Effect of Hay Feeding Methods on Hay Waste and Wintering Costs

Interim Progress Report

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Summary

Three to ten year old beef cows (n = 144) were fed round baled hay delivered using three methods (rolled out, shredded, Weldy Enterprises bale feeder) during a 58 day wintering period to evaluate feed waste, cow performance, labor inputs, and wintering costs arising from the three methods. This economic analysis of hay feeding methods was initiated this winter and is in progress at this writing. Weight gain, fat depth change, body condition score change, hay intake and hay efficiency means are shown in Table 1. Discussion and final results will be presented in the next annual report.

Introduction

Winter feeding costs make up a large portion of production costs for North Dakota beef cattle producers (Hughes, 1999). Over the last five years, winter feed costs averaged ($144 per head) for producers participating in North Dakota's IRM program.

In most cases, hay makes up the largest portion of this winter feeding cost. A windshield survey of North Dakota beef cattle operations over the past three years indicates that the majority of this hay is put up in the form of large round bales. Numerous methods exist to deliver and feed hay stored in round bales to cattle during the winter. Some of the more common methods of feeding include rolling bales out on the ground, feeding bales in some sort of bale feeder, and using a bale processor to chop the bale and feed in a windrow.

Data recently published by Michigan State University (Buskirk et al., 2000) indicates that feeder type can influence the amount of hay wasted by beef cattle. In that particular study, losses ranged from 3 to 14%. A review of the literature indicates that waste from hay fed on the ground can be as high as 45% (Bell and Martz, 1973). Hay processors have gained acceptance by a large number of beef cattle producers for several reasons. First of all, it can reduce the overall investment in machinery compared to tub grinding and feeding hay with a mixer wagon. Secondly, many people believe hay waste is less with this feeding method (compared to feeding on the ground or in a feeder), especially with 'stemmy' hays since the stems are chopped and essentially mixed in the windrow as the cattle are fed, eliminating or reducing the sorting problems which can occur with these types of hay. In addition, as herds become larger, a mechanized method of feeding, which can reduce labor inputs, becomes necessary. However, no data exists that compares the use of a hay processor to either of these two feeding methods (on the ground or in a feeder).

The objective of this study is to compare feed waste, labor inputs, wintering cost, cow performance, and wintering analysis under three different feeding methods.

Materials and Methods

One hundred ninety-two crossbred cows weighing approximately 1275 pounds are being used in this wintering/economic methods study. Cows are divided into 12 groups with12 cows assigned to each of twelve 5 acre wintering lots located on section 19 at the Dickinson Research Extension Center's ranch headquarters, Manning, North Dakota. Treatments evaluated include:

- Round bales fed by removing the strings and rolling the bale out on the ground
- Round bales fed by placing the bale in a feeder designed by Weldy Enterprises, Wakarusa, Indiana
- Round bales shredded on the ground with a Haybuster® Model 256 Plus II Bale Processor

Each treatment was replicated 4 times with a total of 48 cows participating in each treatment.

Cows in the study are weighed, visually condition scored , and measured for fat depth using ultrasonography at the beginning, middle, and end of the study. Fat depth measurements are being taken 3 inches distally from the midline between the 12th and 13th ribs and at a rump location medially on a line between the hook and pin bones. Detailed records of the quantity and quality of hay delivered and feeding time required are being kept. Individual bales are weighed and core sampled for subsequent proximate analysis before delivery to each pen.

Feed Delivery Based on Dry Matter Intake Estimate:

Forage fed is a mixed hay comprised largely of crested wheatgrass and bromegrass hays with a lesser contribution of alfalfa (20%). For the purposes of DMI prediction, the hay is estimated to contain a net energy value of approximately 1.146 Mcal/kg (1.07, 1.14, and 1.31 Mcal/kg for crested, brome and alfalfa hays, respectively). Based on the most current equation for predicting DMI among second/third trimester beef cows (NRC, 1996), DMI is estimated using the following formula: $DMI = SBW^{0.75} * (0.04997 * NEm^2 + 0.04361) / NEm)$ where $SBW^{0.75}$ is shrunk body weight (weight,kg*.95) to the 0.75 power, and NEm is the net energy value of diet for maintenance expressed in Mcal/kg. The DMI value is further adjusted for temperature, mud and postcalving milking ability of the gestating cow.

Example for 1275 lb. cow (549.6 kg):

		DMI, kg	**As Fed, lb.**	**+2.7 For Milk**
DMI, No Adjust.		**10.8**	23.8	26.5
Temp Adjustment:				
5-10 F	7% Inc.	**11.6**	25.5	28.2
0 F	10% Inc.	**11.9**	26.2	28.9
-10 to 0 F	16% Inc.	**12.6**	27.7	30.4

Accounting for Unutilized Feed Energy Delivered:

Based on pounds of hay delivered (energy delivered), initial and final visual body condition score, fat depth measurement (quantitative energy reserve change), cow body weight change (shrunk weight gain), conceptus weight (fetal and associated uterine tissues), and recorded ambient temperature adjustment, the quantity of energy consumed versus energy delivered within each hay feeding treatment will be predicted. Thus, accounting for unutilized feed energy delivered (waste).

Economic Analysis of Winter Feeding Methods:

Partial budgeting will be used to make economic comparisons between the three treatments. Partial budgets comparing the per cow cost of each treatment include consideration of only those costs which differ between treatments. These costs include depreciation or lease cost of machinery and equipment (bale feeder, bale shredder) and associated operating expenditures, including fuel, and labor cost. Actual machinery and equipment costs will be used. Labor and fuel costs will be intermediate term historic averages.

Results and Discussion

There is another year of data collection planned for this investigation. Economic analysis and final discussion will be presented in the next annual report. Weight gain, fat depth change, body condition score change, hay intake and hay efficiency are shown in Table 1. Average high and low temperatures for the period from November 19, 2001 to January 16, 2002 are shown in Table 2.

Literature Cited

Bell and Martz. 1973.

Buskirk, D. 1999. Effect of feeder type on hay waste. NCR-87 Annual Report. pp. 59-63.

Hughes, H. 1999. North Dakota IRM Benchmarks. http://www.ag.ndsu.nodak.edu/cow/irm/irm5yravg.htm

NRC. 1996. National Research Council. Nutrient Requirements of Beef Cattle. Seventh Revised Ed., Washington, D.C., National Academy Press, pp119.

Table 1. Round bale feeding methods: cow gain, fat depth change, condition score change, and hay efficiency.

	Bale Roll Out	**Bale Shredder**	**Weldy Enterprises Bale Feeder**
No. Cows	48	48	48
Days Fed	58	58	58
Starting Wt., lb.	1266	1284	1275
End Wt., lb.	1353	1375	1364
Gain, lb.	87	91	89
ADG, lb.	1.50	1.57	1.53
Ultrasound Fat Depth			
Rib Fat - Start	.38	.38	.38
Rib Fat - End	.45	.44	.44
Fat Depth Change	+.07	+.06	+.06
Rump Fat - Start	.41	.42	.41
Rump Fat - End	.79	.80	.79

Fat Depth Change	+.38	+.38	+.38
Condition Score			
Start	5.4	5.4	5.4
End	5.7	5.8	5.8
Change	+.3	+.4	+.4
Hay/Cow, lb.	1795	1736	1524
Hay/Day, lb.	30.9	29.9	26.3
Hay:Gain, lb.	20.6	19.04	17.2

Table 2. Average high and low temperatures from November 19, 2001 to January 16, 2002.

	November	**December**	**January**
Average High	50.2	29.4	28.1
Average Low	25.4	11.8	12.0