Evaluating Hay Feeding Methods on Heifer Performance, Hay Waste, and Economics

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IMPACT STATEMENT

Feed costs during the winter make up the largest portion of production costs. Reductions in amount of hay waste produced can lead to direct increases in producer profits. The most common method of feeding hay on pasture is to roll the bales out on the ground. The use of a bale feeder, which contains more of the hay and increases availability to the animal, can help to decrease the overall amount of hay waste.

SUMMARY

The objective of this study was to determine the impacts of two different bale feeder designs (ring bale vs. LS) on heifer performance, hay waste, and economics. Initial bale weight and total bale disappearance were not different between the hay feeders. However, hay waste was significantly greater for the ring-bale feeder compared with the LS feeder. This reduction in waste will save costs associated with labor, fuel, and hay when using the LS feeder. Although the LS feeder has a greater up-front cost, the return on investment may occur within the first feeding season.

INTRODUCTION

Bell and Martz (1973) determined that 45% of hay is wasted when rolled out on the ground due to trampling. The use of a bale feeder, which contains more of the hay and increases availability to the animal, can help to decrease the overall amount of hay waste. Several bale feeder designs are available, such as: ring, cone, cradle, or trailers. Landblom et al. (2007) found that using a cone feeder can decrease hay waste by 4.3 to 5 times when compared to rolling out or bale processing. Martinson et al (2012) found that when horses were fed round bales without a feeder 57% of the hay fed was wasted, compared to a 24-52% reduction in hay waste depending on type of feeder. Similarly, Buskirk et al. (2003) observed a reduction in hay waste when feeding bales via cone or ring bale feeders (3.5 and 6.1%, respectively) compared with the trailer or cradle (11.4 and 14.6%, respectively). Therefore, to reduce hay waste, utilizing bale feeders may be more economical, and some feeders may be more economical than others.

A new bale feeder design has recently become commercially available from Cattle Systems by LS. This new Cattle Systems by LS bale feeder is collapsible, easily transportable, and could potentially help to significantly reduce hay waste and associated hay costs. Therefore, the objective of this research trial is to compare the Cattle Systems by LS bale feeder with two other common bale feeders to evaluate impacts of feeder type on beef cattle performance, hay waste, and economic impact.

PROCEDURES

Fourteen heifers were used in a 2 × 2 Replicated Latin Square design. Heifers were housed at the Bozeman Agriculture Research and Teaching (BART) Farm. Heifers were stratified by body weight to one of two bale feeding methods (n = 7 heifers per pen). Bale feeding methods included: 1) traditional ring feeder and 2) Cattle Systems by LS feeder. Each pen contained one feeder treatment, and both pens had a cement floor for ease of data collection.

Each period was 5 days in length for a total of 10 days for each replication, with two replications during the experiment, for a total 20

Table 1. Forage quality analysis of initial hay bales and hay waste. Only treatment comparisons were made, no quality comparisons were made to initial hay samples due to limited number of samples.

			Feeder			*P*-value[1]		
Nutrient[2]	Initial	SEM[3]	Ring	LS	SEM	Feeder	Period	Feeder*Period
DM	90.75	0.05	89.26	89.40	0.11	0.39	0.12	0.02
CP	15.75	0.75	9.30	10.70	0.22	<0.001	0.003	0.01
TDN	61.00	2.00	43.10	41.50	0.48	0.03	0.01	<0.001
ADF	36.50	1.75	52.10	53.60	0.42	0.03	0.01	<0.001
NE_l	0.63	0.03	0.43	0.41	0.01	0.03	0.01	<0.001
RFV	127.00	12.00	70.30	68.15	0.95	0.13	0.02	0.002

[1]*P*-values represent the statistical significance of the feeder, period, and the interaction for the hay waste.
[2]Nutrient abbreviations: DM – dry matter; CP – crude protein; TDN – total digestible nutrients; ADF – acid detergent fiber; NE_l – net energy of lactation; and RFV – relative feed value.
[3]Standard error of the means.

days for the trial. Heifers were weighed on two consecutive days at the beginning and end of the trial. Heifers were weighed on day 1 of each period in the interim.

