Performance of Beef Cows Managed in two Overwintering Environments

Michael Undi, Jessalyn Bachler, Kevin Sedivec and Stephanie Becker
Central Grasslands Research Extension Center, Streeter, N.D.

Allowing beef cattle to harvest their own forage potentially can decrease production costs by reducing inputs of labor and machinery required for forage harvest. This study assesses performance of beef cattle kept on pasture to bale graze or fed in drylot pens during the winter in North Dakota. Preliminary results show that bale grazing may be a viable alternative to keeping cattle in drylots in winter. Further, environmental conditions such as blizzards will not necessarily hinder bale grazing when proper precautions are taken to ensure that animals have access to water, feed and shelter.

Summary

Performance of beef cows managed in two overwintering environments (pasture or drylot pens) was assessed in a study conducted during two winters, 2016 and 2017, at the Central Grasslands Research Extension Center, Streeter, N.D.

Starting in the fall of each year, non-lactating pregnant Angus cows (2016: n = 32, body weight [BW] = 1,322 ± 150 pounds, body condition score [BCS] = 5.7 ± 0.34; 2017: n = 40, BW = 1,367 ± 131 pounds, BCS = 5.4 ± 0.23) were divided into four groups of similar BW and kept on pasture to bale graze or in drylot pens. Pastured cows were kept in paddocks separated by four-strand, high-tensile wire electric fencing. Drylot pens, bedded with straw, contained hay feeding bunk and water bowl.

Cows in both housing scenarios were offered the same Conservation Reserve Program (CRP) hay free choice. Two-day body weights were taken at the start and end of each grazing period. Two independent observers assigned BCS using a 9-point system (1 = emaciated, 9 = obese) at the start and end of each grazing period.

Keeping cows on pasture or in drylot pens in winter did not influence ($P > 0.05$) final BW, daily gain, BCS or BCS change. Environmental conditions, with the first year being colder than the second, influenced animal performance because daily gain and BCS change were greater ($P > 0.05$) in the second year relative to the first year.

Whether on pasture or in drylot pens, cows lost body weight and condition in the first year but maintained or gained weight and BCS in the second year. Preliminary results show that bale grazing may be a viable alternative to keeping cattle in drylots in winter. Further, environmental conditions such as blizzards will not necessarily hinder bale grazing when proper precautions are taken to ensure that animals have access to water, feed and shelter.

Introduction

Winters in North Dakota are characterized by cold temperatures, low wind chills, freezing rain and snow. A large portion of winter (40 to 70 days) averages 0° F, although extreme minimum temperatures of minus 60° F have been recorded (Enz, 2003).

The majority of beef cows in the northern Plains is housed in open drylot pens during the winter (Asem-Hiablie et al., 2016) and is exposed to these extreme winter conditions. In drylots, cattle are fed mechanically harvested feeds such as hay and silage.

Winter feed costs, resulting from labor, machinery and energy required to provide feed, water and bedding to cattle kept in drylots, make up more than 60 percent of total feed costs for most beef cow-calf operations. Because feed costs account for approximately 60 percent of cow-calf production costs (Taylor and Field, 1995), beef producers are interested in reducing winter feed costs by extending the grazing season.

Extending the grazing season by keeping cattle on pasture for a significant period of time during the winter allows animals to harvest their own food and decreases reliance on inputs such as machinery and energy required to harvest forage (D'Souza et al., 1990). By maximizing the use of grazed grass, the cheapest feed resource for ruminants (Hennessy and Kennedy, 2009), extending the grazing season can decrease production costs and enhance profitability of livestock production (D'Souza, et al. 1990; Hennessy and Kennedy, 2009).

Strategies for extending the grazing season such as swath grazing, bale grazing and stockpiling have been evaluated (D'Souza et al., 1990; Willms et al., 1993; Volesky et al., 2002; McCartney et al., 2004; Jungnitsch et al., 2011; Kelln et al., 2011; Baron et al., 2014). The economic benefits from these strategies accrue mainly from cost reductions of feeds and feeding, labor, fuel, machinery maintenance and repair, and manure removal.

Environmentally, keeping cattle on pasture returns nutrients directly onto the land and allows for optimal nutrient capture by growing plants (Jungnitsch et al., 2011; Kelln et al., 2011). Depositing manure directly on pastures avoids nutrient accumulation in one place, minimizing nutrient loss to the environment through runoff or leaching (Kelln et al., 2012; Bernier et al., 2014).

Extending the grazing season must show benefits to the animal as well as to the producer. Local information on animal performance in extended grazing systems, especially bale grazing, as well as data on the economics of extended grazing under North Dakota winter conditions, is limited. Therefore, this study was conducted to assess the performance of pregnant beef cows managed in two overwintering environments (pasture or drylot) under south-central North Dakota winter conditions.

