



Dietary Grouping Strategies to Improve Profitability on Dairy Farms

V.E. Cabrera & A. Kalantari

University of Wisconsin-Madison Dairy Science

Considering nutritional grouping

Take home messages

Opportunity to improve economic efficiency

Considering additional nutritional groups

Diets closer to requirements

Saves feed costs and increases income over feed costs

Improved profitability

IOFC gains far exceed additional expenses or losses

Additional benefits

- ↓ environmental concerns
- ↑ health conditions

Feeding all lactating cows equally

A larger number of cows are overfed

Same ration (TMR) to all cows (groups)

All lactating cows receive same nutrient density diet

Preferred “high” rations

Low producing animals receive more nutrients than required



One diet for all

Would never optimize production and efficiency

Improve feed efficiency

+ feeding groups

Improved nutrient use efficiency

Diet closer to cow requirements



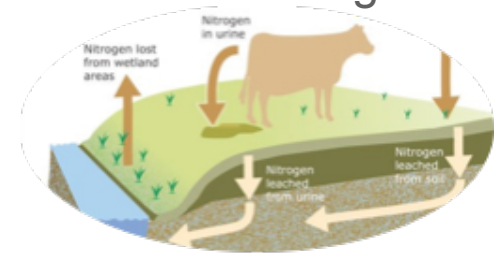
Less overfed animals

Decreased over conditioned cows

Less nutrient excretion

Decreased environmental concerns

Wang et al., 2000



Lower feeding costs

Higher milk income over feed cost



Why farmers do not group more?

Trying to find most important constraints

2-page mailed survey

The image shows two pages of a survey form. Page A, titled 'A. BASIC BARNY FARM INFORMATION', contains questions about the number of milking cows, milk production, and farm management practices. Page B, titled 'B. FEEDING & RATIONS FOR LACTATING COWS', contains questions about feeding practices, ration components, and the use of different rations for different groups of cows. Both pages include checkboxes and tables for data entry.

Results (responses)

- 196 WI farms
- 211 MI farms

Constraints to feeding more ration groups

1. Milk drops when cows are moved
2. Desire to keep management simple
3. Conflicts with grouping for reproduction
4. Farm facilities do not allow it
5. Not enough labor or personnel to handle it

A simulation study...



Strategies for grouping cows

Depend on farm and herd characteristics

Individual cow nutrient requirements

- Energy
- Protein (RUP, RDP, MP)

Number of lactating cows on the herd

States

Farm characteristics

Capacity to handle
lactating feeding groups



Adapted from McGilliard et al., 1983; St-Pierre and Thraen, 1999

Milk (and components)

Cow-specific lactation curves

Milk based on

- Herd ME305
- Cow PPA or ME305
- Stochasticity

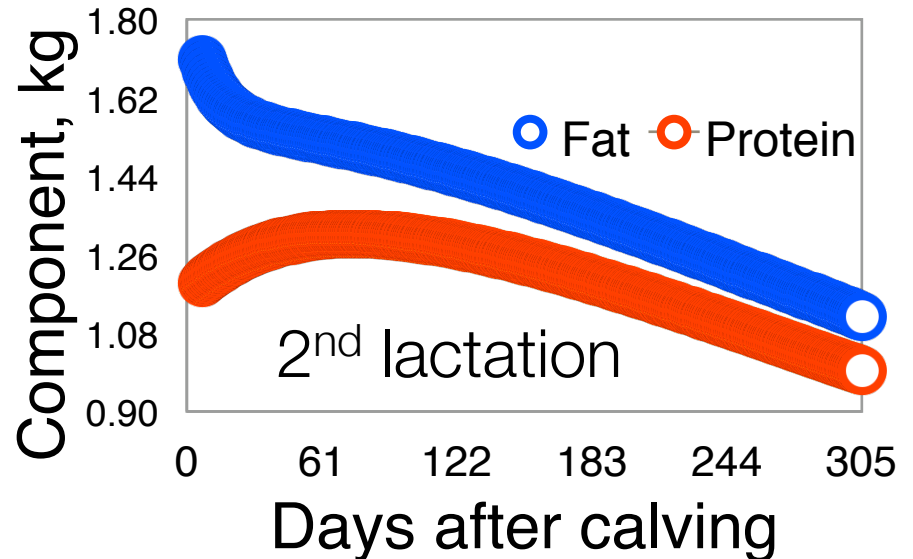
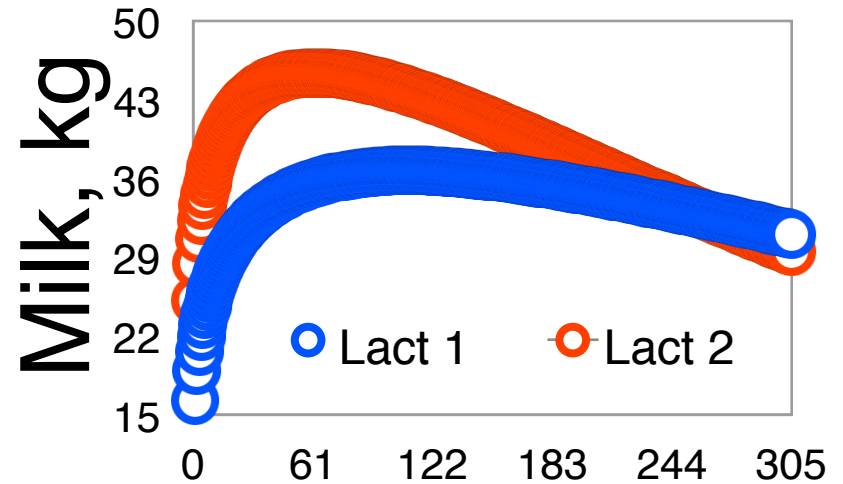
Components

