

Effects of Round Bale Feeding Methods on Hay Waste and Animal Performance

November 6, 2012

Eastern KS. ASI Agent Update

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Background

- Harvested feed is the largest cost contributor to maintaining a profitable beef cattle herd (Miller et al., 2001)
- Large round bales are the most common form of packaging harvested hay (Belyea et al. 1985)

Background

- Concerns
 - Hay waste
 - Costs
 - Hay
 - Equipment
 - Labor/time



Objectives

- Evaluate popular types of hay feeding methods and their effects on hay waste and cow performance
- Determine how different feeder types effect hay waste and feeding behavior of animals
- Discuss alternative methods of feeding hay to reduce waste

Popular hay feeding methods

- Ground unrolling
 - Fast
 - All animals can access feed at once
 - “Bed and Breakfast”



Popular hay feeding methods

- PTO- Driven Bale Processor
 - Decreases particle length
 - Increased digestibility?
 - Increased K_p
 - Difficult to eat
 - Reduced feeding time
 - Cost: \$8,000-15,000



Popular hay feeding methods

- Bale Feeder
 - Many types
 - Affordable
 - \$150-1000
 - Can put out many days worth of feed
 - No trampling



Effect of hay feeding methods on cow performance, hay waste, and wintering cost

- Materials and methods
 - 360 crossbred cows
 - 610 kg
 - Three year study
 - Alfalfa mix
 - Oat hay
 - 4 replicates /method
 - 2.02 ha dry lot
 - 59 d

Effect of hay feeding methods on cow performance

Feeding Method

| Item | Roll out on ground | PTO processor | Tapered cone feeder | SE | P-Value |
|-------------|--------------------|--------------------|---------------------|-------|---------|
| BW gain, kg | 22.5 ^a | 29.9 ^b | 36.1 ^b | 2.72 | < 0.01 |
| ADG, kg | 0.381 ^a | 0.507 ^b | 0.611 ^b | 0.046 | < 0.01 |
| Hay/cow, kg | 815 ^a | 799 ^b | 692 ^c | 14.21 | < 0.01 |

^{a-c}Values with unlike superscripts differ significantly ($P < 0.05$)

^dValues are hay /cow, kg from year 1

Quantitative analysis of feeding area waste for each feeding method

| Item | Feeding method | | | SE | Yr | P- Value | |
|-----------------|--------------------|---------------|---------------------|------|------|----------|----------|
| | Roll out on ground | PTO processor | Tapered cone feeder | | | Trt | Yr × Trt |
| Alfalfa mix, kg | 61.5 | 52.5 | 12.1 | 9.72 | 0.09 | 0.30 | < 0.01 |
| Oat hay, kg | 48.4 | 28.1 | 90.3 | — | — | — | — |

Three-year economic analysis comparing hay feeding methods for a 100 head cow herd

| Item | Feeding method | | |
|-----------------------------------|--------------------|---------------|---------------------|
| | Roll out on ground | PTO processor | Tapered cone feeder |
| Hay cost/ cow, \$ | 98.58 | 103.11 | 89.45 |
| Total non-hay expense per cow, \$ | 10.44 | 23.90 | 10.81 |
| Total cost per cow, \$ | 109.02 | 127.01 | 100.26 |

Implications

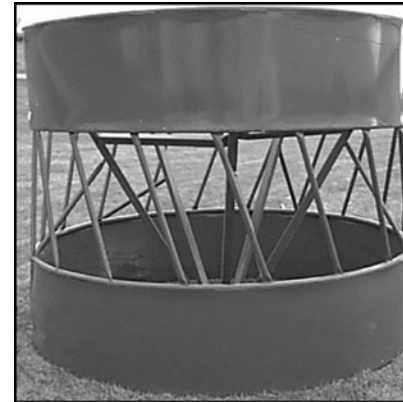
- Tapered cone bale feeder was superior winter hay feeding method
 - Reduced waste
 - Decreased amount of hay per cow
 - Decreased wintering cost per cow

What are the effects of different feeder types?

- Does design effect hay waste?
- Does design effect DMI?
- Does design effect cow behavior?

