Hay Storage Systems

Hay Production School
John W. Worley

Alternatives

- Curing
  - Field Dry
  - Baleage
- Packaging
  - Round Bales
    - Twine
    - Bale Wrap
  - Square Bales

Alternatives

- Storage
  - Square Bales - Barn
  - Round Bales
    - Field
    - Tarp
    - Barn

Baleage

- Greater control over harvesting time
- Excellent quality if moisture level right and no leaks
- Reduces Nitrate Levels

Baleage

- Costs more
- Can cause problems if ensiling isn’t successful
- Disposal of Plastic

Square vs. Round Bales
Twine vs. Hay Wrap

Hay Storage – Preserving Quality
- Why build it?
- How to build it
- How to use it

Hay Barn
- Best choice for long-term storage

Hay Barn
- Enclosed sides –
  - Better Protection (sun and rain)
  - Costs about twice as much
  - Ventilation
  - High-end hay storage

Tarp
- Low-cost alternative
- More Labor
- Decreased losses in case of fire

Uncovered
- Lowest Cost - Greatest Losses - Poorest Quality
### Cost of Owning a Building

- 50 by 100 ft building at $4.50/ square foot ($22,500) (Roof only)
  - Depreciation $1500
  - Interest $850
  - Tax & Ins. $650
- Total Annual Cost $3000

### Benefits of Covered Storage

- Reduced Dry Matter Loss
- Improved Nutritional Value
- Reduced animal refusal
- Barn can be used for other things when not used for hay (equipment storage)

### Dry Matter Losses (%)

<table>
<thead>
<tr>
<th>Study</th>
<th>Ground Stored</th>
<th>Elevated on Pallets</th>
<th>Elevated &amp; Tarped Only</th>
<th>Barn Stored</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>65</td>
<td>38</td>
<td>14</td>
<td>na</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>32</td>
<td>14</td>
<td>na</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>na</td>
<td>na</td>
<td>10</td>
</tr>
</tbody>
</table>

### Size of Bale Affects Losses

- Outer 4 to 6 inches is lost
- Higher percentage of a small bale

### Dry Matter Losses (%) As Affected by Bale Size

<table>
<thead>
<tr>
<th>Bale Diam. (ft.)</th>
<th>Ground Stored</th>
<th>Elevated on Pallets</th>
<th>Elevated &amp; Wrapped</th>
<th>Barn Stored</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>32.4</td>
<td>26.2</td>
<td>14.6</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>23.8</td>
<td>17.4</td>
<td>11.4</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>19.6</td>
<td>13.4</td>
<td>10.0</td>
<td>4</td>
</tr>
</tbody>
</table>

### Digestability and Palatability Also Affected
Nutritional Losses (% Digestibility)

<table>
<thead>
<tr>
<th>Study</th>
<th>Ground Stored</th>
<th>Elevated on Pallets</th>
<th>Elevated &amp; Tarped</th>
<th>Tarped Only</th>
<th>Barn Stored</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45 (16)</td>
<td>49</td>
<td>52</td>
<td>na</td>
<td>54 (52)</td>
</tr>
</tbody>
</table>

Annual Savings on Hay Storage

- **Assumptions**
  - Hay valued at $65/ton (dry matter)
  - Hay losses reduced by 30%
  - 50 x 100 building (annual cost = $3000)
  - Storage Capacity = 240 tons
  - Hay stored at 15% moisture

- **Annual Savings on Hay Storage**
  - Dry matter saved = 61 tons - $3965
  - Net Savings = $965

- **What if?**
  - If Digestibility Improved by 5% (Total of 42% Savings) Net Savings = $2769
  - If Hay worth $80/ton, Net Savings = $4054
  - If dry matter loss improved by 50%, (101 tons) Net Savings = $3630

If You Build A Barn

- **Build to meet Southern Building code (80 mph wind)**
- If possible, orient the long axis east and west on open-sided barns
- Hay storage should be open, especially at the gable end for ventilation
- Stack bales on end to increase capacity
- Make sure the eave height (vertical clearance) of barn is sufficient

How Much Should You Store in the Barn?

- All that you can fit in existing barns
- All square bales
- 50 to 75% of crop (feed last cutting first and store outside)
- Depends on distance from field to barn and barn to pasture
Rot and Rust on Inside Roof?

Enclosed Gable

Water Loss from Curing Hay
- 100 tons of hay stored at 16% moisture
- Dries to 13% moisture
- 3% of 100 tons = 3 tons of water
- = 722 gallons
- Must be removed by ventilation

How much Ventilation?
(Enclosed Barn)
- Equivalent of:
  - 6” continuous ridge vent
  - 2’/ 10 ft of width
  - Which ever is greater
- For a 50-ft wide building -10” Ridge vent
  (83 sq. ft of ridge/gable opening for 100-ft long building)
- Equal area of opening near bottom of walls (Door can serve as part of vent)

Flooring for Square Bales
- Anything that promotes ventilation under the hay is good
  - Large rock
  - pallets
- Ideal is a raised floor with air underneath (not always practical)
- Bottom layer on edge – primarily to keep twine from rotting, but also helps promote ventilation

If You Store In the Field
Field Storage Recommendations
- Store on high, well-drained ground
- Store in open, sunny area
- Store in rows with flat edges touching and round edges separated (unless tarped)
- Orient rows North and South
- Orient rows down slope, not across slope
- Store near feeding area

What’s Right? What’s Wrong?

What’s Right? What’s Wrong?

2nd Year Outside Hay

QUESTIONS?

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