



Performance of Beef Cattle Managed in Two Overwintering Environments

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Allowing beef cattle to harvest their own forage reduces reliance on inputs such as labor and machinery required for forage harvest and potentially can decrease production costs. This study assesses performance of beef cattle kept on pasture or in dry lot pens during the winter in North Dakota. Preliminary results suggest that feed quality may be more important than housing in determining cattle performance in the winter. Further, weather events such as blizzards will not necessarily hinder bale grazing when producers take proper precautions to ensure that animals have access to water, feed and shelter.

Summary

This study was conducted to assess the performance of pregnant beef cows kept on pasture or in dry lot pens during the winter in North Dakota. Non-lactating, pregnant Black Angus cows ($n = 32$; body weight = $1,321 \pm 150$ pounds; body condition score = 5.6 ± 0.31), were divided into two groups and kept on pasture or in dry lot pens during the winter. Cattle in both housing scenarios were offered the same Conservation Reserve Program (CRP) hay (7.5 percent crude protein [CP]; 51.7 percent total digestible nutrients [TDN]), free choice.

Two-day body weights were taken at the start and end of the study. Two observers assigned cow body condition scores (BCS) using a 9-point system (1 = emaciated, 9 = obese) at the start and end of the study. Despite heavy snow accumulations from three blizzards in December, cows were able to graze for 70 days before termination of the study.

Keeping cows on pasture or in dry lot pens during the North Dakota winter had no effect ($P > 0.05$) on final body weight (BW), daily gain or BCS. Whether on pasture or in dry lot pens, cows lost body weight and condition, which indicates that the CRP hay fed did not provide adequate nutrients to meet animal requirements of non-lactating beef cows.

Preliminary results suggest that feed quality may be more important than housing in determining animal performance during the winter. Further, weather events such as blizzards will not necessarily hinder bale grazing, but producers need to take precautions 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 -60°F have been recorded (Enz 2003).

The majority of beef cows in the Northern Plains are housed in open dry lot pens during the winter (Asem-Hiablíe et al. 2016) and are exposed to these extreme winter conditions. In dry lots, 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 dry lots, make up more than 60 percent of total feed costs for most beef cow-calf operations. Because total 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 be assessed against benefits to the animal as well as to the producer. The majority of beef producers in North Dakota still overwinter cattle in dry lots. Low adoption rates of extended-grazing strategies by producers may be attributed to limited 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.



Participants at a winter grazing conference in North Dakota (www.ag.ndsu.edu/centralgrasslandsrec/winter-grazing-workshop-held-nov-4-5) identified the need for more locally generated information on extended grazing strategies. Therefore, this study was conducted to assess performance of pregnant beef cows managed in two overwintering environments (pasture or dry lot) under south-central North Dakota winter conditions.

Procedures

This study was conducted from Nov. 4, 2016 to Jan. 12, 2017 at the Central Grasslands Research Extension Center, Streeter, N.D. Non-lactating pregnant Black Angus cows ($n = 32$; $BW = 1,321 \pm 150$ pounds; $BCS = 5.6 \pm 0.31$) were assigned to one of four groups of similar total body weight and were kept on pasture or in dry lot pens.

Two-day body weights were taken at the start and end of the study. Two observers assigned BCS using a 9-point system (1 = emaciated, 9 = obese; Wagner et al. 1988) at the start and end of the study. 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, turnips and other brassicas. In 2016, the site was burned down with 2,4-D and Round-up in late April, after which meadow brome was planted in early May.

The field was divided into eight three-acre paddocks using four-strand, high-tensile wire electric fencing. One water tank was placed between two paddocks. Wind breaks were placed in each paddock.

In early fall, round CRP hay bales (7.5 percent CP; 51.7 percent TDN) 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 within each treatment moved at different paces. Cows had *ad libitum* access to fresh water, mineral supplement and salt blocks.

Dry Lot. Two groups of cows were kept in two dry lot pens. Each pen contained a two-bale hay feeder and a Richie water tank. Pens were bedded with straw as needed throughout the study. Dry lot 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, dry lot cows had *ad libitum* access to fresh water, mineral supplement and salt blocks.



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Results

Initial cow BW and BCS were similar ($P > 0.05$) between treatments (Table 1). Keeping cows on pasture or in dry lot pens did not influence ($P > 0.05$) final BW or daily gains (Table 1). No difference ($P > 0.05$) in BCS change was found between cows kept on pasture and those in dry lot pens (Table 1). Whether on pasture or in dry lot pens, cows lost weight and BCS.

Discussion

This 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 the termination of the study. The study was terminated after it became impossible to access water points. Strategies for extending the grazing season should be accompanied by a contingency plan for feed and water supplies in case grazing becomes impossible.

Here are some interesting observations from blizzard events of 2016:

- First, despite windbreaks, not all cows sought shelter during the blizzards. Some simply would 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, we saw a “catch up” period of several days following 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 during the course of the study, which was probably a function of the quality of hay offered to cows. The hay was low in energy, protein and phosphorus (P) content and supplied approximately 57, 95 and 60 percent of the energy, protein and P, respectively, required by cows in mid-gestation (National Research Council 1996). As such, these cows would have benefitted from some form of supplementation.

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

Table 1. Performance of cows kept on pasture or in dry lot pens in the winter.

	Housing		SE	P-value
	Pasture	Dry lot		
Initial BW, lbs.	1,316	1,327	38.1	0.87
Final BW, lbs.	1,264	1,279	38.7	0.79
Daily gain, lbs./day	-0.66	-0.74	0.077	0.63
Initial BCS	5.6	5.8	0.08	0.17
Final BCS	5.4	5.5	0.09	0.31
BCS change	-0.24	-0.27	0.05	0.68

Many producers in the Northern Plains use windbreaks to protect cattle from harsh winter weather (Asem-Hiablíe 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 dry lot pens would be expected to give dry lot 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, over and above 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 dry lot 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

Preliminary results from this study suggest that feed quality may be more important than housing in determining cattle performance in overwintering environments. Further, weather events such as blizzards will not necessarily hinder bale grazing, but producers should take precautions to ensure that animals have access to water, feed and shelter.

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