Innovations in Effective Harvest Management

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What Quality Reaches the Cow’s Mouth

- **When** you harvest
- **How long** it takes from start to finish
- The **quality lost in** harvest/fermentation
When You Start Harvest: Quality Window Opens

- When Alfalfa is 15 – 16 inches
- Cut Grass
- When Alfalfa is 23 – 24 inches
- Cut Alfalfa-Grass Mix
- When Alfalfa is 30 inches
- Cut Alfalfa
How Long Does it Take to Harvest?

- Alfalfa

<table>
<thead>
<tr>
<th>Harvest Interval</th>
<th>NDF</th>
<th>NDF</th>
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<tbody>
<tr>
<td>10 day</td>
<td>.50</td>
<td>.50</td>
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</table>

- May 1
- May 15
- June 1
100 Cows, Cumulative Loss Each Day Harvest is Delayed

5 day delay = $8,000
Biology of Drying Forages

Initial Phase

Intermediate Phase

Conditioning

Final Phase

Dry Hay

Time

Moisture

80%

20%
Axial moisture movement

Stomatal openings

65-70%
Stomate = Lungs of the Plant
35% of alfalfa stem moisture exits through the leaf (Harris & Tulberg, 1980)

Legumes 10X more stomata than Grass

Sunlight – they stay open -shading closes Stomata
Physics of Moisture Loss

or

What Helps or Hurts Drying

Rotz et al. 1987
Swath Sunlight

3 X more sunlight
2nd Cut Grass Swath Core Temp

Swath Air & Swath Temp

Date/Time

11:35 AM
12:35 PM
1:35 PM
2:35 PM
3:35 PM
4:35 PM
5:35 PM
6:35 PM
7:35 PM
8:35 PM
9:35 PM
10:35 PM

Narrow
Wide
Density had greater impact on drying than Conditioning, Mixing or Turning Swath. Wright et al. 1997
Swath density decreases moisture removal

5.5X More Dense
Drying Reduced

10 – 100X

Harris & Tullberg 1980

No Sun

Stomata Closed
Wide swath

Field Results?
12 ft mower opened to wide swath = 8 ft. 66% of cutterbar width
Width Matters More Than Conditioning – Alfalfa- Swath Not Moved

% Moisture Lost

- 2 hour

NHC40%  NHC59%  NHC73%  NHC83%  SB 94%

12.00%
10.00%
8.00%
6.00%
4.00%
Width Matters More than Conditioning – Grass – Swath Not Moved

% Dry Matter

1 hour

NH 40%
NH 59%
Diskmow 65%
NH 73%
NH 83%
Sidebar 94%
Moisture Removal Rate/Hour

% Moisture removed/hr

<table>
<thead>
<tr>
<th>Method</th>
<th>Rate/Hour</th>
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<tbody>
<tr>
<td>Traditional Narrow</td>
<td>0.50%</td>
</tr>
<tr>
<td>Wide Swath</td>
<td>1.00%</td>
</tr>
<tr>
<td>Wide/H&amp;S merged</td>
<td>1.50%</td>
</tr>
<tr>
<td></td>
<td>2.00%</td>
</tr>
<tr>
<td></td>
<td>2.50%</td>
</tr>
<tr>
<td></td>
<td>3.00%</td>
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</table>

14.9 hrs.  
7.4 hrs.  
4.9 hrs.
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<thead>
<tr>
<th></th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
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<tbody>
<tr>
<td>May</td>
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<td><strong>19</strong></td>
<td><strong>20</strong></td>
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<td></td>
<td>23</td>
<td>24</td>
<td></td>
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<td>28</td>
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<td></td>
<td>30</td>
<td>31</td>
<td>25</td>
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<td></td>
<td>27</td>
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<td>1</td>
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<td>4</td>
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<td></td>
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<td></td>
<td></td>
<td>2</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>30</td>
<td>31</td>
<td></td>
<td>8</td>
<td></td>
<td>10</td>
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<tr>
<td></td>
<td>6</td>
<td>7</td>
<td>9</td>
<td>11</td>
<td></td>
<td>12</td>
<td></td>
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</table>
What Quality Reaches the Cow’s Mouth

