Hay Storage & Feeding Management

by

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Questions to Consider

- Are you cutting hay for quality or quantity?
- Do you know what your bales weigh?
- Are you forage testing to confirm protein, energy and fiber levels?
- Are you tracking hay consumption or hay disappearance?
- What kind of hay feeders are you using?

The goal is to get the most high-quality forage into the animal.
Typical Forage Harvesting Losses

- Field curing: -26%
- Harvesting: -14%
- Storage: -35%
- Feeding: -30%

30% Left
Optimum Forage Harvesting Losses

Field curing -12%
Harvesting -8%
Storage -5%
Feeding -8%

70% Left
Important Factors for Quality Hay

- Forage species
- Cutting - stage of maturity at harvest
- Baling - moisture content at baling
- Handling
- Storage conditions
- Feeding methods
Forage Moisture Affects Dry Matter Harvest & Storage Losses

Source: Hoglund (1984)
Shape Dictates Moisture Content at Baling

Small Square Bales

60 lbs. ÷ 21.3 sq.ft. = 2.8 lbs./sq.ft.

Large Round Bales

1200 lbs. ÷ 142.5 sq.ft. = 8.4 lbs./sq.ft.
Maximum Hay Moisture Content (%) at Baling

Percent Moisture Content

Small Square 22% 18% 16%
Large Round
Large Square

Reference: MU Guide G3151 Using a Microwave Oven to Determine Moisture in Forages
Round Bale Silage - Baling

- Bale at 50-60% moisture content
Forage Moisture Testing

Heater/fan dryer (Koster® unit)  
$365

Electrical conductance moisture meter  
$450

Microwave  
$50 - $100

Reference: Determining Forage Moisture Concentration  
http://pubs.ext.vt.edu/442/442-106/442-106.html

Prices as of January 2014
What Do the Round Bales Weigh?

Density = 9.2 lbs./cu. ft.  Moisture content = 18%

<table>
<thead>
<tr>
<th>Length (feet)</th>
<th>Diameter (feet)</th>
<th>Weight (lbs.)</th>
<th>Surface Area (sq.ft.)</th>
<th>Volume (cu.ft.)</th>
<th>Weight per Surface Area (lbs./sq.ft.)</th>
<th>Dry matter per bale (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>4.0</td>
<td>462</td>
<td>75.4</td>
<td>50.3</td>
<td>6.1</td>
<td>379</td>
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<tr>
<td>4.0</td>
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<td>723</td>
<td>102.1</td>
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<td>5.0</td>
<td>5.0</td>
<td>903</td>
<td>117.8</td>
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<td>741</td>
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<td>5.5</td>
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<td>1,202</td>
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<tr>
<td>6.0</td>
<td>6.0</td>
<td>1,561</td>
<td>169.6</td>
<td>169.6</td>
<td>9.2</td>
<td>1,280</td>
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</table>
What Do the Square Bales Weigh?

Small Square Bales
Density = 10.3 lbs./cu. ft.  Moisture content = 22%

<table>
<thead>
<tr>
<th>Height (in.)</th>
<th>Width (in.)</th>
<th>Length (in.)</th>
<th>Weight (lbs.)</th>
<th>Surface Area (sq.ft.)</th>
<th>Volume (cu.ft.)</th>
<th>Weight per Surface Area (lbs./sq.ft.)</th>
<th>Dry matter per bale (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.0</td>
<td>18.0</td>
<td>40.0</td>
<td>60</td>
<td>21.3</td>
<td>5.83</td>
<td>2.8</td>
<td>47</td>
</tr>
<tr>
<td>16.0</td>
<td>18.0</td>
<td>40.0</td>
<td>69</td>
<td>22.9</td>
<td>6.67</td>
<td>3.0</td>
<td>54</td>
</tr>
</tbody>
</table>

