Alfalfa for Dairy Cows

- Evaluating
- $Valuation
- Harvest/Storage
- Feeding

Cows do NOT require alfalfa!

Cows require nutrients
- Energy
- Protein
- Fiber
- Minerals
- Vitamins

Feeds are simply nutrient delivery devices*

* True for many feeds but forages are different
High Quality Alfalfa

1. Provides **needed** nutrients cheaper than alternatives

2. Allows for high intakes

Forage Quality = Concentration of Available Nutrients $\times$ DMI potential

Economic Value of Feeds

The value of a feed should approximate the sum of the value of its nutrients

$/\text{ton} = \text{Mcal NEL} \times \$/\text{Mcal} + \text{lbs MP} \times \$/\text{lb MP} + \text{lbs eNDF} \times \$/\text{lb eNDF} + \ldots$
Economic Evaluation of Feeds

Cost of a feed = $\sum$ value of its nutrients

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Central Ohio</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEL, $/Mcal</td>
<td>0.10 0.18</td>
</tr>
<tr>
<td>MP, $/lb</td>
<td>0.28 0.30</td>
</tr>
<tr>
<td>eNDF, $/lb</td>
<td>0.04 0.01</td>
</tr>
<tr>
<td>neNDF, $/lb</td>
<td>-0.09 -0.14</td>
</tr>
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See: [http://dairy.osu.edu](http://dairy.osu.edu) (Buckeye dairy news)

All Protein is not created equal

CP: SBM ≠ DDG ≠ Alfalfa ≠ Canola

CP → MP Efficiency

- Alfalfa: 0.55
- Distillers: 0.65
- SBM: 0.70

Do Not Use CP to compare value across feeds
Lab Report

1 Ton Alfalfa Hay

85% DM
42% NDF
0.58 Mcal/lb NEL
20% CP

MP assumed = 0.55CP

1700 lbs
714 lbs
986 Mcal
340 lbs

Economic Value
NDF = $0.01/lb
NEL = $0.18/Mcal
MP = $0.30/lb

From SESAME
Based on current costs (OH)
This alfalfa is **worth** $245/ton

**Major Problem:**
Approach ignores effect of “forage quality” on milk yield

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**NDF from Forage affects DMI**

Increasing NDF via forage usually reduces DMI

Allen, 2000
Increasing alfalfa NDF reduces milk and NEL

FCM = 75 - 0.34*NDF

TMR digest (50% alf+50% conc)

Alfalfa NDF, %

Weiss, 2007

Weiss, 2007

Alhadhrani and Huber, 1992

Alfalfa Quality Adjustment

Captures value of lost or increased milk yield

Base: 44% NDF = 0 Adjustment

$/ton DM/% NDF

35-44% >44%

$17/cwt +$4.75 -$4.75

$22/cwt +$7.00 -$7.00

This adjustment is after you have calculated nutrient value
Quality…. or quantity?

Dianne Shoemaker, OSU Extension
(Proc. Tristate Dairy Nutr Conf. 2012, pg 87-96)

3-cut average vs 4-cut better stuff

Assumptions
- 3-cut @ 10% bloom yields 15-20% more than 4 cut at bud stage (Undersander)
- 4-cut yield = 5.8 T DM (2011 Wooster OH)
- 3-cut yield = 6.7 (115%) or 7 T (120%)
- Costs from 2012 OSU Haylage budget
4-Cut: 60:40 with 40% or 44% NDF vs. 3-cut @44% NDF

115% avg $50/yr; 120% avg $95/yr greater returns than the 4-cut system

4-Cut: 75:25 with 40 or 44% NDF vs. 3-cut with 44% NDF

In last 5 years: 115% avg. $51/year

120% avg $80/yr greater returns
4-Cut all at 40% NDF vs. 3-cut with 44% NDF

120% 3-cut avg $52 higher than 4-cut in last 5 years

4-Cut 60/40 with 40 or 36% NDF vs. 3-cut with 44% NDF

4 cut always has the advantage, averaging $91/acre over 115% and $45/acre over 120%
Quality vs Quantity