- Wide Swath Makes a Difference!!
Sunshine Produced Dry Matter

Respiration lost Dry Matter

+50 - 20

+ 30 Net Gain
Sunshine Produced Dry Matter

- Shade or Nighttime
- Respiration lost Dry Matter

Net Loss -20
Relationship between overnight DM loss and minimum night temps

Knapp et al. 1973
Milk loss From Respiration in just 24 hours

16% - 30% of Dry Matter loss by Respiration

Sugar 7.72
Starch 3.5

Sugar 6.4
17.7% loss
Starch 2.9
17.1% loss
Wide swath

Sugar 8.10
Starch 3.075

Sugar 7.68
5% loss
Starch 3.2
4% gain!
Narrow Fresh  Wide Fresh  Narrow Wilt  Wide Wilt

1st cut alfalfa  2nd cut grass  2nd cut alfalfa
Impact of Drying Time on Forage NPN

Table from Brady, 1960
### Impact on Potential Milk/Ton

<table>
<thead>
<tr>
<th></th>
<th>1st Cut Alfalfa</th>
<th>2nd Cut Grass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narrow Fresh</td>
<td>2652 a</td>
<td>3513 a</td>
</tr>
<tr>
<td>Wide Fresh</td>
<td>2731 a</td>
<td>3606 a</td>
</tr>
<tr>
<td>Narrow Ferment</td>
<td>2279 b</td>
<td>3400 b</td>
</tr>
<tr>
<td>Wide Ferment</td>
<td>2574 a</td>
<td>3705 a</td>
</tr>
<tr>
<td><strong>lbs potential Milk/ton</strong></td>
<td><strong>294.9</strong></td>
<td><strong>304.5</strong></td>
</tr>
<tr>
<td><strong>$/ton DM</strong></td>
<td>$44.24</td>
<td>$45.68</td>
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</tbody>
</table>

275 Acres x 3 T DM/A x $40/T = $33,000
• Mowers are limiting factor: 50:9ft 200: 36
• Width matters most for hay silage or dry hay
• Conditioning works for dry hay, counter productive for silage
• You can get same-day hay silage
Wide Swath Has Huge Impact on Harvest System

- Chopper and Trucks ready when you start mowing
- Chopper running closer to capacity – greater field efficiency
- May need more trucks/wagons
- Bunk set up (Packing & Leveling) for more rapid fill
- Might have to switch from progressive wedge to flat fill
- Check particle size (non uniform feed to cutters)
# Haylage

<table>
<thead>
<tr>
<th></th>
<th>Sealed Silo</th>
<th>Bunk Silo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>10 - 15 %</td>
<td>15 - 25%</td>
</tr>
<tr>
<td>Middle</td>
<td>30 - 40%</td>
<td></td>
</tr>
<tr>
<td>Bottom</td>
<td>40 – 50%</td>
<td></td>
</tr>
</tbody>
</table>

Note: Post Fermentation Screening makes particles stick together and appear on a larger screen than they actually are.
Impact on Dry Matter Intake
No Processing vs Sliced When Baled

Test 1

Test 2

Test 3
Baled vs Chopped, Impact on pH

Days after Ensiling:

- 0 days: Baled pH 5.6, Chopped pH 5.8
- 1 day: Baled pH 5.4, Chopped pH 5.6
- 3 days: Baled pH 5.2, Chopped pH 5.4
- 9 days: Baled pH 4.8, Chopped pH 5.2
- 60 days: Baled pH 4.4, Chopped pH 4.6
Corn Silage Harvest

Making the Most of What you Grow
Dry August

Start Checking Harvest Moisture at 1/4 milk line

Wet August

Start Checking Harvest Moisture at 1/2 milk line

41 Days After Tassel
The only accurate predictor of silage harvest is a DRY MATTER CHECK
## Corn Silage

<table>
<thead>
<tr>
<th></th>
<th>Sealed Silo</th>
<th>Bunk Silo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>2 - 4 %</td>
<td>10 – 15%</td>
</tr>
<tr>
<td>Middle</td>
<td>40 – 50%</td>
<td></td>
</tr>
<tr>
<td>Bottom</td>
<td>40 – 50%</td>
<td></td>
</tr>
</tbody>
</table>

Only REAL Measurement of Effective Fiber!

