Feeding High-Producing Holstein Cows

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Change in Dairy Farm Numbers in the United States

http://agebb.missouri.edu/commag/dairy/audit/figure10.htm
What has changed by selecting for higher milk yield?

- Cows produce milk instead of getting fat.
- Cows eat more.
- Cows mobilize more body tissue.
- Competition for resources between milk production and other body functions has increased.
Introduction

• Many factors combine to permit high milk yield.
• Nutrients for milk are supplied to the udder by the blood.
• Feeding an adequate amount of a balanced ration is important.
• Milk is widely used as a measure of efficiency of dairy cows.
Objective is to Feed:

1. A palatable combination for adequate intake of dry matter
2. Enough of each nutrient
3. Feed that will be digested and absorbed
4. And, achieve genetic capability of the cow.
Cows Need:

1. Energy
2. Protein
3. Fiber
4. Minerals
5. Vitamins
Results of Survey of Producers Of High-Producing Holsteins
(n = 114 USA Farms)
% Use of Forages

<table>
<thead>
<tr>
<th></th>
<th>Lactating</th>
<th>Dry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forage fed</td>
<td>Lactating</td>
<td>Dry</td>
</tr>
<tr>
<td>Corn silage</td>
<td>90.4</td>
<td>79.8</td>
</tr>
<tr>
<td>Legume (Alfalfa)</td>
<td>78.1</td>
<td>32.5</td>
</tr>
<tr>
<td>haylage</td>
<td>59.7</td>
<td>25.4</td>
</tr>
<tr>
<td>Legume hay</td>
<td>59.7</td>
<td>25.4</td>
</tr>
</tbody>
</table>
## % Use of Forages

<table>
<thead>
<tr>
<th>Forage fed</th>
<th>Lactating</th>
<th>Dry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grass haylage</td>
<td>18.4</td>
<td>21.0</td>
</tr>
<tr>
<td>Grass hay</td>
<td>15.8</td>
<td>57.9</td>
</tr>
<tr>
<td>Small grain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>silage</td>
<td>7.9</td>
<td>11.4</td>
</tr>
<tr>
<td>Sorghum silage</td>
<td>2.6</td>
<td>3.5</td>
</tr>
</tbody>
</table>
Alternative Products Used

- Whole Cottonseed 71.2 %
- Roasted Soybeans 47.8 %
- Bypass fat (Megalac) 45.6 %
- Dry Distillers Grains 36.4 %
- Blood Meal 34.2 %
- Molasses 33.3 %
- Tallow 23.7 %
### Alternative Products, cont.

- Beet Pulp: 23.4%
- Other Fat Source: 21.9%
- Corn Gluten Meal: 18.9%
- Soybean Hulls: 16.2%
- Fish Meal: 13.5%
- Bakery Products: 8.1%
- Wet Brewers Grains: 8.1%
- Hominy Feed: 5.4%
## Percentage Using Supplements

- Sodium bicarbonate 79.0 %
- Selenium 64.9 %
- Yeast 58.8 %
- Magnesium oxide 56.1 %
- Zinc methionine 42.1 % *(Zinpro)*
- Niacin 41.2 %
- 4-Plex® *(Zinpro)* 30.7 %
Milk Cows on Pasture
Pasture Is Used Successfully

• In New Zealand and Ireland producers use pasture with limited grain feeding…but production is lower than in confinement.

• The cow uses about 13% more energy to graze…but exercise improves her health and extends her lifetime production.
Southeastern Grazing Dairy Industry Faces Different Challenges

- Long term physiological stress from heat and humidity
- Body weight loss and condition can be excessive on pasture

Dr. Charles Staples, Univ. of Florida
The optimum grazing height of the sward is about 20 cm for a high-yielding dairy cow. The grass at this stage is at its most succulent and nutritious.

www.offwell.free-online.co.uk/.../grazing.htm
Winter Grazing of Rye-Ryeegrass With or Without Clover

OM Digestibility = 69%
Crude Protein = 26.4%

Dr. Charles Staples, Univ. of Florida
Cows Eating Kale (Brassicas)
Seasonal Forage Availability

Dr. John Jennings, University of Arkansas
Seasonal Forage Production

Spring:
- Fescue
- Ryegrass
- Small Grain
- Clover

Summer:
- Bermudagrass
- Bahiagrass
- Dallisgrass
- Crabgrass
- Summer Annuals
- Lespedeza

Fall:
- Fescue
- Ryegrass?
- Small Grain?
- Clover

Winter:
- Wheat
- Rye

Dr. John Jennings, University of Arkansas
Warm-season annuals

- Sudangrass
- Pearl millet
- Crabgrass
- Lespedeza
- Red clover
Effect of Over-Grazing on Root Reserves