Large Square Bales
Density = 10.3 lbs./cu. ft.  Moisture content = 16%

<table>
<thead>
<tr>
<th>Height (in.)</th>
<th>Width (in.)</th>
<th>Length (in.)</th>
<th>Weight (lbs.)</th>
<th>Area (sq.ft.)</th>
<th>Volume (cu.ft.)</th>
<th>Weight per Surface Area (lbs./sq.ft.)</th>
<th>Dry matter per bale (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>36.0</td>
<td>36.0</td>
<td>96.0</td>
<td>742</td>
<td>114.0</td>
<td>72.00</td>
<td>6.5</td>
<td>623</td>
</tr>
<tr>
<td>36.0</td>
<td>48.0</td>
<td>96.0</td>
<td>989</td>
<td>136.0</td>
<td>96.00</td>
<td>7.3</td>
<td>831</td>
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<tr>
<td>48.0</td>
<td>48.0</td>
<td>96.0</td>
<td>1,318</td>
<td>160.0</td>
<td>128.00</td>
<td>8.2</td>
<td>1,107</td>
</tr>
</tbody>
</table>
At a given temperature and relative humidity, there is a corresponding moisture content below which the hay will no longer release moisture.
Effect of Moisture at Baling Time on Heat Retention in Big Bales

Source: University of Missouri, 1979
# Critical Bale Temperatures

<table>
<thead>
<tr>
<th>Bale Temperature</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;120 °F</td>
<td>Safe</td>
</tr>
<tr>
<td>120 °F – 160 °F</td>
<td><strong>Caution:</strong> Monitor for temperature increase</td>
</tr>
<tr>
<td>&gt;160 °F</td>
<td><strong>Fire is likely!!</strong> Call fire department. Remove susceptible bales to safe area away from other hay</td>
</tr>
</tbody>
</table>

Reference: MU Guide G4575 Making and Storing Quality Hay  
Heating Losses

- Fire
- Mold damage
- Maillard reaction (browning)
  - Formation of sugar/protein polymers
  - Lowers digestibility of available protein and sugars
  - Test for available protein as well as total protein
Round Bale Storage Alternatives

- **Outside**
  - In field
  - In rows
  - Individual covers
  - Wrapped
  - Pyramid stack

- **Inside**
  - Pyramid stack
  - On-end stack
Outside-Stored Round Bales

- Less dense → more squat → more damage
- Under trees → less drying → more damage
- Flat ground → less drainage → more damage
- Rounded sides touching → more damage
- Smaller diameter → more damage
Bale Density Affects Weathering

Precipitation = 3 inches
Storage Time = 100 days

Moisture penetration = 16.3"
74% of original height
Very difficult to handle

Moisture penetration = 3.5"
91% of original height
Easy to handle
Estimating Round Bale Spoilage Depth

Actual spoilage pattern

Equivalent spoilage

6"

20
## Amount of Dry Matter in Outer Layers of Round Bales

<table>
<thead>
<tr>
<th>Bale Dia. (feet)</th>
<th>2&quot;</th>
<th>4&quot;</th>
<th>6&quot;</th>
<th>8&quot;</th>
<th>10&quot;</th>
<th>12&quot;</th>
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</thead>
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<tr>
<td>3.0</td>
<td>21</td>
<td>40</td>
<td>56</td>
<td>69</td>
<td>80</td>
<td>89</td>
</tr>
<tr>
<td>3.5</td>
<td>18</td>
<td>35</td>
<td>49</td>
<td>62</td>
<td>73</td>
<td>82</td>
</tr>
<tr>
<td>4.0</td>
<td>16</td>
<td>31</td>
<td>44</td>
<td>56</td>
<td>66</td>
<td>75</td>
</tr>
<tr>
<td>4.5</td>
<td>14</td>
<td>27</td>
<td>40</td>
<td>51</td>
<td>60</td>
<td>69</td>
</tr>
<tr>
<td>5.0</td>
<td>13</td>
<td>25</td>
<td>36</td>
<td>46</td>
<td>56</td>
<td>64</td>
</tr>
<tr>
<td>5.5</td>
<td>12</td>
<td>23</td>
<td>33</td>
<td>43</td>
<td>51</td>
<td>60</td>
</tr>
<tr>
<td>6.0</td>
<td>11</td>
<td>21</td>
<td>31</td>
<td>40</td>
<td>48</td>
<td>56</td>
</tr>
</tbody>
</table>
Which Has More Spoilage?

