Making Dry Hay & Baleage

Aaron Gabriel, Cornell Cooperative Extension
Leaf retention is critical for quality hay
Something Can Be Managed At Each Step

- Mowing
- Conditioning
- Tedding
- Raking
- Baling
- Wrapping for baleage
- Transporting
- Storage
Morning or Afternoon mowing makes no difference in the northeast 90% of the time

Estimated gm sugar/Kg grass DM

8:00 AM  Noon  7:00 PM  Midnight  8:00 AM
Discbines

- can travel 5 – 10 mph
- do not plug like sickle mowers
- Cut a lodged crop better

* easier to replace knives
Conditioning is essential for dry hay, but not for baleage
Rubbing wax off leaves vs crimping stems

- 2-4% more leaf loss with tines, but can be adjusted less
- Tines work best on grass
- Rolls are good for alfalfa, wear out in the middle fastest
Tine or Finger Conditioner
tines may swing on some brands
Macerator
gain from 0 to 24 hrs drying time
Rubber rolls in front hold forage firmly.

Steel rolls behind spin at different speeds to nick and scrape wax off grass leaves and alfalfa stems.
Teddar
ted hay soon after mowing
Teddar with horizontal long & short tines
Hay Rakes

- rake at >35% moisture

Roping

Gentle, roping, roping

Fluff for good drying,
Set PTO to wheel speed, repairs

No roping, repairs
Keep Soil Out of Hay

< 10% ash on soil test

- Mow at a decent height (4” grass, 3” alfalfa)
- Properly adjust tedder
- Properly adjust the rake
- Properly adjust pick-up on baler
- Plow & fit fields well so they are smooth
Moisture Testing

1) “Dish rag” test. – Wring out moisture when above the 65%
2) Commercially available testers poor at <40% moisture
3) Koster moisture testers - heated, forced-air dryers, takes longer than a microwave moisture test.
4) **Best Method** - microwave moisture test.
   - Measure 100 grams forage, chopped 1”
   - Place a cup of water in the microwave
   - Microwave 1 minute at a time at first, weigh when it feels dry
   - Microwave 30 seconds or less and weigh each time (avoid burning it)
   - When it stops loosing weight, it is dry (~99% dry)
   - Starting weight – final weight = % moisture (water was removed)
Leaf loss in grass during round baling – moisture effect
Preservatives – liquid & granular propionate

- Bale at 5% more moisture
- Better leaf retention
- Beat the weather
- May be necessary for large squares
- ~$15/ton
- Excellent coverage is necessary
Preservatives Can Maintain Quality

Table 1. Storage losses and composition of alfalfa hay baled at 32% moisture and treated with different rates of propionic acid at baling. 1 Hay at harvest was 70.5% IVDDM (In vitro dry matter digestibility)


<table>
<thead>
<tr>
<th>Treatment</th>
<th>Max. Storage Temperature, °F</th>
<th>Dry Weight Loss, %</th>
<th>Digestibility, %</th>
<th>Total Carbohydrates, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>124</td>
<td>15.1</td>
<td>60.5</td>
<td>3.4</td>
</tr>
<tr>
<td>Propionic Acid Rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.02%</td>
<td>127</td>
<td>16.7</td>
<td>61.8</td>
<td>3.1</td>
</tr>
<tr>
<td>0.2%</td>
<td>115</td>
<td>13.2</td>
<td>62.2</td>
<td>3.9</td>
</tr>
<tr>
<td>0.5%</td>
<td>104</td>
<td>11.7</td>
<td>61.0</td>
<td>4.1</td>
</tr>
<tr>
<td>1.0%</td>
<td>84</td>
<td>7.6</td>
<td>65.0</td>
<td>6.5</td>
</tr>
<tr>
<td>Hay Moisture Level, %</td>
<td>Rate, % (dry wt basis)</td>
<td>lb/ton</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------</td>
<td>--------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-25</td>
<td>0.5</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-30</td>
<td>1.0</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-35</td>
<td>1.5</td>
<td>30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Variable Chamber Baler
Tractor should be heavier than the baler plus bale
Less than perfect conditions for round baling

Baling short, dry and slick material such as straw from a rotary combine can be a challenge. The baler may continually plug or starting the bale may be difficult.

Make decent-sized windrows

Bale in late evening or early morning to take advantage of moisture

Reduce bale density settings

Make smaller bales

Decrease the PTO speed while maintaining normal ground speeds

If possible, adjust the distance from the twine to the end of the bales as wide as possible so the twine doesn't slip off the end of the bale

Use a close twine spacing across the bale
Round Baler Leaf Loss in Chamber

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/eng3129
Round Baler Drive Pattern for Good Bale Shape

