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

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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

Landbolm, et al., 2007

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 ($P < 0.05$)

[d]Values are hay /cow, kg from year 1

Landbolm, et al., 2007

Quantitative analysis of feeding area waste for each feeding method

	Feeding method					P- Value	
Item	Roll out on ground	PTO processor	Tapered cone feeder	SE	Yr	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	—	—	—	—

Landbolm, et al., 2007

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

	Feeding method		
Item	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

Landbolm, et al., 2007

Implications

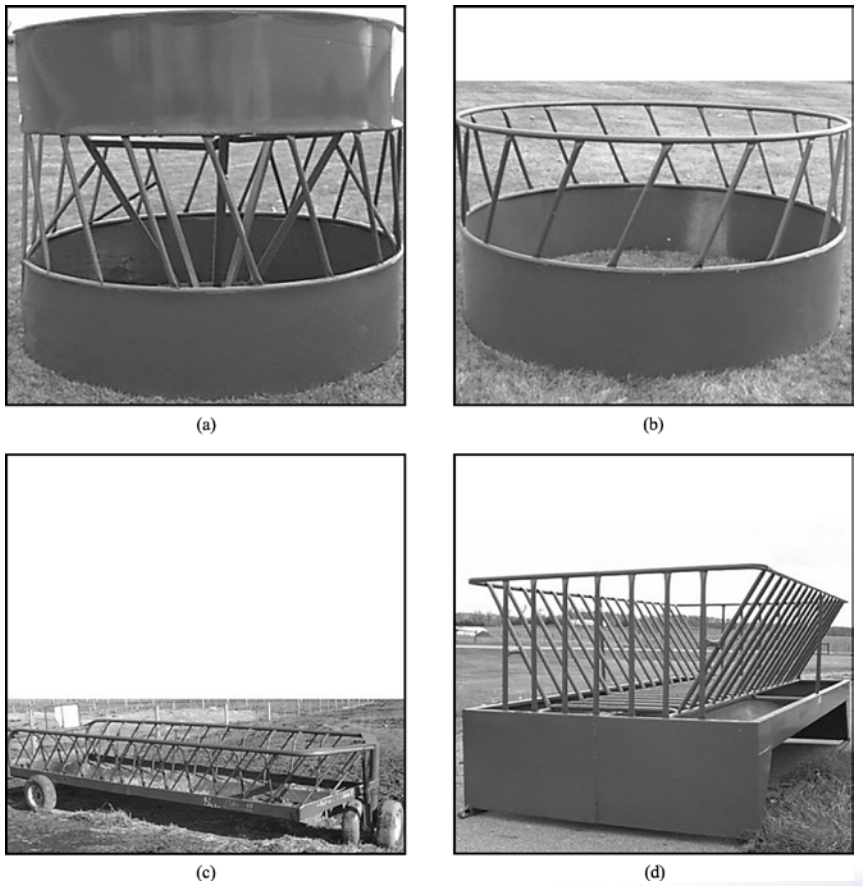
- Tapered cone bale feeder was superior winter hay feeding method
  - Reduced waste
  - Decreased amount of hay per cow
  - Decreased wintering cost per cow

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



Buskirk, et al., 2003

Large round bale feeder design affects on hay utilization

	Feeder Type				
Item	Cone	Ring	Trailer	Cradle	SEM
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

[a]Hay fed less residual hay at the end of the period.
[b]Hay waste as a percentage of hay disappearance.
[c]Hay disappearance less hay waste.
[x,y,z]Within a row, least sqaures means without a common superscript letter differ ($P < 0.05$).

Buskirk, et al., 2003

Effect of feeder type on feeding behavior and dry matter waste

	Feeder Type				
Item	Cone	Ring	Trailer	Cradle	SEM
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

[a]Daily DM waste during simultaneous behavior data collection.

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

Buskirk, et al., 2003

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

	Feeder					
Item	MODC	OBSR	POLY	RING	SEM	P-value
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

	Feeder					
Item	MODC	OBSR	POLY	RING	SEM	P-value
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**
    - **Overcumsumption**
    - **Manure production**
- How?

Ad libitum access to feeders?

	Access Time, h			P-Value	
Item	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

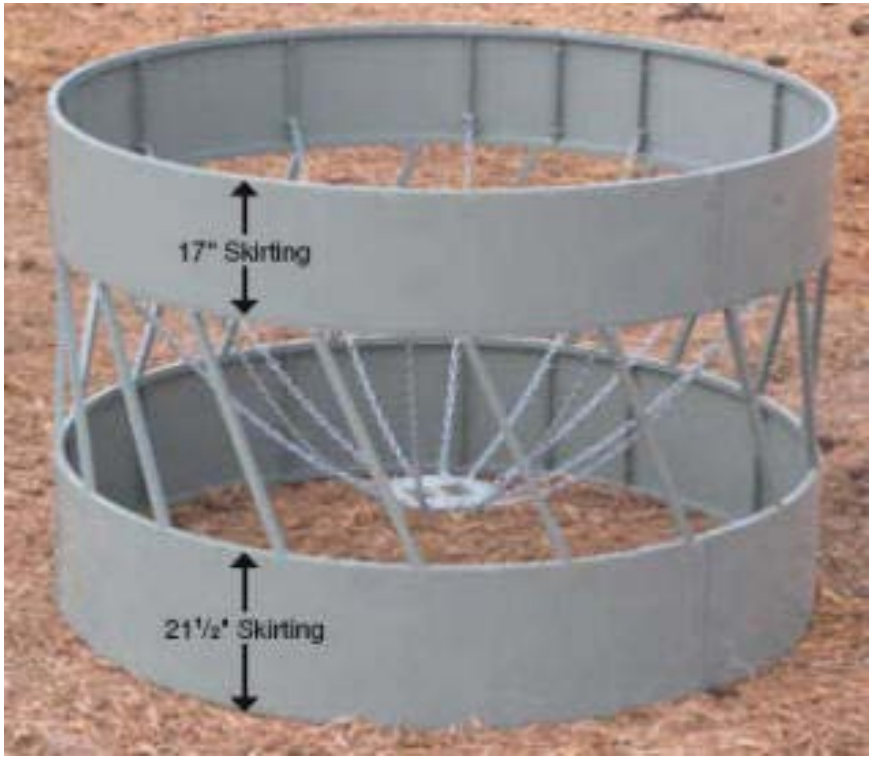
Concluding Remarks

- 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



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Questions?