Two 4’ x 4’ bales @ 460 lbs. each

141 lbs. + 141 lbs. = 273 lbs.
31% + 31% = 23%

One 5.5’ x 5.5’ bale @ 1200 lbs. each

273 lbs. = 23%
Outside Uncovered Storage

- Run rows north-south
- Use sloped site
- Space rows 3+ feet apart
- Butt bales end-to-end

3 feet
Individual Bale Covers or Sleeves

- Trap excess moisture under plastic
- Lost bonnet spikes can puncture tires
- Wind or animal damage likely
- Better than no cover at all
Reduce Ground Contact

Pallets, poles or railroad ties

Net wrap
Moisture Distribution of Twine Wrapped Alfalfa/Grass Round Bales Stored on the Ground vs. on Pallets

Images courtesy of Dr. Kevin Shinners, U of Wisconsin
Is Net-Wrap Worth the Cost?

- Costs $.30 -$.50 more per bale than plastic twine
- Installs quicker than twine; saves fuel & labor
  - 10 seconds vs. 60 seconds
- Sheds water 2X better than twine (3” twine spacing)
- Helps hold bale shape better
  - Less wind damage & bottom rotting
- Can save lost hay if handled often
- May save time at feeding
  - Depends on mud & ice cover
  - Less so with elastic edge
Moisture Distribution of Twine Wrapped vs. Net Wrapped Alfalfa/Grass Round Bales Stored on the Ground

Images courtesy of Dr. Kevin Shinners, U of Wisconsin
Economics of Net-Wrap vs. Twine

- **Net-Wrap**: $210 per 64” x 7,000 ft. roll, 2¼ wraps/bale
- **Sisal Twine**: $40 per 9,000 ft. bale, 3” spacing
- **Plastic Twine**: $37 per 20,000 ft. bale, 3” spacing

![Bar chart showing the cost per bale for different sizes of bales using Net-Wrap, Sisal Twine, and Plastic Twine.]

Prices as of 1/2014
John Deere B-Wrap™
An Alternative to Indoor Storage

- Costs about $5 more per bale than net-wrap
- Sheds rain and snow; protects from ground moisture
- Microscopic pores allow bale moisture to escape
- Installs like net-wrap using a special baler kit
- 1 layer net-wrap + 1 layer B-wrap + 2 layers net-wrap
- Works with baled hay & crop residues; best on high-quality hay
- May achieve similar losses as hay stored in barn

Photo credit: www.deere.com
Pyramid Stacking + Rock Base

End ropes tie to post under stack. Rebar “Ts” in grommets hold sides.

After 6 months outside storage
Large Round Bale Outside Storage

- Cover Hay with Reinforced Plastic or Canvas
- Ground Slopes Away from Stack
- 4"-8" of 2"-4" Crushed Rock
Ownership Cost Summary for Crushed Rock & Reinforced Plastic Tarpaulin

Assumed:

a. 28' W x 120' L x 8" thick crushed rock pad
b. Pad holds 200 bales weighing 1200 lbs. each, 66" L x 66" D (120 tons)
c. Maintenance on rock and tarp is minimal for 3 year life.

Construction Cost:

a. 2"-4" dia. rock (50% <4" dia.), 140 tons @ $19.00/ton = $2,660
   
   8" x 28' x 120' = 2240 cu.ft. = 83 cu.yd.
   
   2240 cu.ft. x 125 lb./cu.ft. = 280,000 lb. = 140 tons
   
   $13.00/ton FOB plant, plus $6.00/ton delivery within 15 mi.

b. Tarpaulin, 12-mil, reinforced polyethylene plastic = $1,430
   
   60' x 120' x $0.20/sq.ft.

