Sustainable Beef Systems
Research Group

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Effect of Winter Feeding Systems on Beef Cow Performance and Feed Site Soil Nutrients

H.A. (Bart) Lardner, P. Jungnitsch, J.J. Schoenau, T. Highmoor
Western Beef Development Centre
Termuende Research Ranch, Lanigan, SK

Introduction

Beef cattle producers in Western Canada compete at an economic disadvantage relative to other regions in North America due to high winter feeding costs. Producers are seeking ways to effectively reduce these costs by managing manure nutrients more efficiently yet still maintain acceptable levels of beef cattle production. Producers are moving from drylot wintering systems where cattle are housed in pens and manure is hauled out, to systems where cattle are wintered on feeding sites and the manure nutrients are distributed over the site. However, beef cattle typically do not retain the majority of feed nutrients. Erickson and Klopfenstein (2001) reported that feedlot steers only retained 10 % of the nitrogen (N), excreting the remaining 90% in the urine and feces. In addition, most of the nitrogen excreted was then lost to volatilization. There is the potential to more efficiently utilize N if losses can be reduced.

Research Objective

This study compared drylot versus field wintering systems, primarily evaluating cow performance, soil nutrients and feed system economics.

Site Description and Winter Feeding Systems

The study was conducted at the Termuende Research Ranch, Lanigan, SK, over two consecutive winters, 2003-2004 and 2004-2005. The study site was a Russian wild ryegrass pasture situated on an Orthic Black soil. The cattle wintering site was 4, 2.5 acre replicate areas placed diagonally opposite each other with a winter watering system in the center. Animals were controlled access to feed using solar powered electric fencing. Portable wind shelters were used to provide protection from the wind. In addition, cows were also housed in drylot pens at the research farm.

Ninety six crossbred pregnant beef cows were randomly allocated to 1 of 3 replicated winter feeding systems. Feeding systems included (1) field bale grazing, round straw + grass-legume hay bales fed *ad libitum* every 3 days - bales had been set out in the fall in a 18 by 8 formation.; (2) field bale process feeding, round straw + grass-legume hay bales processed and windrow fed *ad libitum* every 3 days with feeding areas rotated throughout the paddock over the course of the trial; and (3) drylot feeding, round straw + barley greenfeed bales processed bunk fed with feed wagon and tractor daily.

All feeds were sampled and analyzed for moisture, protein and energy to determine rations for each feeding system. Daily rations were based on 3% of body weight, consisting of 16 lbs of oat straw and 24 lbs grass/legume hay or greenfeed, calculated at 40 lbs per head per day. Salt and trace mineral was supplied free choice.

Throughout the trial, total amounts of feed, minerals and salt were recorded as well as labour and machinery costs. Forage production was also estimated the following summer from each of winter feeding sites and manure treatment areas.

Animal Performance

Cows averaged 1367 and 1331 lbs at start of test, in 2003-04 and 2004-05, respectively. Average cow weight coming off the study was 1412 and 1428 lbs in 2003-04 and 2004-05, respectively.

In the first year, cows were winter fed 105 days and in the second year cows were fed 112 days. In 2003-04 cows fed in drylot, bale graze and bale process gained 0.27, 0.17 and 0.33 lbs./day, respectively. In 2004-05 animals fed in drylot, bale graze and bale process gained 1.10, 0.57 and 0.77 lbs./day, respectively. Total gain was greater in second year due to a longer feeding period. This would suggest the nutrient value of the diets not only met cow maintenance needs but also allowed the animals to put on body condition. There were minimal differences between systems for cow gain or condition. On average, cows entering the study and at the end maintained a body condition score of 3.0.

Soil Nutrients

In fall 2003, soil N levels were low in all treatment areas prior to manure application or cattle wintering. Variation was small, showing an even distribution pattern of nutrients at the research site. However, following winter feeding of beef cows, soil nutrient patterns from the detailed sampling grids showed highly variable soil nutrient levels from feed sites, with inorganic soil N levels varying from 40 to 162 lb/ac. Nitrogen levels were 2.5 to 3.0X greater on bale graze and bale process feeding sites compared to control. Levels were also significantly greater where cattle were wintered compared to treatment areas which received manure or compost. This would suggest these levels appeared to be due to capture of urine nutrients that had been lost when the cows were fed in the corral.

Forage Yield

Forage production varied significantly between treatment areas. Where cows were winter fed on either bale graze (3322 lb/ac) or bale process areas (4209 lb/ac), DMY was 2.5 to 3.5 times greater compared to control areas (1585kg/ha). There was a similar trend observed for DMY in the second year after winter feeding. This would suggest the significant concentration of nutrients deposited by the animals had a carryover effect on subsequent pasture production.

Costs

Costs associated with the project include labor, equipment, feed and custom work. All costs were calculated in total then reported as cost per cow per day. Feed costs including trucking were hay at $68.95/bale, oat straw at $23.00/bale, and greenfeed at $37.70/bale. Labour for feeding was charged at $15.00/hour. Equipment costs were calculated using a guide to machinery rates (Saskatchewan Agriculture & Food, 2004). Therefore, in 2003-04 system costs of drylot, bale process and bale graze were $1.42, $1.04 and $1.06/cow, respectively. In 2004-05, costs for drylot, bale process and bale graze were $1.53, $0.96 and $0.95/cow, respectively. Not only did the field feeding have savings in machinery use and manure handling costs, but also in increased pasture productivity.

Conclusions & Significance to Industry

Benefits from wintering cows on feeding sites can be managed to reduce daily costs with minimal impacts on cow performance.

For more information on this work, contact Dr. H.A. (Bart) Lardner at blardner.wbdc@pami.ca.