Preserving Quality Feed & Feed Quality

Patrick French

Profitability of Mid-Atlantic Dairies

Which Feeds Should We Consider?

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>lbs DM</th>
<th>% of DM</th>
<th>$/f</th>
<th>Days Stored</th>
<th>Inv $ (1,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn Silage</td>
<td>21.0</td>
<td>36.5</td>
<td>1.47</td>
<td>400</td>
<td>425</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>10.2</td>
<td>17.8</td>
<td>1.02</td>
<td>365</td>
<td>279</td>
</tr>
<tr>
<td>Corn Grain</td>
<td>7.3</td>
<td>12.7</td>
<td>1.24</td>
<td>10</td>
<td>9.3</td>
</tr>
<tr>
<td>Wheat Grain</td>
<td>3.5</td>
<td>6.1</td>
<td>0.56</td>
<td>20</td>
<td>8.4</td>
</tr>
<tr>
<td>Soybean Hulls</td>
<td>5.4</td>
<td>9.9</td>
<td>0.26</td>
<td>20</td>
<td>3.8</td>
</tr>
<tr>
<td>Expeller SBM</td>
<td>2.6</td>
<td>4.4</td>
<td>0.48</td>
<td>8</td>
<td>2.9</td>
</tr>
<tr>
<td>SBM</td>
<td>2.8</td>
<td>3.8</td>
<td>0.49</td>
<td>8</td>
<td>2.9</td>
</tr>
<tr>
<td>Brewers</td>
<td>2.0</td>
<td>3.5</td>
<td>0.19</td>
<td>9</td>
<td>1.3</td>
</tr>
<tr>
<td>Condensed Solubles</td>
<td>2.0</td>
<td>3.5</td>
<td>0.16</td>
<td>14</td>
<td>1.7</td>
</tr>
<tr>
<td>Mineral Mix</td>
<td>1.3</td>
<td>2.3</td>
<td>0.65</td>
<td>8</td>
<td>3.9</td>
</tr>
<tr>
<td>Fat</td>
<td>0.8</td>
<td>1.4</td>
<td>0.60</td>
<td>14</td>
<td>6.1</td>
</tr>
<tr>
<td>Animal Protein</td>
<td>0.3</td>
<td>0.5</td>
<td>0.13</td>
<td>90</td>
<td>8.6</td>
</tr>
<tr>
<td>Total</td>
<td>56.6</td>
<td>7.19</td>
<td>754</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Corn Yield (Silage) and Cost

- $35-45/T Standing
- $45-60/T Covered
- $55-75/T Fed
- $70-85/T Value

Value of Corn Silage – The Hokie Way

• Grain
  – 6.0-8.5 T/A @ 35% Grain = 85-120 bu/A
  – $672-948/A or $40/T @ 35% DM
• Forage
  – 35% Mature Grass Hay, 35% Alfalfa Hay, 30% Soyhulls
  – $200/DM T or $70/T @ 35% DM
• Market Replacement of Corn Silage = $110/T

Value of Corn Silage – The Hoo Way

• Carbohydrates - $79/AF T
  – pt Starch = $3.29, pt Sol fiber = $8.88,
    pt Sugar = $1.12, and pt Digestible NDF = $1.43
• Energy - $86/AF T
  – Mcal ME = $0.10, Mcal NE = $0.15, pt TDN = $3.24
• Fiber - $82/AF T
  – pt Effective NDF = $2.45, pt Digestible NDF = $4.97
Where are the Opportunities?

<table>
<thead>
<tr>
<th>Loss</th>
<th>Good Mgt</th>
<th>Not So Good Mgt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeding</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Feed Out</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Storage</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Filling</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Harvest</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>32</td>
</tr>
<tr>
<td>COP</td>
<td>+$10/T</td>
<td>+$15/T</td>
</tr>
</tbody>
</table>

Holten, 2008

How Much Silage is Lost During Storage?