Total Cost = $4,090

Prices as of 12/2010 --Rock cost ranges from $8-$14 per ton, depending on quarry
Building Planning

- What type?
  - Wood truss
  - Steel truss
  - Metal hoop
Location and Layout – Site Selection
Location and Layout – Legalities

- Zoning
- Building permits
- Codes and inspections
Building Design

- **Dead loads**
  - Weight of building materials
  - Assume 5 lbs./sq. ft. for open trusses
  - Add more if ceiling or if trusses will support hanging items

- **Live loads (for the Ozarks)**
  - Snow (15 lbs./sq. ft. uniform loading)
  - Add 5 lbs./sq. ft. for uneven loading (ice)
  - Wind (90 MPH minimum)

**Total load = 25 lbs./sq. ft. minimum**
Buildings – How They Fail
Live Load – Wind Loading Pressures

- Design for 90 MPH winds
- Not tornado-proof
## Maximum Spacing (ft.) of Posts on Closed Gable Roof

<table>
<thead>
<tr>
<th>No. 2 Southern Pine</th>
<th>Eave Height (ft.) with 90 MPH Wind Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Post Size 10’</td>
</tr>
<tr>
<td>6x6</td>
<td>5.7</td>
</tr>
<tr>
<td>6x8</td>
<td>10.5</td>
</tr>
<tr>
<td>6x10</td>
<td>16.9</td>
</tr>
<tr>
<td>8x8</td>
<td>14.4</td>
</tr>
</tbody>
</table>

NR = Not Recommended

- Use ACQ-approved fasteners
- Frost depth = 30 in.

Reference: NRAES-1 Post-Frame Building Handbook
### Post Embedment Depth (in.) for Buildings up to 60 ft. wide

<table>
<thead>
<tr>
<th>Sandy Silt Soil (1500 psf vert.)</th>
<th>Eave Height (ft.) with 90 MPH Wind Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Spacing (ft.)</td>
<td>10’</td>
</tr>
<tr>
<td>4</td>
<td>54</td>
</tr>
<tr>
<td>6</td>
<td>60</td>
</tr>
<tr>
<td>8</td>
<td>66f</td>
</tr>
<tr>
<td>10</td>
<td>66f</td>
</tr>
</tbody>
</table>

- f = full concrete collar
- NR = Not Recommended

Reference: NRAES-1 Post-Frame Building Handbook
Beam & Footing Sizing

- **Beam load:**
  \[(40' \div 2) \times 25 \text{ psf} = 500 \text{ lb./ft.}\]
  \[= 6 \times 10 \text{ beam}\]

- **Footing load:**
  \[10' \times 500 \text{ lb.ft.} = 5000 \text{ psf}\]
  \[= 20'' \text{ dia. footing}\]

- **40’ wide barn**
- **10’ post spacing**
- **25 psf roof load**
Pressure-Treated Lumber

- CCA → Chromated Copper Arsenate
- ACQ-C → Alkaline Copper Quat Type C
- ACQ-D → Alkaline Copper Quat Type D Carbonate
- CBA-A and CA-B → Copper Azole Types A and B
- SBX/DOT → Sodium Borate
- Zinc Borate
- MCQ → Micronized Copper Quat

Use hot-dip galvanized or Types 304 or 316 stainless steel fasteners

One ½" bolt is equal to four 30d pole barn nails.
Wind Bracing & Ceiling Support

- Purlin
- King post
- Knee brace
Sizing Hay Barns

Small Square Bales:
250 cu.ft. per ton

Large Round Bales:
310 cu.ft. per ton
Inside Storage
Stacked Square Bales

Small Square Bales
14" x 18" x 40", 60 lbs., 22% M.C.

Flat (twines up):
6960 bales
163 tons dry matter

On Edge:
7026 bales
164 tons dry matter

40' W x 60' L x 16' H Hay Barn
Inside Storage - Pyramid

Large Round Bales
5' L x 5' D, 900 lbs., 18% M.C.

40' W x 60' L x 16' H Hay Barn

4 rows, 307 bales
113 tons dry matter
18 ft. high

3 rows, 252 bales
93 tons dry matter
13.6 ft. high
Inside Storage - On-End

Large Round Bales
5' L x 5' D, 900 lbs., 18% M.C.

