The Financial Impact of High Forage Rations and Modern Crop Rotations

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Karszes, 2009
Purchased Grain Per Cow per Day vs ROA
85 New York State DFBS, Raising No Grain, Not Grazing, 2008

$\text{ROA} = -0.6661x^2 + 81.391x + 2720$
$R^2 = 0.536$

Net Milk Income Over Purchased Concentrate per Cow by Return on Assets
190 New York Dairy Farms, 2011

Karszes, 2009
Income over feed cost (IOFC) comparison study

PRO-DAIRY Business Focused Discussion Group

Approach

- Information collected for August 2014
  - Group production and DMI information (# cows, milk, components, DIM, % heifers, stocking density) for all lactating groups in herd
  - Rations, forage analyses, costs of purchased ingredients
  - Forages and homegrown feeds given standardized costs
    - $1.25/pt DM haylage; $1.1/pt DM corn silage (+10% for BMR); $150/ton HMSC; $120/ton HMEC, $175/ton grass hay; $185/ton straw
Approach

- All information used to calculate an aggregated single value for each farm for each metrics
  - Performance and efficiency/cost metrics
  - Outcomes based upon IOFC per cow per day

- September 2012 similar analysis conducted for another discussion group
  - IOFC per cow per day
    - Average -- $7.78
    - Range -- $6.68 to $9.66

- August 2014
  - IOFC per cow per day
    - Average -- $12.00
    - Range -- $10.52 to $13.72
Forage NDF intake, % of BW

### 4 herds with IOFC > $12.99 per cow per day

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>High ECM</td>
<td>95.5</td>
<td>95.5</td>
<td>99.5</td>
<td>91.6</td>
<td>95.48</td>
</tr>
<tr>
<td>High Fat and Protein per cow per day</td>
<td>6.29</td>
<td>6.37</td>
<td>6.68</td>
<td>6.06</td>
<td>6.35</td>
</tr>
<tr>
<td>Higher Feed Efficiency (ECM/DMI)</td>
<td>1.75</td>
<td>1.69</td>
<td>1.75</td>
<td>1.68</td>
<td>1.72</td>
</tr>
<tr>
<td>Higher cost cow per day</td>
<td>7.81</td>
<td>7.24</td>
<td>8.2</td>
<td>7.16</td>
<td>7.60</td>
</tr>
<tr>
<td>Lower stocking density, % of stalls</td>
<td>101</td>
<td>108</td>
<td>79</td>
<td>105</td>
<td>98</td>
</tr>
<tr>
<td>Higher Forage NDF intake, % of BW</td>
<td>0.91</td>
<td>0.96</td>
<td>1.04</td>
<td>0.95</td>
<td>0.97</td>
</tr>
<tr>
<td>Similar milk fat %</td>
<td>3.59</td>
<td>3.96</td>
<td>3.94</td>
<td>3.7</td>
<td>3.80</td>
</tr>
<tr>
<td>Similar milk protein %</td>
<td>2.91</td>
<td>3.05</td>
<td>3.09</td>
<td>2.99</td>
<td>3.01</td>
</tr>
<tr>
<td>Slightly higher cost per lb DM</td>
<td>0.143</td>
<td>0.128</td>
<td>0.144</td>
<td>0.131</td>
<td>0.137</td>
</tr>
</tbody>
</table>

### 3 herds with IOFC < $11.00 per cow per day

<table>
<thead>
<tr>
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<th>3</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower ECM</td>
<td>77.8</td>
<td>80.5</td>
<td>76</td>
<td>78.10</td>
</tr>
<tr>
<td>Lower Fat and Protein per cow per day</td>
<td>5.18</td>
<td>5.43</td>
<td>5.09</td>
<td>5.23</td>
</tr>
<tr>
<td>Lower Feed Efficiency (ECM/DMI)</td>
<td>1.57</td>
<td>1.6</td>
<td>1.6</td>
<td>1.59</td>
</tr>
<tr>
<td>Lower cost cow per day</td>
<td>6.49</td>
<td>6.8</td>
<td>6.2</td>
<td>6.50</td>
</tr>
<tr>
<td>Higher stocking density, % of stalls</td>
<td>132</td>
<td>115</td>
<td>94</td>
<td>114</td>
</tr>
<tr>
<td>Lower Forage NDF intake, % of BW</td>
<td>0.87</td>
<td>0.81</td>
<td>0.6</td>
<td>0.76</td>
</tr>
<tr>
<td>Similar milk fat %</td>
<td>4.08</td>
<td>3.84</td>
<td>3.76</td>
<td>3.89</td>
</tr>
<tr>
<td>Similar milk protein %</td>
<td>2.94</td>
<td>3.14</td>
<td>3.11</td>
<td>3.06</td>
</tr>
<tr>
<td>Slightly lower cost per lb DM</td>
<td>0.131</td>
<td>0.135</td>
<td>0.13</td>
<td>0.132</td>
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</table>
Home grown forages

Offers favorable **Income over Feed Cost** with financial and production resilience. Achieved through:

- Crops and cropping systems that fit resources & management
- Forage (types & quality) that match herd needs
- Tight management of:
  - Production cost
  - Harvest schedules
  - Feed shrink
- Ability to routinely achieve targets
  - Optimization of Yield & Quality
  - Crop Stage at Harvest

Production Cost

Crop production carries a large number of fixed cost so it is vital to optimize returns on these inputs.

- Field preparation
- Seed*
- Plant Nutrients*
- Planting
- Harvest*
- Storage*

*These cost are significantly fixed though there will be some variability with yield
Production Cost

Yield per acre and crop stage at harvest significantly influence cost per ton of forage dry matter.