Density = 14.7 lbs DM/ft³ (15)
742 lbs packing/hr (800)
Delivery Rate = 180 T/hr

Invisible Losses in Well Packed Bunker Silos Approaches 8%

<table>
<thead>
<tr>
<th>Bottom</th>
<th>Density, lbs DM/ft³</th>
<th>DM, %</th>
<th>DM Loss, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14.7</td>
<td>31.4a</td>
<td>6.5a</td>
</tr>
<tr>
<td>Mid-Left</td>
<td>16.7</td>
<td>31.7a</td>
<td>5.0a</td>
</tr>
<tr>
<td>Mid-Right</td>
<td>14.0</td>
<td>30.6a</td>
<td>8.4a</td>
</tr>
<tr>
<td>Dome</td>
<td>10.9</td>
<td>29.4a</td>
<td>10.9a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Left</th>
<th>Density, lbs DM/ft³</th>
<th>DM, %</th>
<th>DM Loss, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13.7</td>
<td>30.3a</td>
<td>8.3</td>
</tr>
<tr>
<td>Mid-Left</td>
<td>16.2</td>
<td>31.8a</td>
<td>7.6</td>
</tr>
<tr>
<td>Mid-Right</td>
<td>15.8</td>
<td>31.9a</td>
<td>7.6</td>
</tr>
<tr>
<td>Right</td>
<td>13.2</td>
<td>31.0a</td>
<td>7.2</td>
</tr>
</tbody>
</table>

Griswold et al. (2011)
Dry Matter Loss as Influenced by Silage Density

<table>
<thead>
<tr>
<th>Density (lbs DM/ft³)</th>
<th>DM Loss, % (Alfalfa Silage)</th>
<th>DM Loss, % (Corn Silage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>20</td>
<td>9.8 (10.9)</td>
</tr>
<tr>
<td>14</td>
<td>17</td>
<td>8.1 (8.4)</td>
</tr>
<tr>
<td>15</td>
<td>16</td>
<td>7.7 (7.7)</td>
</tr>
<tr>
<td>16</td>
<td>15</td>
<td>7.3</td>
</tr>
<tr>
<td>18</td>
<td>13</td>
<td>6.5</td>
</tr>
<tr>
<td>22</td>
<td>10</td>
<td>4.8</td>
</tr>
</tbody>
</table>

Sidewall Plastic Improves Silage Quality

Maintained DM% 4% higher NDFD
Higher acetic acid

Drive Over? Pile

18°

32°
Most Piles are Not Drive-Over

- 22 piles
- 2 drive-over piles
- 1 bunker

The San Joaquin Valley Air Pollution Control District’s Rule 4570

Silage Mitigation Measures
- Cover within 72 hours of last delivery with 5 mil+
- Density benchmarks be reached (44 AF lb/ft³)
- Harvest at the correct moisture (≤35% DM) and TCL (≤3/4“)
- Manage exposed face
- Use inoculant or acid
  Or forget the above and use a sealed system (Ag-Bag)

How Do You Get “Good” Density?

\[
\text{Density (lbs DM/ft}^3\text{)} = (8.5 + PF \times 0.0155) \times (0.818 + 0.0136 \times D)
\]

\[
P_F = \left( \frac{\text{Avg Tractor Wt}}{\text{Layer Thickness}} \right) \times \sqrt{\frac{\text{No. Tractors} \times \text{DM}%}{\text{Delivery Rate (T/hr)}}}
\]

- Total Tractor Weight
- Tractor Time
- Packing Layer Thickness
- Delivery Rate
- Height of Pile
- Dry Matter
- Length of Cut
Density and Loss from Bags

Avg Density = 14.8 DM/ft$^3$

Densities (DM/ft$^3$)

- 6.0
- 4.1
- 10.0
- 12.0
- 10.3
- 10.5
- 12.5

Losses
- 8.7% Invisible/Uncollected
- 2.9% Spoilage

Muck and Holmes (2006)

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Holmes, 2008

Other Considerations for Preserving Feed

- Delivery Weight Errors
- Wind
- Birds
- Tires and Tracking
- Mixing Errors & Scale Accuracy
- Feed Refusals & Feed Bunk Management
Dry Matter Variability

Silage DM Changes Over Time

USDFAFRC - A one-day change in DM resulted in a 2.2-lb/cow loss in DMI and a 1.8-lb milk production loss the next two days.

