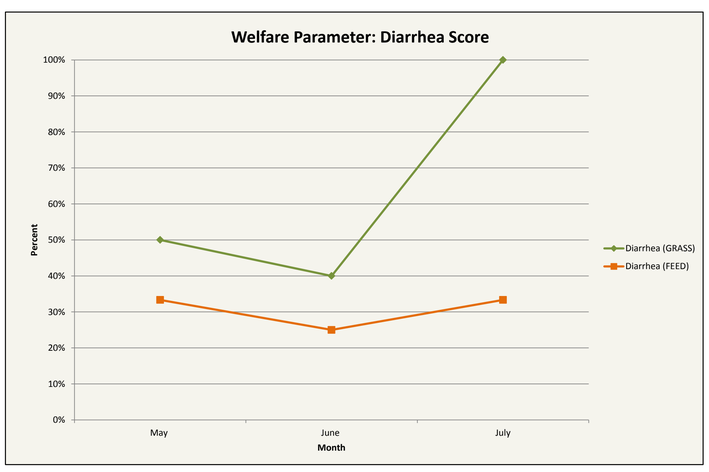

Figure 4. Diarrhea scores recorded over a three month period. Diarrhea is defined as loose watery manure below the tail head on both sides of the tail.

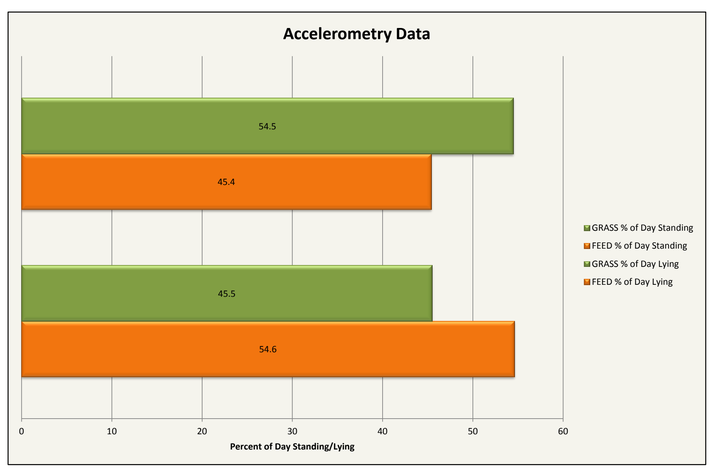

Figure 5. Accelerometer data describing the amount of time cattle from the two different treatment groups spent standing or lying per day.

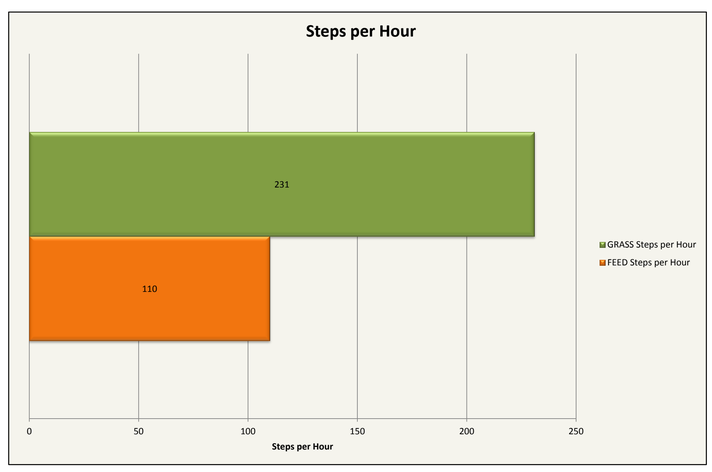

Figure 6. Accelerometer data recorded the number of steps taken per hour for the two different treatment groups.

Abstract

Consumer interest in grass-finished beef is high, but this approach to feeding cattle has been limited. Although some cattlemen are successful within this niche market, consistently producing a high quality carcass from grass fed cattle is challenging. The purpose of this pilot project is to assess the health, welfare, and performance of beef cattle on high quality pasture or grain based feedlot rations in a conventional feedlot. Twenty-two Angus heifers, 12-14 months of age, were blocked by intramuscular fat score and assigned to one of two treatment groups. The first treatment was grass-finished (GRASS) and consisted of 10 heifers (288 ± 28 kg) rotationally grazed on high-quality pasture. The control group (FEED) consisted of 12 heifers (291 ± 33 kg) fed grain-based diets and housed in a hoop barn. This report included data from the first 63 days of the trial (May-July 2012). Cattle were weighed every 28 days, with health assessments completed at the time of weighing. In June cattle were fitted with an ICETag 3D® accelerometer (ICERobotics Ltd. Scotland, UK) that recorded lying, standing, and locomotion over a 7 day period. Average daily gain over the 63 day period was different (p-value <0.001). Feedlot cattle gained 1.5 ± 0.3 kg/d while grass-finished cattle gained 0.8 ± 0.2 kg/d. This was likely in part due to differences in activity levels. For example, during the 7-day sampling period in June, FEED cattle spent more time resting than GRASS (55 vs 46 % of day). GRASS cattle also took more than twice as many steps as FEED cattle (231 vs 110 steps/hr). Mud scores tended to be higher for FEED compared to GRASS, but diarrhea scores were higher for GRASS. No difference was seen in lameness for the two treatments. Overall, cattle in both treatment groups were in good health and had adequate body condition.