Large round bale feeder design affects hay utilization and beef cow behavior

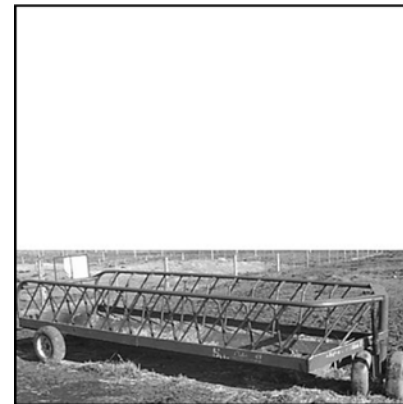
- Materials and methods
 - 4 Feeder types
 - Dry, pregnant beef cows (n=160)
 - 631 ± 78 kg
 - 8 pens
 - 2 replicates for each feeder type



(a)



(b)



(c)



(d)

Buskirk, et al., 2003

Knowledge
forLife

Large round bale feeder design affects on hay utilization

| Item | Feeder Type | | | | SEM |
|--|-------------------|-------------------|-------------------|--------------------|-----|
| | Cone | Ring | Trailer | Cradle | |
| Daily hay disappearance, kg/cow ^a | 12.0 ^x | 12.1 ^x | 13.9 ^y | 12.9 ^{xy} | 0.4 |
| Daily hay waste, kg/cow | 0.4 ^x | 0.7 ^y | 1.6 ^z | 1.9 ^z | 0.1 |
| Hay waste, % ^b | 3.5 ^x | 6.1 ^x | 11.4 ^y | 14.6 ^y | 0.8 |
| Daily hay intake, kg/cow ^c | 11.5 | 11.4 | 12.3 | 11.0 | 0.4 |
| Intake/cow BW, % | 1.8 | 1.8 | 2.0 | 1.8 | 0.1 |

^aHay fed less residual hay at the end of the period.

^bHay waste as a percentage of hay disappearance.

^cHay disappearance less hay waste.

^{x,y,z}Within a row, least squares means without a common superscript letter differ ($P < 0.05$).

Effect of feeder type on feeding behavior and dry matter waste

| Item | Feeder Type | | | | SEM |
|---------------------------------|-------------------|-------------------|-------------------|-------------------|-----|
| | Cone | Ring | Trailer | Cradle | |
| Agonistic interactions/h | 10.9 ^x | 7.4 ^x | 13.6 ^x | 30.7 ^y | 3.2 |
| Frequency of entrances, No./h | 6.3 ^x | 8.0 ^x | 8.3 ^x | 29.8 ^y | 3.3 |
| Daily DM waste, kg ^a | 9.5 ^x | 14.5 ^x | 26.6 ^y | 50.0 ^z | 2.8 |

^aDaily DM waste during simultaneous behavior data collection.

^{xyz}Within a row, least squares means without a common superscript letter differ ($P < 0.05$).

Implications

- Feed losses significantly influenced by feeder type
 - Cone = Ring < Trailer < Cradle
- Feeder design affected the animal behavior

Effects of Bale Feeder Type on Hay Waste, Intake, and Performance of Beef Cattle

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Materials and Methods

Feeder Treatments

- Modified Cone (MODC)
- \$525.00
- 136.2 kg
- 54.6 cm apron
- 9 feeding stations



Materials and Methods

Feeder Treatments

- Open bottom steel ring (OBSR)
- \$100.00
- 45.4 kg
- Open bottom
- 6 Feeding stations



Materials and Methods

Feeder Treatments

- Polyethylene Pipe (POLY)
- \$209.00
- 45.4 kg
- Open bottom
- 6 Feeding stations



Materials and Methods

Feeder Treatments

- Sheeted bottom steel ring (RING)
- \$300.00
- 100.8 kg
- 55.9 cm solid apron
- 16 feeding stations



Results



Effect of Feeder Design on Waste and DMI

Hay Waste

| Item | Feeder | | | | SEM | P-value |
|-------------------------|--------------------|--------------------|---------------------|--------------------|-------|---------|
| | MODC | OBSR | POLY | RING | | |
| Total waste, kg | 32.31 ^a | 128.5 ^b | 133.59 ^b | 77.01 ^c | 9.95 | < 0.01 |
| Orts weight, kg | 102.9 ^a | 36.53 ^b | 29.95 ^b | 45.07 ^b | 10.79 | < 0.01 |
| Waste, % bale wt | 5.31 ^a | 20.54 ^b | 21.04 ^b | 12.6 ^c | 1.62 | < 0.01 |