Three composited forage samples of the hay were collected prior to feeding to ensure all bales are of uniform quality to minimize the effects of quality on intake. Several cores were taken from each bale and three subsamples collected. Subsamples were sent to a commercial laboratory for proximate analysis. All bales were weighed immediately before feeding and wrapping was removed. Heifers had continuous access to the feeders during each period. Hay that fell onto the concrete surrounding the feeder was considered waste and collected from each pen every other day and weighed. Care was taken to avoid manure contamination in waste samples. After collection and weighing of the waste, a sub-sample was collected, weighed, and dried for proximate analysis (n = 24; 3/pen/period). Sufficient hay was placed in each feeder to last each 5-day period to avoid any potential intake effects. Any remaining hay at the end of the 5-day period was collected and reweighed in order to determine animal intake. Waste was calculated as pounds wasted each 5-day period, as well as a percent of total hay consumed each period.

Data were analyzed using the GLM procedure of SAS. Significance was set at $P \leq 0.05$.

RESULTS AND DISCUSSION

Forage quality analysis for initial hay quality and waste quality is presented in Table 1. There were period effects observed during the trial, as indicated in Table 1, but this is mainly due to weather changes; therefore, only main feeder effects will be discussed. Initial quality of the hay bales was not different between the feeders. Overall quality of the hay waste was significantly lower compared to the initial bale quality. The reduction in quality of the waste suggests that all heifers were sorting the hay to consume the higher-quality plant parts, which was expected. The waste for the LS feeder had greater CP ($P < 0.001$) and ADF ($P = 0.03$) and reduced TDN ($P = 0.03$). Overall, this suggests that the hay waste for the LS feeder was of poorer quality than that of the traditional ring-bale feeder based on the higher ADF and TDN, and may indicate that those heifers were able to select a better-quality product to eat compared to when feeding on the ring feeder.

Initial bale weight ($P = 0.19$) and total bale disappearance ($P = 0.34$) was not different between the hay feeders. However, hay waste was significantly greater ($P = 0.04$; Table 2) for

Table 2. Differences in amount of hay wasted by feeder.

	Feeder			
Item	Ring	LS	SEM[1]	*P* - value
Initial Weight, lb	1236	1262	10.6	0.19
Total Consumed, lb	617.3	543.9	46.3	0.34
Waste, lb	175.7[a]	25.8[b]	30.2	0.04
Percent of Total Consumed as Waste, %	30.4[a]	5.3[b]	6.8	0.08

[1]Standard error of the means.

the ring-bale feeder compared with the LS feeder. As a percentage of total bale disappearance, waste tended to be greater ($P = 0.08$) in the ring-bale feeder. This also means that cattle were likely consuming less from the ring feeder, even though total bale disappearance was not different, because more of that disappearance resulted in waste. The use of an LS feeder was able to decrease the amount of the bale wasted by 25%, resulting in significant cost savings.

When evaluating return on investment (ROI) for the ring versus LS feeder, it is evident that it would not take long in order to recoup the cost of the pricier feeder. With the LS feeder costing $3900, compared to $319.99 for the ring feeder, it may cause many producers to baulk. However, when looking at how much more money is spent in waste, it can make up the change in capital investment fairly quickly.

When evaluating on a per ton basis, and using the average cost of alfalfa and alfalfa/ grass mix hay for 2016 in Montana ($133/ton; USDA, 2016), we see that per ton, we lose approximately 608 pounds/ton ($40) using the ring feeder, and 106 pounds/ton ($7.05) with the LS feeder. The difference in cost between the two feeders is $3580, and when that is divided by the amount saved per ton, we find that it only takes 109 tons of hay fed before the LS feeder recoups its investment compared to a ring feeder. Compared to using no feeder at all, it would likely take significantly less time to recoup its investment costs.

For example, if you have a group of 100 cows weighing 1,200 pounds and consuming 3% of their body weight each day in hay, it would take approximately 60 days to recoup the cost of the LS feeder.

Additionally, the LS feeder can hold two large round bales compared with the single bale the ring feeder holds. This will allow the producer to spend less resources filling bale feeders. Based on the initial bale weights in Table 2, and the average consumption of the 7 heifers including waste (ring feeder: 88.2 pounds/day and LS feeder: 77.7 pounds/day), the ring-bale feeder would need to be filled every 14 days and the LS feeder would need to be filled every 32 days. This would result in less time, labor, and mechanical resources being devoted to the LS feeder compared to a ring feeder, saving the producer money as well as time.

Overall, the LS feeder had significantly less waste than the ring-bale feeder. This reduction in waste will save costs associated with labor, fuel, and hay when using the LS feeder. Although the LS feeder has a greater up-front cost, the return on investment may occur within the first feeding season.

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