AB#: M279

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

Introduction

Grouping cows is a common practice farmers use to manage herds more efficiently. They use different grouping strategies to separate cows to address cow-specific needs. However, grouping lactating cows for nutritional purposes is not a widely adopted strategy in the dairy industry.

Feeding one TMR to all lactating cows with diets formulated for the high producing cows is the norm. This results in: 1) more over-conditioned cows; 2) greater nutrient excretion; 3) increased cost of nutrient usage; and 4) likely less than potential productivity.

Objectives

- Evaluate and quantify the economic value of nutritional grouping

Materials & Methods

Simulation Framework

A dynamic, stochastic, Monte Carlo simulation was developed to represent each individual cow in a herd.

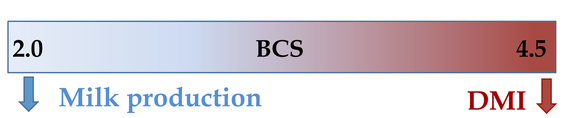
Stochastic Events

- Reproductive (calving, ovulation, estrus detection, service, conception, abortion, dry-off, parturition)
- Non-reproductive (Involuntary and voluntary culling and mortality)

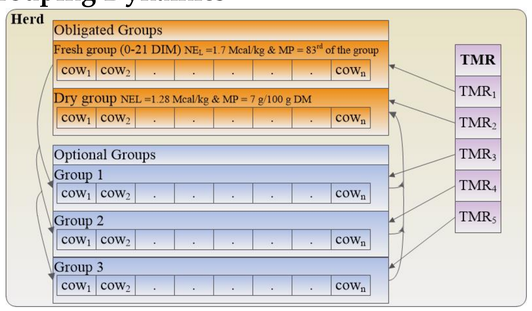
Cow Attributes

- Daily milk, fat and protein production
- Body weight (BW), body condition score (BCS)
- Dry matter Intake (DMI), NE_L and metabolizable protein (MP) requirements (NRC, 2001)

Based on scheduled events, cows' attributes and their nutrients requirements were updated on a daily basis. In addition, changes in BW and BCS of the cows was dynamically tracked by estimating their body energy and updating it based on the consumed energy in the diet.



Grouping Dynamics



Grouping Criteria

Clustering to find the most homogenous subgroup of cows based on both protein and energy requirements

Optional Group Diet Formulation

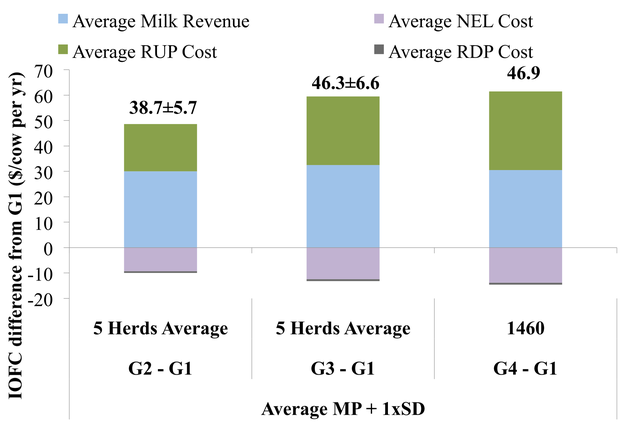
Average, average + 0.5 SD, and average + 1 SD of group requirements used to formulate diets

Input Herds

Parameters	Herd Size				
	331	570	727	787	1,460
Herd ME (kg/yr)	13,348	16,140	13,897	12,884	14,188
1st Lactation (%)	38	43	39	39	45
Average DIM (d)	208	187	201	178	189
21-d PR (%)	17	18	19	19	18
Culling Risk (%)	35	32	37	36	40
Abortion (%)	16	7	11	11	7