- Herd
- Stochasticity

Base function

- Woods
- Adjusted Woods

De Vries, 2001



Initial individual cow BW

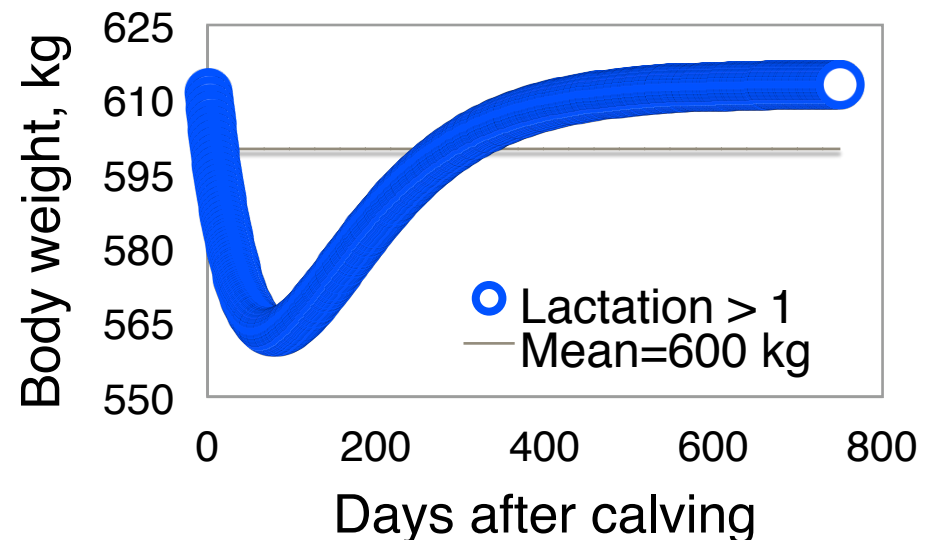
Cow-specific BW



1. Available from farm records, or
2. Stochastic distribution

Daily BW and BCS change according to:

- Lactation
- DIM
- Stochasticity



Criteria for nutritional grouping

Several criteria exist

Days after calving (DIM)

Based on stage of lactation



Fat (protein) corrected milk

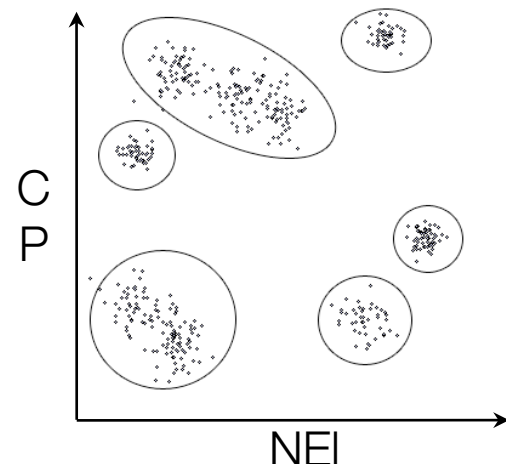
Based on level of production measured as F(P)CM

Dairy merit

Function of both F(P)CM and BW

Cluster

Seems to be MOST efficient criterion



McGilliard et al., 1983
St-Pierre and Thraen, 1999

Nutritional grouping

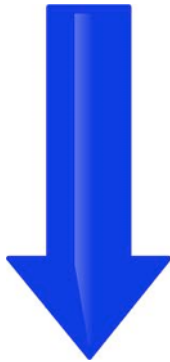
Two main types of groups

Obligated groups

- Fresh (< 22 DIM)
- Dry (~> 220 DCC)
- Daily assigned

Optional groups

- Actual additional groups
- Daily assigned
- Monthly re-grouped



Cow and herd simulation

Monte Carlo approach

Next event scheduling

- Pregnancy
- Abortion
- Dry-off
- Parturition
- Involuntary culling
- Death

Immediate replacement

- After a cow leaves the herd

Two-step

- 1. Binary outcome of event:
 - Happens or not
 - E.g., uniform distribution
- 2. DIM of the occurrence
 - When it happens
 - E.g., Weibull distribution