Background

Interest in grass-finished beef is high in part because of perceived welfare benefits for extensive production systems. Due to the presence of forage to reflect heat, absorb moisture, and redirect cattle behavior, grass-based systems potentially resolve some of the animal welfare challenges present in traditional feedlot environments. Consistently producing a high-value carcass from forage fed cattle is challenging. Intramuscular fat or marbling is a major factor in quality grading of beef. Marbling is heavily influenced by cattle genetics and energy concentration of the diet. Researchers at Iowa State University have pioneered the use of ultrasound measurements to select Angus cattle with high-marbling potential. Forage quality can be manipulated through pasture management, ultimately influencing cattle growth and performance. The dual purposes of this project were to:

1. Examine the feasibility of producing USDA Quality Grade Choice beef—without grain-based finishing—through genetic selection and pasture management.
2. Assess the behavior and welfare of feedlot and grass-finished beef cattle.

Materials and Methods

This study was conducted at the Iowa State University Armstrong Research and Demonstration Farm near Lewis, IA (41°19' N, 95°10' W) beginning May 8, 2012. Mean annual rainfall for the site is 71 cm annually. All procedures used in this study were approved by the Iowa State University Institutional Animal Care and Use Committee. This is a preliminary report of an on-going project and covers the first 63-days of the trial only.

Twenty-two yearling Angus heifers were blocked by intramuscular fat score and assigned to one of two treatments. The first treatment was grass-finished (GRASS) and consisted of 10 heifers (288 ± 28 kg) rotationally grazed on high-quality pasture. Grass-finished cattle were provided free access to water, Bloat-Guard® pressed block (Hubbard Feeds, Mankato, MN), and mineral. Pastures were managed to ensure that cattle had more than sufficient access to forage with cattle being moved to a fresh paddock every 48 hours. In order to maintain high-quality forage throughout the grazing season, surplus forage in paddocks was harvested as appropriate. The control group (FEED) consisted of 12 heifers (291 ± 233 kg) fed grain-based diets and housed in a beef cattle hoop barn (Figure 1). A typical feedlot ration was delivered to FEED cattle daily and FEED cattle also had free access to water.

Cattle were weighed every 28 days, with individual health and welfare assessments completed at the time of weighing. Following weighing, cattle were allowed 1 hour of recovery time, after which pens of cattle were observed and behavior was assessed. Health and welfare assessments of cattle were based on the European Welfare Quality program. Cattle were individually assessed using animal-based parameters for good health and appropriate behavior. Hide cleanliness was also recorded using a scale of 1-5 (1=no mud on hide, 5=lumps of mud and manure attached to hide continuously on underbelly and side of animal). In June, all cattle were fitted with an ICETag 3D® accelerometer (ICE Robotics Ltd. Scotland, UK) (Figure 2) that recorded lying, standing, and locomotion over a 7 day period. Data was summarized and descriptive statistics were prepared using the Data Analysis Tool of Microsoft Excel® for Mac 2011 (Microsoft Corporation, Redmond, WA). Where appropriate simple ANOVA was used to compare treatment groups with differences at the P-value ≤ 0.05 level considered significant.

Results

Average daily gain over the 63 day period was different (p-value <0.001). Feedlot cattle gained 1.5 ± 0.3 kg/d while grass-finished cattle gained 0.8 ± 0.2 kg/d. Health and welfare parameters are described in Figures 3 and 4. Mud scores tended to be higher for FEED compared to GRASS (Figure 3), but diarrhea scores were higher for GRASS (Figure 4). There was no difference in frequency of lameness between the two groups. Figure 5 shows that during the 7-day sampling period in June, FEED cattle spent more time resting than GRASS (55 vs 46 % of day) during a 24 hour period. Figure 6 shows that GRASS cattle also took more than twice as many steps as FEED cattle (231 vs 110 steps/hr).

Discussion

Average daily gain differences between FEED and GRASS were likely due in part to differences in activity levels of the animals and energy density of feedstuffs provided. FEED cattle were being fed standard grain based feedlot rations, while the GRASS cattle had to harvest their own forage by grazing. Energy expenditures while grazing could account for the lower average daily gain and be supported by the accelerometer data that confirms GRASS cattle took more steps compared to FEED and spent more time standing. Mud scores were likely higher because of the environmental conditions where the animals were housed. FEED cattle in the hoop building had appropriate but limited area per animal while GRASS cattle were on pasture with more available space per animal. Diarrhea scores could be higher in GRASS fed cattle due to increased water content of the feedstuff compared to feedlot rations provided to the FEED group. No differences in lameness were noted between the two groups. Due to proper management of cattle in both groups, the animals were all in good health and in adequate body condition.

Conclusions

- Average daily gain for FEED cattle was significantly higher than GRASS cattle (1.5 ± 0.3 kg/d compared to 0.8 ± 0.2 kg/d respectively).
- Diarrhea scores in GRASS were higher than FEED, mud scores were slightly higher in FEED.
- Cattle on pasture (GRASS) took twice as many steps compared to cattle in a feedlot (FEED), during the 7 day sampling period in June.

Acknowledgements

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