Results

Economic Value of Nutritional Grouping



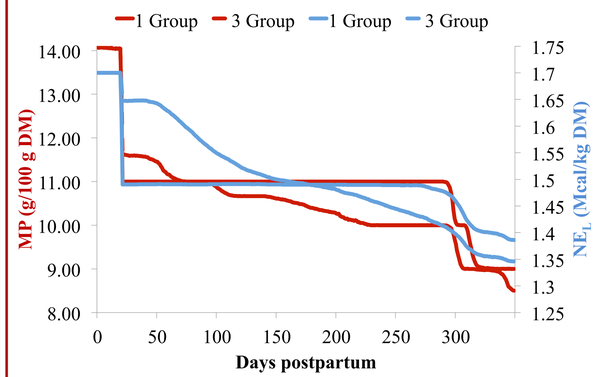
IOFC from 1,000 replications for all the herds when fed average NE_L and average MP+1SD

Scenario Analysis

Average 5 herds IOFC ($/cow per year)					
	Base Case	Worst Case	Best Case	Milk Loss	1st Lactation
2 Groups – 1 Group	39	35	44	20	33
3 Groups – 1 Group	46	45	50	26	39
4 Groups – 1 Group	47	47	49	24	38

Base Case => Milk=\$0.39/kg, NE_L=\$0.1/Mcal, RDP=\$0.18/kg, RUP=\$1.04/kg
Worst Case => Milk= \$0.29/kg, NE_L=\$0.14/Mcal, RDP=\$0.26/kg, RUP=\$1.52/kg
Best Case => Milk= \$0.52/kg, NE_L=\$0.05/Mcal, RDP=\$0.09/kg, RUP=\$0.52/kg
Milk loss => Adding 5 d of 1.82 kg/d milk loss for cows changing to another group
1st lactation => Including 1st lactation cows as a separate group

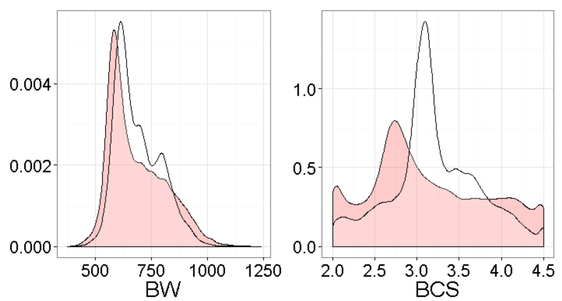
Offered diet NE_L and MP (727-Herd)



Formulated Diet (5 Herds Average)

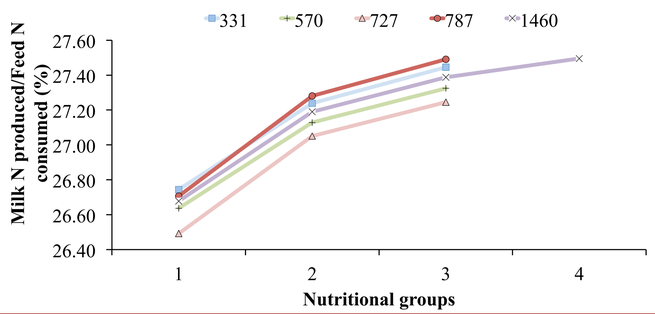
G(#)	G ID	NE_L (Mcal/kg DM)	RDP (% of DM)	RUP (% of DM) 0xSD	0.5xSD	1xSD
1 G	G1	1.5	9.34	5.06	5.46	5.85
2 G	G1	1.59	9.89	5.35	5.63	5.9
	G2	1.41	8.83	4.78	5.01	5.22
3 G	G1	1.66	10.27	5.42	5.68	5.95
	G2	1.48	9.25	5.15	5.27	5.36
	G3	1.38	8.67	4.67	4.85	5.02
4 G	G1	1.42	10.6	5.42	5.68	5.95
	G2	1.52	9.49	5.24	5.38	5.50
	G3	1.45	9.07	4.99	5.08	5.18
	G4	1.37	8.59	4.61	4.75	4.93

BW and BCS Density Plots (787-Herd)



1 Group = Red Shade 3 Groups = White Shade

N Captured in milk



Conclusion

- Nutritional Grouping increased IOFC
- No matter the herd size the majority of IOFC was obtained by having 2 groups
- The IOFC gain was due to higher milk sales and lower RUP cots
- In tough economic conditions the IOFC gain was even greater

Acknowledgment

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.

United States Department of Agriculture
National Institute of Food and Agriculture