Procedures

This study was conducted during two winters: 2016 and 2017. Starting in the fall of each year, nonlactating pregnant Angus cows (2016: n = 32, BW = 1,322 ± 150 pounds, BCS = 5.7 ± 0.34; 2017: n = 40, BW = 1,367 ± 131 pounds, BCS = 5.4 ± 0.23) were divided into four groups of similar BW and kept on pasture to bale graze or in drylot pens in the winter.

Pastured cows were kept in paddocks separated by four-strand, high-tensile wire electric fencing. Drylot pens, bedded with straw, contained hay feeding bunk and water bowl. Cows in both housing scenarios were offered the same Conservation Reserve Program (CRP) hay free choice.

Two-day body weights were taken at the start and end of each grazing period. Two independent observers assigned BCS using a 9-point system (1 = emaciated, 9 = obese; Wagner et al., 1988; Rasby et al., 2014) at the start and end of each grazing period. Animal handling and care procedures were approved by the NDSU Animal Care and Use Committee.

Bale Grazing

Historically, the bale grazing site was cropland in a corn and small-grain rotation. In the two years prior to the start of this study, the site was planted with cool-season cover crops, mainly rye and brassicas. In 2016, the site was burned down with 2, 4-D and Roundup in late April, after which meadow brome was planted in early May.

Three-acre paddocks were separated using four-strand, high-tensile wire electric fencing. One water tank was placed between two paddocks. Windbreaks were placed in each paddock.

In early fall, round CRP hay bales (7.5 percent crude protein [CP]; 51.7 percent total digestible nutrients [TDN]; Table 1) were placed in each paddock in two rows approximately 50 feet apart. Cows were allotted four bales in one grazing session; access to new bales was controlled using portable electric fencing.

Cows were moved to a new set of four bales when the depth of waste feed remaining across the diameter of each bale was less than 4 inches. Cows had *ad libitum* access to fresh water, mineral supplement and salt blocks.

Table 1. Nutrient composition of grass hay offered to cows bale grazing on pasture or kept in a drylot.

Nutrient, % dry matter	
Dry matter	94.3
Crude protein	7.5
Total digestible nutrients	51.7
Neutral detergent fiber	66.3
Acid detergent fiber	47.8
Calcium	0.56
Phosphorus	0.10
Potassium	0.77
Magnesium	0.18

Drylot

Two groups of cows were kept in drylot pens. Each pen contained a two-bale hay feeder and a Richie water tank. Pens were bedded with straw as needed throughout the study. Drylot cows were fed the same CRP hay (7.5 percent CP; 51.7 percent TDN) as the bale-grazed cows. Like the bale-grazed cows, drylot cows had *ad libitum* access to fresh water, mineral supplement and salt blocks.

Results

Animal Performance

Initial cow BW and BCS were similar ($P > 0.05$) between housing treatments in both years. Housing did not influence ($P > 0.05$) final BW, daily gain, BCS or BCS change.

Environmental conditions, with the first year being colder than the second, influenced animal performance because daily gain and BCS change were greater ($P > 0.05$) in the second year relative to the first year. Whether on pasture or in drylot pens, cows lost body weight and condition in the first year but maintained or gained weight and BCS in the second year (Figures 1 and 2).

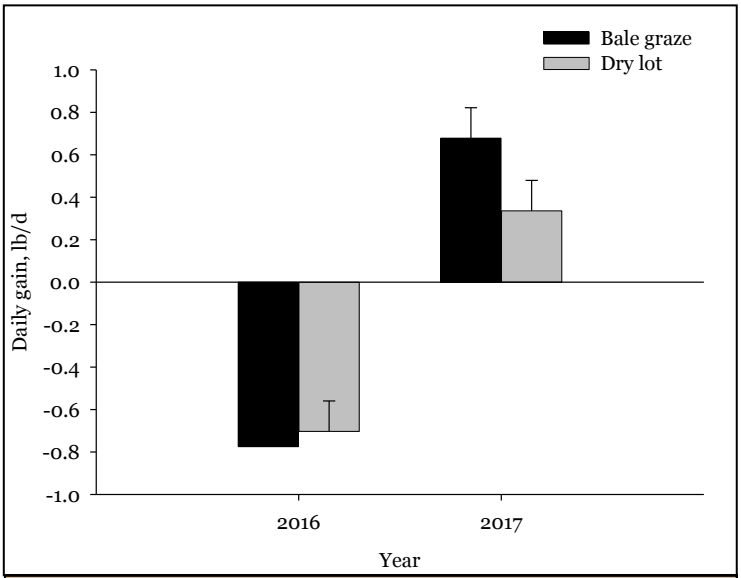

Figure 1. Average daily gain of cows (2016, n = 32; 2017, n = 40) kept on pasture or in a drylot in winter during two winters.