3 rows on-end, 288 bales
106 tons dry matter
15 ft. high

40' W x 60' L x 16' H Hay Barn
Ownership Cost Summary for Clear-Span Wood or Steel-Truss Barn

Assumed:

a. 40' W x 60' L x 16' H barn rated at 25 psf total roof load.

b. Barn holds 200 bales weighing 1200 lbs. each, 66" L x 66" D (120 tons)

c. $7.50/sq.ft. cost = clear-span, colored metal, dirt floor, 15-20 year life.

Construction cost at $7.50 per sq.ft., including labor = $18,000

Annual Barn Cost (depreciated over 10-year life of 9% loan):

a. Depreciation ($18,000 ÷ 10 years) = $ 1,800

b. Interest (2/3 of annual interest rate on loan = 6%) = 1,080

c. Repairs (0.7% of construction cost) = 126

d. Taxes (1% of construction cost) = 180

e. Insurance (0.3% of construction cost) = 54

Total Annual Cost = $ 3,240
Hoop Structures for Hay Storage

Specifications for this structure:

- 30 ft. x 102 ft.  
  (widths range from 24-70 ft., lengths in 10-ft. increments)
- UV-treated polyethylene cover
- Clearance: 11’4” + wall height  
  (11’4” + 6’ = 17’4”)
- Holds 270 bales weighing  
  1200 lbs. each, 66” L x 66” D  
  (160 tons) in 6-5-4 pyramid
- Estimated 10-year life
Hoop Structures for Hay Storage

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package (hoops, cover)</td>
<td>$10,080</td>
</tr>
<tr>
<td>Posts (42 ea.)</td>
<td>1,260</td>
</tr>
<tr>
<td>Concrete for posts &amp; lumber for side walls</td>
<td>1,260</td>
</tr>
<tr>
<td><strong>Approx. materials cost</strong></td>
<td><strong>$12,600</strong></td>
</tr>
<tr>
<td>Approx. labor cost</td>
<td>$ 5,700</td>
</tr>
<tr>
<td><strong>Approx. Total Cost</strong></td>
<td><strong>$18,300</strong></td>
</tr>
</tbody>
</table>

= $6.00 per sq.ft.

Price estimate as of 12/2010
Round Bale Storage Economics

- **Outside**: 28'W x 120'L x 8"H rock pad, $4,090 total cost ($1,363/year)
- **Inside**: 40'W x 60'L x 16'H barn, $18,000 construction cost ($3,240/year for 10 years)

```
<table>
<thead>
<tr>
<th>Bale Size (L' x D' x Weight)</th>
<th>Annual Cost per Bale ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5 x 5.5 x 1200</td>
<td>Inside-Stored, On-End</td>
</tr>
<tr>
<td>5 x 5.5 x 1090</td>
<td>Inside-Stored Pyramid</td>
</tr>
<tr>
<td>5 x 5 x 900</td>
<td>Outside- Stored Pyramid</td>
</tr>
<tr>
<td>4 x 5 x 720</td>
<td></td>
</tr>
<tr>
<td>4 x 4 x 460</td>
<td></td>
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</table>
```

53
## Affordability of Storage
($$ value of hay lost)

<table>
<thead>
<tr>
<th>Storage loss (%)</th>
<th>Hay price (per ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$40</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
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<tr>
<td>10</td>
<td>4</td>
</tr>
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<td>15</td>
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<td>20</td>
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<td>30</td>
<td>12</td>
</tr>
<tr>
<td>35</td>
<td>14</td>
</tr>
<tr>
<td>40</td>
<td>16</td>
</tr>
</tbody>
</table>

Note: Does not include losses associated with shrinkage or reduced quality.