Energy Corrected Milk (lbs) by Month (Jan ’11-’12)

Typical rules that are used to indicate out of statistical control situations with control and warning limits are:
1. Seven points beyond the warning limits (WL).
2. Two points not lying beyond the lower limit (LWL, such as Dec ’11 and Jan ’12).
3. Seven consecutive points lying on one side of the mean, start dating back to Aug.
4. Four consecutive points going in the same direction (indicate a trend), start dating back to Jan.
On-farm Methods for Determining Dry Matter

<table>
<thead>
<tr>
<th></th>
<th>Koster</th>
<th>Microwave</th>
<th>Dehydrator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of equipment</td>
<td>$255</td>
<td>$50</td>
<td>$50-100</td>
</tr>
<tr>
<td>Scale</td>
<td>$50</td>
<td>$50</td>
<td>$50</td>
</tr>
<tr>
<td>Minutes/test</td>
<td>25 to 30</td>
<td>15 to 20</td>
<td>240</td>
</tr>
<tr>
<td>Multiple samples</td>
<td>no</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Attendance</td>
<td>+</td>
<td>+++</td>
<td>none</td>
</tr>
</tbody>
</table>

Formulated Ration(s) lbs/cow/day

Adjust for DM Changes

Adjust for Nutrient Changes

Total lbs of Each Feed Needed

Remove and Measure Refusals

Adjust Amount Fed

Remove Spoiled Feed

Properly Deface Silos

Begin Loading Feed

Mix Appropriate Time

Deliver Correct Amount to Each Group

Document Operator

Check Load Order

Calibrate Scales

Corn Silage - Nutrient Changes Over Time

Total Ration Starch Increases 3 Pts

Crude Protein

NDF

Starch

% of DM

MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB
Forage Sampling Frequency by Herd Size

<table>
<thead>
<tr>
<th>Number of Milking Cows</th>
<th>50</th>
<th>100</th>
<th>200</th>
<th>400</th>
<th>800</th>
<th>1600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interval between sampling, days</td>
<td>30</td>
<td>14</td>
<td>14</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>No. of sampling days per month</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>No. of samples per sampling day per forage</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>No. of samples per month per forage</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

http://www.uwex.edu/ces/crops/uwforage/ForageSamplingFrequency-FOF.pdf

Formulated Ration(s)

lbs/cow/day

Adjust for DM Changes

Adjust for Nutrient Changes

Remove Spilled Feed

Properly Deface Silos

Total lbs of Each Feed Needed

Remove and Measure Refusals

Adjust Amount Fed

Document Operator

Check Load Order

Calibrate Scales

Begin Loading Feed

Mix Appropriate Time

Deliver Correct Amount to Each Group

Remove Spoiled Feed

Properly Deface Silos

Begin Loading Feed

Mix Appropriate Time

Deliver Correct Amount to Each Group
Feedbunk Management

• Feed animals exactly what they need to achieve zero leftovers
• The idea of feeding lactating cows for a zero feed-refusal rate is usually met with resistance
  – Don’t read bunks often enough
  – Overstock feeding space
• If feed-refusal rate 2-3%, you may be ready to take the next step

Slick-bunk Management

Feedbunk Scoring System

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No feed remaining in the bunk</td>
</tr>
<tr>
<td>1</td>
<td>Most of the feedbunk floor devoid of feed</td>
</tr>
<tr>
<td>2</td>
<td>Less than 1” of feed across bottom of the bunk</td>
</tr>
<tr>
<td>3</td>
<td>2-3” of feed across the bottom of the bunk</td>
</tr>
<tr>
<td>4</td>
<td>More than 50% of the feed remaining from last delivery</td>
</tr>
<tr>
<td>5</td>
<td>Feed virtually undisturbed and &gt;90% remaining</td>
</tr>
</tbody>
</table>
Transition Cow Index®

- System of evaluating transition cow management programs
  1. Bunkspace in prefresh pen and fresh pen
  2. Stall base (sand vs mattress)
  3. Stall size, area
  4. Move to calving pen (≤2 days vs 3+ days)
  5. Screening method (4 categories)
Formulated Ration(s)
Btu/cow/day

Adjust for DM Changes
Adjust for Nutrient Changes

Number of Cows to Feed

Remove and Measure Refusals
Adjust Amount Fed

Total Btu of Each Feed Needed

Document Operator
Check Load Order
Calibrate Scales

Begin Loading Feed
Mix Appropriate Time
Deliver Correct Amount to Each Group

Remove Spoiled Feed
Properly Deface Silos

How Much and What Was Loaded, Mixed, and Delivered?