8 cm
## Minimum Stubble Heights (cm) for Long Term Persistence (Univ. FL)

<table>
<thead>
<tr>
<th>Forage</th>
<th>Rotational Grazing</th>
<th>Continuous Grazing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahiagrass</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Coastal bermuda</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>Tifton 85 bermuda</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Stargrass</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Limpograss</td>
<td>23</td>
<td>35</td>
</tr>
<tr>
<td>Pearl millet</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>Annual ryegrass</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Rye/Oat</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Wheat/Triticale</td>
<td>12</td>
<td>15</td>
</tr>
</tbody>
</table>
Under-grazing Pearl Millet

% IVOMD = 68%   CP = 22%
Protein Should Be High

• Grass has high protein when it is young and growing.
• The protein is digestible, but may be quickly degraded in the rumen and lost as NH$_3$-N.
• A supplemental energy source will help.
Concentrate Should Be Added

- Holsteins need about 1 kg of grain for each 4 kg of milk. However, if fat and protein are high in milk, then 1 kg of grain should be fed for each 3 kg of milk.

- A cow giving 32 kg of milk would need 8 to 11 kg of grain mixture.
Added Concentrate for Pastured Cows

Concentrate Reduces Forage Intake of Cows

- So more concentrate is offered, the cow will eat less pasture.
  1. This helps balance energy & N.
  2. This places more emphasis on high-quality pasture.
  3. This means you can have more cows per acre.
Added Concentrate for Pastured Cows

Substitution Rate, 3 studies

Nitrogen Use from Pasture

• Rumen NH$_3$-N concentrations during a 24-h period were higher in the unsupplemented cows at most hours. Regardless of pasture allowance, both unsupplemented groups had higher NH$_3$-N values than both supplemented groups.
Nitrogen Use from Pasture

• In contrast, supplemented cows had a more constant pattern of NH$_3$-N in the rumen, indicating the improved utilization of NH$_3$-N by energy provided with the concentrate or a different diurnal pattern of grazing resulting from supplementation.
Milk Urea Nitrogen for Low/High Herds

Rajala-Schultz and Saville, 2003
CHO Sources for Pasture

- Starch supplements (grains) help with medium-quality pastures while fiber-based concentrates (soy hulls or wheat bran) may be more beneficial with high-quality pastures. – Delahoy, et al. (2003)
Concentrate or TMR with Pasture

Cows on TMR averaged 45 kg, but dropped in milk yield when changed slowly to:

1. Pasture plus concentrate (18% less milk) or

2. Pasture plus partial TMR (held indoors at night, fed a TMR), 15% less milk. —Bargo, et al. (2002)
Concentrate or TMR for Pastured Cows

Bargo, et al. (2002)
Feeding for Lactation

Maintenance based on BW

+ 

- Amount of milk produced
- Composition of the milk
Feeding for Lactation

Milk Fat Composition Varies

(generally inverse to amount milk)

• Stage of lactation
• Breed/genetics
• Season of year
• Type of feed
  – Milk fat % is greater as forage proportion of the diet increases
  – Pelleting or fine grinding decreases fat.
Feeding for Lactation—Ca

Minimum calcium requirements have been set at levels (0.45%) that would require mobilization from the bones and replenishment by the end of the dry period. There is no reason to be low.
Feeding for Lactation—P

Phosphorus had been set too high (0.60%), because of ATP (energy) and reproduction. Yet, 0.38% (of dry matter) is sufficient for milk yield and reproduction, and 0.33 has been enough in some experiments.
During the transition period, for example, a ration’s DCAD should range between -10 and -15. After calving, however, your cow’s DCAD level should be closer to +40.
Feeding for Lactation

Salt (iodized) is needed at 0.5% of diet. Magnesium may be needed. Zinc, copper, manganese, and cobalt are usually needed in supplements. Selenium is needed in some regions.
Fig. 9.1  A Co-deficient heifer (left) in Florida that had access to an Fe–Cu salt supplement. Note the severe emaciation. Her blood contained 6.6 g hemoglobin per 100 ml on February 25, 1937. The same heifer (right) fully recovered with an Fe–Cu–Co salt supplement while on the same pastures. (Courtesy of late R. B. Becker, University of Florida, Gainesville.)
Feeding for Lactation

Vitamins A, D, & E are needed. Some are increasing A & E in “stress” rations.

B vitamins are supplied by rumen, but some are giving extra niacin and biotin for health. Biotin appears needed for hooves.
Feed Well for Good Production