Reference: Oklahoma State University factsheet BAE-1716 Round Bale Hay Storage
Hay Feeding Losses Can Be Significant

Up to 40% loss possible with this common method
## Hay Wasted by Cows When Fed With and Without Racks

(Bell, S., and F.A. Martz., University of Missouri, 1973)

<table>
<thead>
<tr>
<th>Type of Hay</th>
<th>Percent Wasted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Square bale in rack</td>
<td>7%</td>
</tr>
<tr>
<td>Large round bale in rack</td>
<td>9%</td>
</tr>
<tr>
<td>Large round bale without rack</td>
<td>45%</td>
</tr>
</tbody>
</table>
General Rules on Hay Feeding

Hay quality should be matched to animal needs
• Sort cattle into groups based upon stage of production
• Barns with side access work best for this
• Feed lowest-quality hay to dry or non-lactating cows
• Feed highest-quality hay to lactating heifers or cows
• Feed “pounds of hay,” not “number of bales”

Feed outside-stored hay before inside-stored hay
• Animals fed high-quality hay early in the season will often refuse poor-quality hay when it is offered later
General Rules on Hay Feeding

- Feed coarse, less-dense, or high-quality outside hay before fine-stemmed, more-dense outside hay.
- Feed hay in small amounts or in a feeder to minimize waste.
- Feed hay in well-drained areas or move hay areas around.
- Time feeding to force clean-up.
  - Remember last part of hay is lowest quality – watch body condition!
Herbicide Precautions of Feeding Hay

Was hay treated with herbicide products containing aminopyralid?

• GrazonNext® HL, Chaparral™, Milestone®
• Aminopyralid readily passes through livestock, with no effect on the animal
• Land planted to sensitive broadleaf crops can be impacted by herbicide residue in urine and manure
  ▪ Alfalfa, soybeans, sunflowers, cotton, tobacco, peanuts, sugarbeets
  ▪ Tomatoes, beans, lettuce, cucurbits, potatoes, strawberries, grapes, flowers

Graphic credit: www.dowagro.com/range/eSteward/south_index.htm
Herbicide Precautions of Feeding Hay

◆ If feeding hay you raised:
  • Stop feeding treated hay to cattle 3 days before moving them to sensitive fields
  • Manure can be spread on pasture grasses, grass grown for seed, wheat or corn

◆ If purchasing hay:
  • Ask if the hay you are buying has been treated with a herbicide
  • Do not use treated hay for compost or gardening

◆ As a hay producer:
  • Will the hay be used on-farm or will it be sold?
  • If sold, communicate precautions to the purchaser
## Estimated losses (% of hay offered) from different hay-feeding methods

<table>
<thead>
<tr>
<th>Bale Type</th>
<th>With Rack</th>
<th></th>
<th>Without Rack</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-Day Supply</td>
<td>7-Day Supply</td>
<td>1-Day Supply</td>
</tr>
<tr>
<td>Small square</td>
<td>3.9</td>
<td>4.9</td>
<td>6.7*</td>
</tr>
<tr>
<td>Large round or square</td>
<td>4.9</td>
<td>5.4</td>
<td>12.3*</td>
</tr>
<tr>
<td>Formed haystacks</td>
<td>8.8</td>
<td>15.0</td>
<td>22.6</td>
</tr>
<tr>
<td>Small round bales</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(fed in place on pasture)</td>
<td>10.0</td>
<td>30.0</td>
<td></td>
</tr>
</tbody>
</table>

* Bales spread or unrolled across pasture

Reference: MU Guide G4570  Reducing Losses When Feeding Hay to Beef Cattle
http://extension.missouri.edu/explorepdf/agguides/crops/g04570.pdf
Advantages of Unrolling Hay

• Allows “boss” cows and timid cows to eat together
• Less hoof damage to feeding area because it is larger
• Controls the amount of hay allotted by portioning bales
• Can help overseed pastures with legumes
• Distributes fertilizer nutrients back on field
**Bale Processors - Pros & Cons**

- **Myth**: grinding forages will increase forage quality
- Quality may decrease, especially if hay is ground on a windy day (leaf loss)
- Decreased particle size = decreased rumen retention time = increased forage intake
- Allows a way to increase consumption of low to medium quality forages
- Allows a way to combine forages of differing quality for best use in a cow feeding diet
- Allows a way to manage problem forages, i.e., high nitrates
- Increased ownership cost of $20K-$25K equipment

Reference: www.extension.org/pages/17216/forage-feeding-losses-can-add-up
# Bale Processors

<table>
<thead>
<tr>
<th>Feeding Method</th>
<th>100-cow herd, feeding cost per cow</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTO-powered bale processor</td>
<td>$128.10</td>
</tr>
<tr>
<td>Unrolling bales on ground</td>
<td>$113.90</td>
</tr>
<tr>
<td>Tapered-cone round bale feeder</td>
<td>$101.80</td>
</tr>
</tbody>
</table>

Rolling bales out on the ground or shredding into windrows with a bale processor increased hay consumption and winter feeding cost without enhancing cow performance.

