Impact of Nutritional Grouping on the Economics of Dairy Production Efficiency

Victor E. Cabrera

Nutritional grouping can be beneficial by
- ↓ feed costs
- ↑ feed efficiency
- ↑ productivity
- ↑ herd health
- ↓ emissions

Cabrera and Kalantari, 2016

One TMR for all lactating cows
- ↑ over-conditioned cows
- ↑ nutrient excretion issues

Allen, 2009

One TMR is standard
- e.g., 58% WI & MI farms use 1 TMR

Contreras-Govea et al., 2015
One TMR formulation
• high producing
• overfeed low producing

Groups with more precise diets
• ↑ feed efficiency
• ↑ profitability

More precise diets
• ↑ productivity

Nutritional grouping
• ↑ body condition
• ↑ health

Nutritional groups
• ↓ group variation
• ↑ inter-group variation
• ↓ competition at the feed bunk
Needed

• continued assessment of nutritional grouping’s economic efficiency

Cabrera and Kalantari, 2016

Economic impact of nutritional grouping in dairy herds

A. S. Kalantari, L. E. Armentano, R. D. Shaver, and V. E. Cabrera

Department of Dairy Science, University of Wisconsin-Madison, Madison 53706

Available

• important previous studies

Cabrera and Kalantari, 2016
Model
- daily
- stochastic
- Monte Carlo
- next event

de Vries, 2001

Initialization
- commercial dairy herds
- list of stochastic events

2-step process
- event occurs (y/n)
- day of occurrence

Herd data
- lactation
- day postpartum
- reproductive status
- ...

Stochastic events
- pregnancy
- culling
- death
- abortion
- dry-off
- parturition
- ...

Cow-level requirements
• $N_{EL}$
• MP

Cow-level projections according to diet
• milk
• fat
• protein
• BW
• BCS

BCS

�품

↓Milk

↓DMI

5.0

4.5

1.0
Nutritional grouping
• post-fresh (>21 d) lactating cows
• monthly regrouping (clustering; McGilliard et al., 1983)
• Same size groups: Available cows ÷ number of groups

Monthly regrouping
• NE and MP requirements

Group diet formulation
• Average NE and
• Average MP +1SD

Economic parameters
• 2005-2014 Wisconsin prices
  • $0.39/kg milk
  • DairyMGT.info/FeedVal
  • $0.1/Mcal
  • $0.18/kg RDP
  • $1.04/kg RUP

Kalantari et al., 2016
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>331</th>
<th>570</th>
<th>727</th>
<th>787</th>
<th>1,460</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Herd ME305 (kg/cow per yr)</td>
<td>13,348</td>
<td>16,140</td>
<td>13,897</td>
<td>12,884</td>
<td>14,188</td>
</tr>
<tr>
<td>1st Lactation (%)</td>
<td>38</td>
<td>43</td>
<td>39</td>
<td>39</td>
<td>45</td>
</tr>
<tr>
<td>Average days in milk (d)</td>
<td>193</td>
<td>169</td>
<td>181</td>
<td>165</td>
<td>174</td>
</tr>
<tr>
<td>Average days in Pregnancy (d)</td>
<td>134</td>
<td>140</td>
<td>141</td>
<td>133</td>
<td>157</td>
</tr>
<tr>
<td>Average lactation number (#)</td>
<td>2.03</td>
<td>1.99</td>
<td>2.29</td>
<td>2.21</td>
<td>2.02</td>
</tr>
<tr>
<td>21-d Pregnancy Rate (%)</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Conception Rate (%)</td>
<td>35</td>
<td>32</td>
<td>36</td>
<td>37</td>
<td>40</td>
</tr>
<tr>
<td>Estrus Detection (%)</td>
<td>49</td>
<td>57</td>
<td>51</td>
<td>51</td>
<td>45</td>
</tr>
<tr>
<td>Culling (%/yr)</td>
<td>35</td>
<td>32</td>
<td>36</td>
<td>37</td>
<td>40</td>
</tr>
<tr>
<td>Abortion (%/gestation)</td>
<td>16</td>
<td>7</td>
<td>11</td>
<td>11</td>
<td>7</td>
</tr>
</tbody>
</table>
IOFC difference from 1 TMR, $/cow.yr

- 2 TMR: 5 herds
  - 38.7±5.7
- 3 TMR: 5 herds
  - 43.6±6.6
- 4 TMR: 1,460-cow herd
  - 46.9

Milk

RUP

NEL

RDP
<table>
<thead>
<tr>
<th>Production kg/305-d</th>
<th>IOFC difference 3 TMR vs. 2 TMR $/cow per yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,000</td>
<td>21</td>
</tr>
<tr>
<td>9,000</td>
<td>33</td>
</tr>
<tr>
<td>10,000</td>
<td>40</td>
</tr>
</tbody>
</table>

**Williams and Oltenacu (1992)**

**2 and 3 TMR**
- Increased net return

**Østergaard et al. (1996)**

<table>
<thead>
<tr>
<th>IOFC difference vs. 1 TMR $/cow per yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 TMR</td>
</tr>
<tr>
<td>3 TMR</td>
</tr>
</tbody>
</table>