Automated

Manual
Feed Management Software

- TMR Tracker (Digi-Star, Fort Atkinson, WI)
- EZfeed (DHI-Provo, Provo, UT)
- Feed Supervisor (WI)
- FeedWatch (Valley Ag Software, Tulare, CA)

Feed Management Software

Nutritionist’s Ration
Enter into Computer
Transfer to Mixer

Read Bunks
Deliver Ration
Scale Head Calls Ing/Amt

TMR Tracker Load Report

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Grid</th>
<th>Time</th>
<th>Call Wt</th>
<th>Loaded Wt</th>
<th>Deviation</th>
<th>%</th>
<th>Planned</th>
<th>Actual</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>BHT97</td>
<td>09:40</td>
<td>851</td>
<td>779</td>
<td>850</td>
<td>776</td>
<td>-1</td>
<td>0.1%</td>
<td>$202.54</td>
<td>$202.30</td>
</tr>
<tr>
<td>H3X5</td>
<td>09:42</td>
<td>3766</td>
<td>2387</td>
<td>3750</td>
<td>2381</td>
<td>-9</td>
<td>0.2%</td>
<td>$207.42</td>
<td>$206.74</td>
</tr>
<tr>
<td>HL022</td>
<td>09:44</td>
<td>1963</td>
<td>824</td>
<td>1950</td>
<td>818</td>
<td>-13</td>
<td>0.7%</td>
<td>$53.98</td>
<td>$53.63</td>
</tr>
<tr>
<td>CSL7</td>
<td>09:46</td>
<td>2703</td>
<td>973</td>
<td>2705</td>
<td>974</td>
<td>2</td>
<td>0.1%</td>
<td>$54.06</td>
<td>$54.10</td>
</tr>
<tr>
<td>CSL8</td>
<td>09:47</td>
<td>2760</td>
<td>973</td>
<td>2759</td>
<td>974</td>
<td>5</td>
<td>0.2%</td>
<td>$55.90</td>
<td>$55.70</td>
</tr>
</tbody>
</table>

Total 12056 5906 12040 5987 15 0.3% $653.60 $652.46 $1.14

Delivery: 12056 11540 216 1.8% $653.57 $641.62 $11.95
Formulated Ration(s) lbs/cow/day
Adjust for DM Changes
Adjust for Nutrient Changes
Remove Spoiled Feed
Properly Deface Silos
Remove and Measure Refusals
Adjust Amount Fed
Document Operator
Check Load Order
Calibrate Scales
Begin Loading Feed
Mix Appropriate Time
Deliver Correct Amount to Each Group

How often do you calibrate the mixer wagon scale?

![Graph showing frequency of checking mixer scale]

 Seventy-nine percent of producers checked the mixer scale at least once a year. But, only 19% checked it at least monthly. The mixer wagon was calibrated by an outside service (60%) or an in-house employee (40%).
Formulated Ration(s) lbs/cow/day
Adjust for DM Changes
Adjust for Nutrient Changes
Total lbs of Each Feed Needed
Remove Spoiled Feed
Properly Deface Silos
Begin Loading Feed
Mix Appropriate Time
Deliver Correct Amount to Each Group
Number of Cows to Feed
Remove and Measure Refusals
Adjust Amount Fed
Document Operator
Check Load Order
Calibrate Scales

Properly Managed Face
Formulated Ration(s) lbs/cow/day

Adjust for DM Changes
Adjust for Nutrient Changes

Number of Cows to Feed

Remove and Measure Refusals
Adjust Amount Fed

Total lbs of Each Feed Needed

Document Operator
Check Load Order
Calibrate Scales

Remove Spoiled Feed
Properly Deface Silos

Begin Loading Feed
Mix Appropriate Time
Deliver Correct Amount to Each Group

Thank You