Reference: North Dakota State University, 2005 -- www.ag.ndsu.edu/archive/dickinso/research/2004/beef04r.htm
Low-Labor Hay Ring Management

- Space bales 20 ft. apart in pasture or paddock corner
- Enclose bales with movable electric fence
- Feed bales in hay rings
- Use multiple rings to reduce “boss” cow problems
- Move fence & rings as needed

Reference: MU Guide G4570 Reducing Losses When Feeding Hay to Beef Cattle
http://extension.missouri.edu/p/G4570
Feeder Design Affects Wastage

Cattle remove hay & step on it

Hay gets used as bedding
Feeder Design Affects Wastage

JAS 81:109 (Michigan State University, 2003)

- Cone feeder: 3.5% loss
- Ring feeder: 6.1% loss
- Trailer: 11.4% loss
- Cradle: 14.6% loss
Why the Big Differences?

- Slanted bars discourage cows from backing out of feeder
- Most dropped hay stays in feeder
- Boss cows less aggressive toward timid cows

Cone feeder = $1000 + shipping
vs.
Ring feeder = $120 - $350
Cone Feeder Pros & Cons

- Keeps hay off of the ground
- Saves 10-20% hay usage annually
- Saved hay stretches limited supplies
- Supports bales up to 2,500 lbs. in weight
- Top ring keeps cattle from pulling hay off of the top
- Much longer life compared to cheap hay rings
- Feeder weighs 600+ lbs. Cannot be easily moved by hand
- Higher initial cost
Can You Afford a Cone Feeder?

- Initial feeder cost = $725
- Assume 10% hay savings on $50 bale
- Assume 10-year life vs. 1-2 year life

- Saves $500 for every 100 bales fed, or $5,000 for 1000 bales fed over 10 years

When might a cheap hay ring be better?.......

…….when feeding junk hay that the cows are going to waste. It’s easier to move the ring by hand more frequently.
Example:
50 cows for 3 months
30 lbs. hay per day
$60 per 1000 lb. bale

= $1,053 hay wasted

Reference: www.noble.org/ag/tools/livestock/hay-ring
Example:
50 cows for 3 months
30 lbs. hay per day
$60 per 1000 lb. bale

= $429 hay wasted

Reference: www.noble.org/ag/tools/livestock/hay-ring
Cone Feeder Styles

Photo credit: fyi.uwex.edu

Photo credit: www.applegatelivestock.com

Photo credit: www.weldyenterprises.com

Photo credit: www.franklinwaterers.com/bale.html

Photo credit: www.titanwestinc.com/bextra.html
Cone Feeder Styles
Feeding Strategies

Keep feeding areas as dry as possible
Feed on a pad or elevated surface
Feeding Strategies

Make animals use up hay before adding more to feeder
Feeding Strategies

Cull aggressive animals
Feeding Strategies

Consider feeder durability vs. cost
Summary

- Harvest for quality or buy good hay
- Protect the hay from moisture
- Know what your bales weigh
- Test for nutrient quality before feeding
- Use some type of hay feeder if not limit-unrolling
- Select feeder that minimizes waste
  - At least solid lower panels and slanted bars
- Limit-feed in well-drained area
- Costly-to-buy feeders likely cheaper long-term
Questions?

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To file a program complaint you may contact any of the following:

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  130 Heinkel Bldg, Columbia, MO 65211

USDA
- Office of Civil Rights, Director
  Room 326-W, Whitten Building
  14th and Independence Ave., SW
  Washington, DC 20250-9410

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