**St-Pierre and Thraen (1999)**
Nutritional grouping
• Increases IOFC
• Would increase profitability

Profitability and feasibility are highly related to
• Farm conditions
• Market situation

Optimal number of nutritional groups
• 3 TMR, in general
• 4 or more in larger herds
Nutritional grouping
• Cows are fed closer to their requirements throughout lactation
• More in early and less in late lactation

Excess NE\textsubscript{L} late lactation
• Over conditioned cows and complications next lactation

NE\textsubscript{L} provided
• More efficiently according to DIM and productivity

Cameron et al., 1998
Resulting herd BW

Change in BW
- Similar distributions
- Nutritional grouping did not change BW in the cows or herd

Stable BW with groups
- Previously reported
  Smith et al., 1978; Clark et al., 1980; Kroll et al., 1987
Resulting herd BCS

1 TMR
- Thick tailed
- Mode = 2.75
- † over-conditioned
- † under-conditioned

3 TMR
- Normal
- Mode = 3.25
BCS distribution
• Similar for 2 TMR

Nutritional grouping
• Appears to ensure that energy is better distributed and cows are healthier

N use efficiency
• More N is captured in milk with groups
• 2.7% higher in 3 TMR than 1 TMR

N emission
• Nutritional groups decrease the N excreted

VandeHaar, 2014
Milk N produced
Feed N consumed

<table>
<thead>
<tr>
<th>Herds</th>
<th>331</th>
<th>570</th>
<th>727</th>
<th>787</th>
<th>1460</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>26.4</td>
<td>26.6</td>
<td>26.8</td>
<td>27.0</td>
<td>27.2</td>
</tr>
<tr>
<td></td>
<td>27.4</td>
<td>27.6</td>
<td>27.8</td>
<td>28.0</td>
<td>28.2</td>
</tr>
<tr>
<td></td>
<td>28.4</td>
<td>28.6</td>
<td>28.8</td>
<td>29.0</td>
<td>29.2</td>
</tr>
<tr>
<td></td>
<td>29.4</td>
<td>29.6</td>
<td>29.8</td>
<td>30.0</td>
<td>30.2</td>
</tr>
<tr>
<td></td>
<td>30.4</td>
<td>30.6</td>
<td>30.8</td>
<td>31.0</td>
<td>31.2</td>
</tr>
</tbody>
</table>

Number of TMR
Conclusions

• Nutritional grouping has an economic value and should be promoted

• The difference of milk income minus costs of $NE_L$, RUP and RDP ($/cow per yr) from 1 TMR were:
  • $39 for 2 TMR
  • $46 for 3 TMR
  • $47 for 4 TMR

• Gains are explained by more milk production and less RUP costs

• Potential losses due to regrouping cows would have an deleterious economic impact, but not high enough to overcome the gains
Grouping Strategies for Feeding Lactating Dairy Cattle

V.E. Cabrera, UW-Madison Dairy Science

Sample Farm: Total Cows = 470

Tool Overview

This tool evaluates grouping strategies for feeding lactating dairy cattle. It uses different criteria to group cows, optimizes the cows belonging to a feeding group, suggests a group diet ration based on Net Energy (NEL, Mcal/lb) and Crude Protein (CP, %), computes the expected Income Over Feed Cost (IOFC), and the additional economic benefits of feed grouping after additional costs of management, labor and an expected milk depression on lactating cows re-grouped.

A herd test file is needed to use the tool. This should contain information regarding Cow ID, Lactation, Days in Milk (DIM), Milk Produced, and Milk Fat Content. Optionally, for more accurate calculations, Body Weight (BW) could be added (if BW is not provided, the tool calculates BW based on lactation and DIM after a user-entered average BW for primiparous and multiparous cows). The tab with name upload farm details helps the user upload an excel file with those parameters. It is suggested to first download the parameters file to a local computer and then use this as a template to enter farm specific data. The tool will always indicate which file is being used. The number of lactating cows in the file will be automatically counted and displayed. Also in this tab the user defines indirectly the price of feed energy ($/MCal) and feed protein ($/lb CP), which are based on nutritive content and prices of refereed feeds (Corn and Soybean meal). The user can over-write these calculated values, if desired.

Once the data have been entered, the user could move to the tab with name 'Group Cows'. This tab is self-explanatory and follows a decision tree structure to help the user analyze grouping strategies. After following the questions in the decision tree, the user could hit the 'Analyze' button and get the results in the 'Reap Benefits' tab. This last tab of the tool ('Reap Benefits') displays the economic benefit of different group strategies compared to the farm defined current strategy.

Acknowledgements

USDA – National Institute of Food and Agriculture
This project is supported by Agriculture and Food Research Initiative Competitive Grant No. 2011-58004-30340 from the USDA National Institute of Food and Agriculture.
This project was supported by Agriculture and Food Research Initiative Competitive Grant no. 2011-68004-30340 from the USDA National Institute of Food and Agriculture.