Hay Storage & Feeding Management

by
Bob Schultheis
Natural Resource Engineering Specialist
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: Haglund (1964)
Shape Dictates Moisture Content at Baling

Small Square Bales

\[ \frac{60 \text{ lbs.}}{21.3 \text{ sq.ft.}} = 2.8 \text{ lbs./sq.ft.} \]

Large Round Bales

\[ \frac{1200 \text{ lbs.}}{142.5 \text{ sq.ft.}} = 8.4 \text{ lbs./sq.ft.} \]
Maximum Hay Moisture Content (%) at Baling

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 $385

Microwave $50 - $100

Photo Credit: www.enasco.com/product/C08633N

Photo Credit: www.enasco.com/product/C16283N


Prices as of October 2012
## 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>
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<td>5.0</td>
<td>5.0</td>
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<td>1,202</td>
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<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>
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<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>
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</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>
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<td>623</td>
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<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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<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>
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<tbody>
<tr>
<td>&lt;120 °F</td>
<td><strong>Safe</strong></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
# Amount of Dry Matter in Outer Layers of Round Bales

<table>
<thead>
<tr>
<th>Bale Dla. (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>
</tr>
</thead>
<tbody>
<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>
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<tr>
<td>4.0</td>
<td>16</td>
<td>31</td>
<td>44</td>
<td>56</td>
<td>66</td>
<td>75</td>
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<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>
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<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

One 5.5’ x 5.5’ bale @ 1200 lbs. each

141 lbs. + 141 lbs. = 273 lbs.

31% + 31% = 23%
Outside Uncovered Storage

- Run rows north-south
- Space rows 3+ feet apart
- Use sloped site
- 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

Soil Contact

Pallet

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

- Costs $.40 -$.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**: $195 per 64” x 7,000 ft. roll, 2¼ wraps/bale
- **Sisal Twine**: $35 per 9,000 ft. bale, 3" spacing
- **Plastic Twine**: $28 per 20,000 ft. bale, 3" spacing

<table>
<thead>
<tr>
<th>Bale Size (L’ x D’)</th>
<th>Net-Wrap</th>
<th>Sisal Twine</th>
<th>Plastic Twine</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 X 6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.5 X 5.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 X 5.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 X 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 X 5</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4 X 4</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Prices as of 12/2010
John Deere B-Wrap™
An Alternative to Indoor Storage

- Costs a few dollars 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

SIDE-LOADING HAY BARN LAYOUT

END-LOADING BARN LAYOUT

40’

40’
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

- Original Position
- Racking
- Collapse
- Overturning
- Lateral Movement (Shifting)
- Damage Caused by Outside Objects
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>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**

**Sandy Silt Soil (1500 psf vert.)**

<table>
<thead>
<tr>
<th>Post Spacing (ft.)</th>
<th>Eave Height (ft.) with 90 MPH Wind Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td></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

- 40’ wide barn
- 10’ post spacing
- 25 psf roof load

Beam load:
\[(40’ ÷ 2) \times 25 \text{ psf} = 500 \text{ lb./ft.} \]
\[= 6\times10 \text{ beam}\]

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

Truss Anchorage

- One ½" bolt is equal to four 30d pole barn nails

- Upper chord
- Lower chord
- Purlin
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>
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<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><strong>Approx. labor cost</strong></td>
<td><strong>$5,700</strong></td>
</tr>
<tr>
<td><strong>Approx. Total Cost</strong></td>
<td><strong>$18,300</strong></td>
</tr>
</tbody>
</table>

Price estimate as of 12/2010

= $6.00 per sq.ft.
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>Inside- Stored Pyramid</td>
</tr>
<tr>
<td>4 x 4 x 460</td>
<td>Inside- Stored Pyramid</td>
</tr>
</tbody>
</table>
## Affordability of Storage

($$ value of hay lost)

### Hay price (per ton)

<table>
<thead>
<tr>
<th>Storage loss (%)</th>
<th>$40</th>
<th>$60</th>
<th>$80</th>
<th>$100</th>
<th>$120</th>
</tr>
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<td>8</td>
<td>10</td>
<td>12</td>
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<tr>
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<td>9</td>
<td>12</td>
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<td>40</td>
<td>16</td>
<td>24</td>
<td>32</td>
<td>40</td>
<td>48</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>
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!
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>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-Day</td>
<td>7-Day Supply</td>
<td>1-Day Supply</td>
<td>7-Day Supply</td>
</tr>
<tr>
<td>Small square</td>
<td>3.9</td>
<td>4.9</td>
<td>6.7*</td>
<td></td>
</tr>
<tr>
<td>Large round or square</td>
<td>4.9</td>
<td>5.4</td>
<td>12.3*</td>
<td>43.0*</td>
</tr>
<tr>
<td>Formed haystacks</td>
<td>8.8</td>
<td>15.0</td>
<td>22.6</td>
<td>41.0</td>
</tr>
<tr>
<td>Small round bales (fed in place on</td>
<td></td>
<td></td>
<td>10.0</td>
<td>30.0</td>
</tr>
<tr>
<td>pasture)</td>
<td></td>
<td></td>
<td></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
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

Photo credit: Gene Kinlaw
Can You Afford a Cone Feeder?

- Initial feeder cost = $725
- Assume 10% hay savings on $60 bale
- Assume 10-year life vs. 1-2 year life

Saves $600 for every 100 bales fed, or $6,000 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

Photo credit: jlhaysavers.com

Photo credit: behlencountry.com

Photo credit: www.centurylivestockfeeders.com

Photo credit: www.haymizer.com/haymizer_I.htm

Photo credit: www.klenepipe.com
Feeding Strategies

Keep feeding areas as dry as possible
Feeding Strategies

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

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- MU Extension AA/EEO Office
  109 F. Whitten Hall, Columbia, MO 65211
- MU Human Resources Office
  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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