- 3 cuts of +15-20% yield of fair quality more profitable than 4 cuts with some higher quality
- If some premium (36% NDF) alfalfa is harvested then 4-cut more profitable
- Did not factor in longer stand life of 3-cut systems

Important Quality/Economic Measures (in order)

1. DM (storage, $)
2. NDF (NEL, DMI)
3. CP ($)
4. IVNDFD (DMI, NEL)
5. Ash (NEL)
Under **ideal** conditions, ~15% of the forage harvested as hay or silage is lost (shrink)

**Production Cost = $180/ton of DM**

<table>
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<th>Shrink</th>
<th>Cost of forage fed</th>
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<tr>
<td>15%</td>
<td>$207/ton of DM</td>
</tr>
<tr>
<td>20%</td>
<td>$216/ton of DM</td>
</tr>
<tr>
<td>25%</td>
<td>$225/ton of DM</td>
</tr>
<tr>
<td>30%</td>
<td>$234/ton of DM</td>
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Coblentz and Bertram, 2012
Hay Silage DM, 3 farms

Hay Silage NDF, 4 farms
Hay Silage CP, 3 farms

Within Farm Ranges (14 days)

DM: Hay sil. more variable than corn sil.
NDF: Hay silage = corn silage
Within farm ranges in forage DM%
Feeds were sampled over a 12 month period and were fed at least 5 months on a farm.

- **Min**
- **Mean**
- **Max**

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How many samples were required to get the ‘right answer’?

Right answer = <5% from mean

Corn Silage vs. Alfalfa: Is there an optimum mix?

1. Risk (weather, cropping, feed costs, milk yield/cow health)

2. Farm specific: what can you grow and what does it cost?

3. Long term protein vs energy costs
More alfalfa increases milk yields
With Very good alfalfa (38 NDF, 23CP)

Alfalfa silage: Corn Silage Ratios
With Very good alfalfa (38 NDF, 23CP)

Brito and Broderick (2006)
More Corn Silage Increases Milk Yields
(Alf = 43% NDF)

Kowser et al., 2008

Increasing Alfalfa:Corn Silage Ratio

Generally:

1. DMI
2. Milk and protein yield
3. Milk fat% and yield
4. Milk protein%
5. Manure output
6. 'Purchased' feed costs
7. Total feed costs or

Diagram:

- DMI and ECM
- Fat and Protein
- Various ratios: 40:0, 24:16, 20:20, 16:24
**Formulation: Alf vs CS Diets**

<table>
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<tr>
<th>Milk Fat</th>
<th>High Alf</th>
<th>High CS</th>
</tr>
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<tbody>
<tr>
<td>+ Tallow (Sil)</td>
<td>⇐</td>
<td>⇒</td>
</tr>
<tr>
<td>+ Starch (Sil)</td>
<td>⬇</td>
<td>⬇</td>
</tr>
<tr>
<td>+ Monensin (Hay)</td>
<td>⬇</td>
<td>⇐</td>
</tr>
<tr>
<td>+ DDG (Hay)</td>
<td>⬇</td>
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**Higher alfalfa allows higher starch**

Weiss et al., 2009
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<td>+ Essential oils (Sil)</td>
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<tr>
<td>+ DDG (Hay/sil)</td>
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</tr>
<tr>
<td>+ Molasses (Hay)</td>
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<td></td>
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<tr>
<td>+ Ca salts of fat</td>
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DMI \downarrow
Summary

1. DM and NDF good indices of quality
   - Proper DM = ↓shrink (big bucks)
   - Proper NDF = good DMI with good yields

2. Blend of alf and corn silage most profitable over time

3. Most situations: majority corn silage is more profitable

4. Balance for nutrients (with a few adjustments)
Mowing at sundown was better than at sunup for alfalfa stored as balage (52% DM, no rain)

Britto et al., 2008

Remember wilt time
a.m. mow: 30 hr
p.m. mow: 48 hr

+3.5 lbs