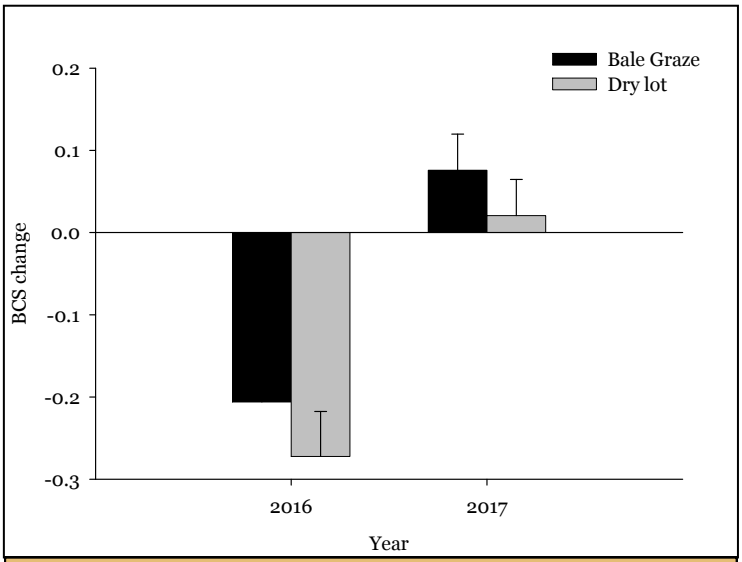

Figure 2. Changes in BCS in cows (2016, n = 32; 2017, n = 40) kept on pasture or in a drylot in winter during two winters.

Discussion

The first year of the study was marked by three blizzards, which led to huge snow accumulations. Despite snow depths being greater than 20 inches in some places, cows were able to bale graze for 70 days before termination of the grazing period. Grazing was terminated after accessing water points became impossible. This shows that strategies for extending the grazing season should be accompanied by a contingency plan for feed and water supplies in case grazing becomes impossible.

Some interesting observations from blizzard events in 2016:

First, despite windbreaks, not all cows sought shelter during the blizzards. Some would simply stand on the leeward side of the bales while other cows did not seek shelter at all and continued to graze.

Secondly, when water troughs were cleared of snow after each blizzard and re-filled, not all cows visited the water troughs immediately, as anticipated. However, a "catch up" period of several days seemed to follow blizzards when water intake increased, as noted by more frequent filling of water troughs.

Events such as blizzards can prevent or drastically reduce access to water, requiring pastured cows to utilize snow as a source of water. Animals can survive on snow, as shown in beef calves (Degen and Young, 1990a) and pregnant beef cows (Degen and Young, 1990b).

Cows in both housing scenarios lost body weight and condition in the first year, which was probably a function of the combination of quality of hay offered to cows and environmental conditions. The hay may have been low in energy, protein and phosphorus content and did not supply these nutrients to meet requirements of cows in midgestation (National Research Council, 1996), particularly during adverse weather conditions as encountered in 2016 (Figure. 1). The positive animal performance during the second year may be attributed to a very mild winter.

Keeping cows on pasture or in drylot pens did not influence animal performance in this study because both housing scenarios provided similar protection from the elements, particularly wind. The windbreaks used in this study seemed to be effective in ensuring that both groups of cows had adequate protection.

Many producers in the northern Plains use windbreaks to protect cattle from harsh winter weather (Asem-Hiablie et al., 2016). Using windbreaks minimizes convective heat loss, thereby reducing the use of endogenous reserves (Olson and Wallander, 2002). However, using windbreaks may not improve overall performance because time spent behind windbreaks is time spent not feeding or foraging (Olson and Wallander, 2002).

The smaller size drylot pens would be expected to give drylot cows a competitive energy expenditure advantage over cows on pasture. Animals on pasture spend more energy walking in search of food and water or shelter and more time eating and foraging for food than housed animals (Osuji, 1974). Extra muscular activities, in addition to those observed indoors, might increase maintenance energy requirements of animals on range by 25 to 50 percent (Osuji, 1974). However, this might not apply in bale grazing situations where animals do not travel long distances to feed.

Keeping cattle on pasture or in drylot pens in winter must be assessed against benefits to the animal, as well as financial benefits to the producer. Extending the grazing season reduces feed costs significantly because animals harvest their own food (D'Souza et al., 1990). Several studies (D'Souza et al., 1990; Willms et al., 1993; McCartney et al., 2004; Jungnitsch et al., 2011; Kelln et al., 2011; Baron et al., 2014) have shown economic advantages of extending the grazing season associated with reducing costs of feeds and feeding, labor, fuel, machinery maintenance and repair, and manure removal.

Conclusions

Results show that bale grazing may be a viable alternative to keeping cattle in drylots in the winter. Further, environmental conditions such as blizzards will not necessarily hinder bale grazing when proper precautions are taken to ensure that animals have access to water, feed and shelter.

Acknowledgments

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Photos by Michael Undi, NDSU