WEAVING PATTERNS

Expanding Chamber (Hard Core) Baler - Right

Fixed Chamber (Soft Core) Baler - Right

Wrong

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/eng3129
Windrow Size – full or < ½ pick-up width for good bale shape
<table>
<thead>
<tr>
<th>COMPARISON</th>
<th>Variable</th>
<th>Fixed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Req.</td>
<td>Less</td>
<td>More</td>
</tr>
<tr>
<td>Purchase Price</td>
<td>More</td>
<td>Less</td>
</tr>
<tr>
<td>Maintenance Cost</td>
<td>More (belts)</td>
<td>Less</td>
</tr>
<tr>
<td>Bale Size</td>
<td>Adjustable</td>
<td>One size</td>
</tr>
<tr>
<td>Bale Pressure</td>
<td>Adjustable</td>
<td>Slightly adjustable</td>
</tr>
<tr>
<td>Leaf loss</td>
<td>2 – 4%</td>
<td>3 – 8%</td>
</tr>
<tr>
<td>Baleage</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Management Areas for Leaf Retention

- Ted and Rake at Proper moisture, no less than 35 or 40%
- Ted and Rake at a gentle speed
- Bale at proper moisture: 18-20% sm sq. / 16-18% Round / 15-16% lg sq
- Baler pick-up speed, same as forward speed.
- Baler forward speed, do not pull or push forage into the baler
- Windrows full of hay
- Round balers should turn no more than necessary to form the bale; square bale plunger should plunge a chamber full of hay
- Square bales partially on thrower belt lose leaves
- Handle bales as few times as possible
John Deere B-Wrap for Dry Hay

- Sheds rain and snow
- Lets moisture escape, so bales can cure
- Protects bales from ground moisture
Baleage balers

• heavy duty bearings & rollers
• scrapers to keep gum off belts and rollers
Table Wrapper

- Either place bale on table with tractor or it will have an arm to lift bales onto table
- 20 – 30 bales / hour
In-line (tootsie roll) bale wrapper
40 – 50 bales/hr
Inline Wrapper

http://www.farm-equipment.com/wysiwyg/images/issues/07_2012_issue/TubelineBaleWrapper_opt.jpeg
Silage Fermentation

wilt forage to 40 – 60% moisture

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
<th>Phase 4</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>Day 2</td>
<td>Day 3 to 6</td>
<td>Day 7 to 21</td>
<td>After Day 21</td>
</tr>
<tr>
<td>Chemical Changes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxygen + Sugar</td>
<td>Sugar</td>
<td>Sugar</td>
<td>Sugar</td>
<td>Stable state until silage is exposed to oxygen</td>
</tr>
<tr>
<td>Heat Water</td>
<td>Acetic Acid</td>
<td>Lactic Acid</td>
<td>Lactic Acid</td>
<td></td>
</tr>
<tr>
<td>Proteins Degraded</td>
<td></td>
<td>Acetic Acid Ethanol Mannitol CO₂</td>
<td>Acetic Acid Ethanol</td>
<td></td>
</tr>
</tbody>
</table>

Chemical Changes:
- Oxygen + Sugar
- Heat Water
- Proteins Degraded

Microbial Growth:
- Aerobic Bacteria
- Acetic Acid Bacteria
- Lactic Acid Bacteria

Temperature:
- 70°F
- 80 to 100°F
- 5.0
- 4.2
- -4.0

pH:
- 6.0
- -
Baleage Tips

1. Use good quality forage, no rain damage
2. Make dense bales
3. Wilt to 40 - 60% moisture
4. Wrap with 6 mil (6 layers) of plastic. Do not stretch plastic too much.
5. Wrap ASAP, w/in 2 hr on a hot day, w/in 12 hr on cool days
6. Wrap in a area free of puncture hazards
7. Store in area of low temperature fluctuation
8. Check bales weekly, repair with polyethylene tape
Table 1. Temperature (°F) in silage bales bagged immediately, after 8 hours, and after 24 hours.

<table>
<thead>
<tr>
<th>Days After Ensiling</th>
<th>Interval Between Baling and Bagging (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>118</td>
</tr>
<tr>
<td>1</td>
<td>111</td>
</tr>
<tr>
<td>2</td>
<td>113</td>
</tr>
<tr>
<td>8</td>
<td>129</td>
</tr>
<tr>
<td>24</td>
<td>127</td>
</tr>
<tr>
<td>24</td>
<td>132</td>
</tr>
</tbody>
</table>

Source: University of Missouri, 1983 Research Reports.
Bale Grabber
handle bales as little as possible to keep sealed

http://kts.se/NT/images/multigrip7.jpg
Labor Saving Machinery

- There is a lot of different bale handling equipment
- Youtube has many videos
Bale throwers are safer than kickers
Bale table accumulates bales, places them on the field for later pickup by a grabber

https://www.farm-equipment.com/wysiwyg/images/Koyker_photo_for_E-Watch.png
Very few moving parts
Works on hills according to the dealer

http://ak3.picdn.net/shutterstock/videos/215389/preview/stock-footage-farmer-square-baling-hay.jpg
Bale grabber has hydraulically operated hooks

http://www.hoelscherinc.com/g/fork3.jpg
Bale wagons work well when you stack bales in sheds

There are many types of bale accumulators. Youtube has lots of videos.
This accumulator picks up bales in the field. Some are designed to not tear baleage plastic.
Round Bale Unroller

http://www.ibiblio.org/farming-connection/grazing/forgey/images/unroll.gif
Questions?

http://i.dailymail.co.uk/i/pix/2011/06/15/article-0-0C920C0E00000578-144_634x579.jpg