Note: Post Fermentation Screening makes particles stick together and appear on a larger screen than they actually are.
WHAT IS CHEAPER? A SILO FULL OF SILAGE TOO FINE/CORASE OR A $250 FORAGE SCREEN SET?
Silage processing

• Generally agreed that processing at ¾” TLC and 1-3 mm increases starch availability and milk production.

• Roller clearance depends on silage maturity:
  “Start with a nickle, end with a dime.”

• Watch custom harvesters closely! Check kernels and cobs. Cobs should be “kibble” size, 95% of kernels crushed.

• Machine capacity is reduced by 25% or so, and power requirements increase by about 10%.
Processed or Not: Are the Kernels Clipped?

- $3 plastic dish pan or a pail
- Fill with water
- Dump in silage
- Swish around
- Pour off water with floating silage
- Kernels are left at the bottom
- Check for chipping vs whole kernels.
Whole Farm Impact

http://counties.cce.cornell.edu/agriculture/rensselaer/
Composition of Crop Harvested over Length of Stand

% Alfalfa

Years of Stand

1 2 3 4 5 6
How Your Rotation Choice Affects Cost/ton DM

Yrs. of Alfalfa

1 corn
2 corn
3 corn
4 corn
5 corn

39.5 41.5 43.5
## Crop Plan Summary

<table>
<thead>
<tr>
<th>Crop</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
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<tbody>
<tr>
<td>Total Corn</td>
<td>277</td>
<td>236</td>
<td>258</td>
<td>270</td>
<td>218</td>
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<tr>
<td>Corn Grain</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Corn Silage</td>
<td>277</td>
<td>236</td>
<td>258</td>
<td>270</td>
<td>218</td>
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<tr>
<td>Total Hay Crop</td>
<td>682</td>
<td>664</td>
<td>629</td>
<td>542</td>
<td>616</td>
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<tr>
<td>Mixed Hay</td>
<td>656</td>
<td>642</td>
<td>535</td>
<td>526</td>
<td>564</td>
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<tr>
<td>Grass Hay</td>
<td>26</td>
<td>22</td>
<td>94</td>
<td>15</td>
<td>52</td>
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<td>New Seedings*</td>
<td>238</td>
<td>74</td>
<td>257</td>
<td>128</td>
<td>127</td>
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<tr>
<td>Idle/Other</td>
<td>43</td>
<td>103</td>
<td>115</td>
<td>191</td>
<td>169</td>
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<tr>
<td>Totals</td>
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<td>1002</td>
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</tbody>
</table>

* Note: Acres of New Seedings are also included in the Hay acreages.

- 1002
- 191
- 809 cropped
- 15 cont. grass
- 794 rotated

Divide by 6 = 132 A seed

X 2 = 264 A corn

X 3 = 397 rot hay
Manure can **BUILD** rather than **MINE** nutrients

While saving on the fertilizer bill

<table>
<thead>
<tr>
<th>Field ID</th>
<th>Acres</th>
<th>Crop</th>
<th>Total N Required</th>
<th>Total P2O5 Required</th>
<th>Total K2O Required</th>
<th>Primary Rate</th>
<th>N Balance (lbs/acre)</th>
<th>P2O5 Balance (lbs/acre)</th>
<th>K2O Balance (lbs/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2323-22</td>
<td>9.9</td>
<td>COS2</td>
<td>67</td>
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<td>60</td>
<td>9,000</td>
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<td>98</td>
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<tr>
<td>T2323-25</td>
<td>8.9</td>
<td>COS2</td>
<td>67</td>
<td>45</td>
<td>60</td>
<td>9,000</td>
<td>22</td>
<td>30</td>
<td>98</td>
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<tr>
<td>T2323-26</td>
<td>5</td>
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<td>-60</td>
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