^{a,b,c}Means within a row with uncommon superscript differ (P <0.05)

Dry Matter intake

| Item | Feeder | | | | SEM | P-value |
|---------------------|--------|------|------|------|------|---------|
| | MODC | OBSR | POLY | RING | | |
| DMI, kg/hd/d | 8.37 | 8.19 | 8.43 | 8.75 | 0.24 | 0.12 |
| DMI, % BW | 1.70 | 1.67 | 1.72 | 1.78 | 0.05 | 0.12 |

Implications

- MODC was most efficient design
 - Less waste = longer feeding period = less hay used annually
- Sheeted bottom results in less waste
- Feeder design didn't affect DMI



Ad libitum access to feeders?

- Feeding losses
 - 12-25%
 - (Belyea et al. 1985)
- Feeding to meet cow requirements
 - Decrease
 - Cost
 - Hay waste
 - Overconsumption
 - Manure production
- How?

Ad libitum access to feeders?

| Item | Access Time, h | | | P-Value | |
|----------------|----------------|------|------|---------------------|-------------------|
| | 6 | 14 | 24 | 24 h vs. restricted | 14 vs. 6 h access |
| DMI, lb | 21.2 | 24.4 | 27.4 | < 0.0001 | < 0.01 |
| Hay waste, lb* | 0.8 | 4.2 | 7.7 | <0.0001 | 0.0026 |
| BW change, lb | 27.3 | 36.5 | 51.2 | 0.051 | > 0.10 |

*Expressed as a % of DMI

Adapted from Jaderburg et al., 2011

Implications

- Limiting access time results in:
 - Acceptable performance
 - Decreased DMI
 - Decreased hay waste
 - Decreased overall costs due to:
 - Less hay needed
 - Less labor needed

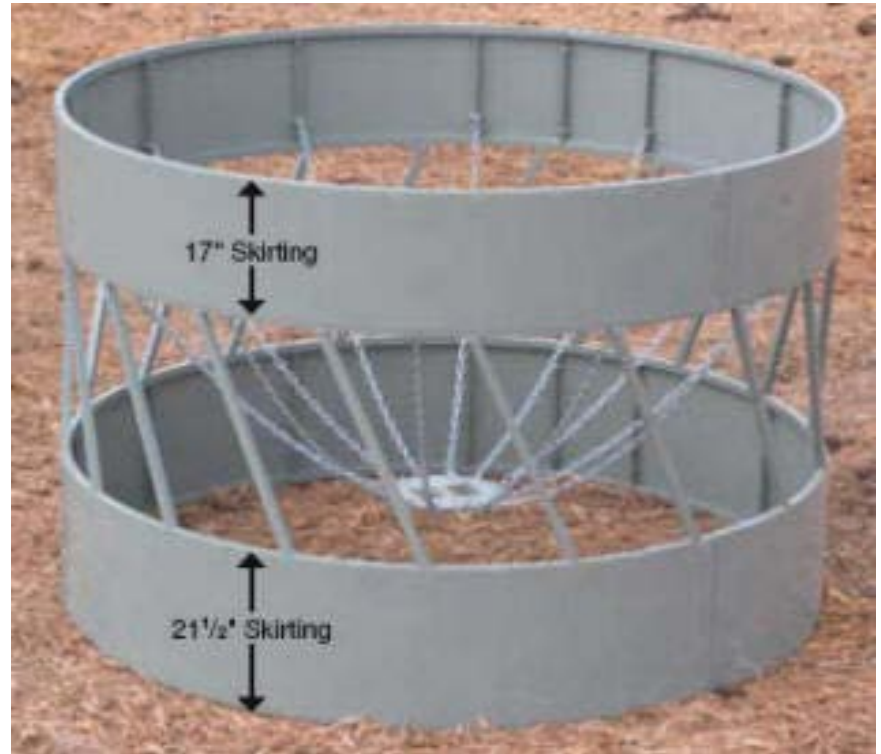
Concluding Remarks

- Round bale feeding method effects
 - Hay waste
 - DMI
 - Cow behavior
 - Cow performance
 - Overall feeding cost

- Feeding method is ranch specific

Concluding Remarks

- Sheeting height matters
 - Calves vs. Cows
- Consider commercial name vs. visual appraisal of feeder
- Other feeding options
 - Bale grazing
 - Hot wire bunks



Literature Cited

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Questions?