Table 6. Impact of yield and dry matter (DM) percentage on cost per ton of dry matter for corn silage produced at a cost of $568 per acre.

<table>
<thead>
<tr>
<th>Silage Moisture (％ DM silage)</th>
<th>Yield=10 tons/acre</th>
<th>Yield=15 tons/acre</th>
<th>Yield=20 tons/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>217</td>
<td>145</td>
<td>109</td>
</tr>
<tr>
<td>33</td>
<td>184</td>
<td>123</td>
<td>92</td>
</tr>
<tr>
<td>35</td>
<td>174</td>
<td>116</td>
<td>87</td>
</tr>
<tr>
<td>38</td>
<td>160</td>
<td>107</td>
<td>80</td>
</tr>
</tbody>
</table>

Source: Calculated by the authors from the NCSU corn silage enterprise budget.

https://content.ces.ncsu.edu/forage-economics

Focus on what has impact

Major Factors Affecting Forage Quality

1. Maturity (harvest date)
2. Crop Species
3. Harvest and storage
4. Environment (climate)
5. Soil fertility
6. Variety (cultivar)

- Dr. Marvin Hall, Penn State Forage Specialist
Focus on what has impact

Fiber Digestibility and Harvest Timing

About 50% of the NDFD decline in spring is due to morphology (heading) and about 50% is due to plant age or calendar date.

Early heading cultivars/species can be 10% units higher in NDFD at heading compared to late heading cultivars/species at heading.

Average alfalfa + Timothy: $80-100/acre
Low Lignin Alfalfa + Meadow Fescue: $170-190/acre

Seed Cost

A high quality alfalfa and premium grass could have seed cost $80-100 per acre greater than an average alfalfa and grass but this should not deter a grower from choosing the high quality option as the value more than makes up for the added cost.

- Jerry Cherney, 2017 Oneida Co Crop Congress
**Focus on what has impact**

**Good Silage Management**

<table>
<thead>
<tr>
<th></th>
<th>Losses w/ Good Management</th>
<th>Losses w/ Poor Management</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hay</td>
<td>Com</td>
</tr>
<tr>
<td>Value Lost</td>
<td>$11,204</td>
<td>$8,572</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$19,776</td>
</tr>
</tbody>
</table>

- 100 cow herd with replacements
- Hay Silage Value = $125/TDM  Com Silage Value = $100/TDM

Source: U. of Wisconsin Team Forage

**Focus on what has impact**

**Law of Diminishing Return**
- Fertilizer
- Seeding rates
- Years of production
Focus on what has impact

Fertility Management

- 4 R’s
  - Right Place
  - Right Time
  - Right Source
  - Right Rate

- Example
  - 1st year corn after sod
    - N in the starter band = Yes
    - Additional N beyond Starter: No

<table>
<thead>
<tr>
<th>N Sidedress Rate</th>
<th>Silage Yield (35% DM)</th>
<th>Milk per ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>lbs N/acre</td>
<td>tons/acre</td>
<td>Ib/ton</td>
</tr>
<tr>
<td>0</td>
<td>21.7</td>
<td>3195 a</td>
</tr>
<tr>
<td>50</td>
<td>22.2</td>
<td>3224 a</td>
</tr>
<tr>
<td>100</td>
<td>22.4</td>
<td>3214 a</td>
</tr>
<tr>
<td>150</td>
<td>22.4</td>
<td>3211 a</td>
</tr>
</tbody>
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<tbody>
<tr>
<td>lbs N/acre</td>
<td>tons/acre</td>
<td>Ib/ton</td>
</tr>
<tr>
<td>No Starter</td>
<td>19.6</td>
<td>3100 a</td>
</tr>
<tr>
<td>0</td>
<td>21.1</td>
<td>3165 a</td>
</tr>
<tr>
<td>50</td>
<td>21.5</td>
<td>3207 a</td>
</tr>
<tr>
<td>100</td>
<td>22.6</td>
<td>3104 a</td>
</tr>
<tr>
<td>150</td>
<td>22.1</td>
<td>3168 a</td>
</tr>
</tbody>
</table>

A Resilient System

Dairies have a great opportunity in their cropping system to build a high level of resiliency.

- Financial & Production Resiliency:
  - Control production cost
  - Buffer input cost volatility
  - Buffer weather extremes
  - Buffer environmental impact

- Achieved through:
  - Nutrient Management
  - Soil Health
  - Crop Diversity
  - Careful assessment of land productivity
Long Term Rotation Study in CNY

- **Treatments**
  - Fertilizer only
  - Manure Solids
    - Low Rate
    - High Rate
  - Manure Liquid
    - Low Rate
    - High Rate

- All treatments applied during corn years, no manure during alfalfa years

**Experimental Site**

- **Silage corn** 2003-2005
- **Alfalfa** 2006-2010
- **Grain corn** 2011-2015

**Alfalfa DM Yield (Avg. 2006-2010)**

Clear benefit of compost and high rate of manure on alfalfa yield.

- **Fertility treatments**
  - N0
  - N100
  - HC
  - LC
  - HM
  - LM

Alfalfa DM yield (tons/acre)

- a
- b

Slide Credit: Cyzmk, Sadeghpour, Ketterings, Nutrient Management Spear Program
Corn Grain Yield (2015)

Clear benefit of a resilient soil under severe weather conditions.

Corn grain yield (bu/acre)

Fertility treatments

N0, N100, HC, LC, HM, LM

Thank You!

Cornell University PRO-DAIRY

http://prodairy.cals.cornell.edu/