Replicates

- 1,000 replicates for each cow within specific herd

Cow simulation

Follows actual COW card

Variable	Unit	Description
Cow ID	#	Cow identification
Parity	#	Lactation
DIM	d	Days in milk, days after calving
DCC	d	Days in pregnancy (DIP)
Fat	%	Fat component on milk
Protein	%	Protein component on milk (%)
PPA*	%	Predicted producing ability
ME 305*	kg/305 d	Mature equivalent milk production
BW	kg	Live body weight

*Either PPA or ME305 used to assess cow's milk class. PPA preferred if available

Studied herds

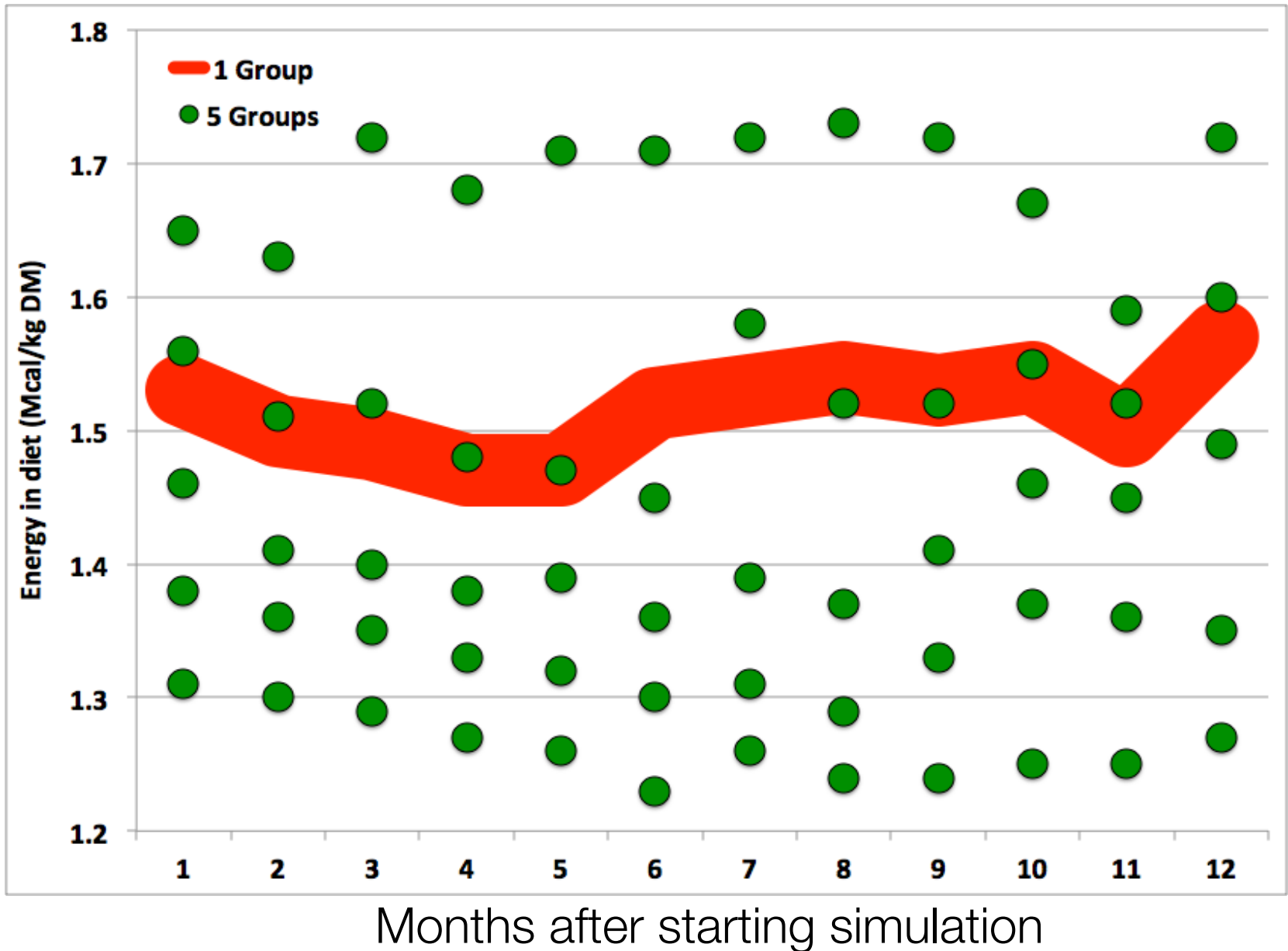
All data collected at the **cow-level**

Herd (size)	570	787	727	331	1460
Herd ME 305, kg	16,140	12,884	13,897	13,348	14,188
1st lactation, %	43	39	39	38	45
Average DIM	187	178	201	208	189
21-d PR, %	18	19	19	17	18
Culling risk, %	32	37	36	35	40
Abortion, %	7	11	11	16	7
BW available	X	X	✓	✓	X

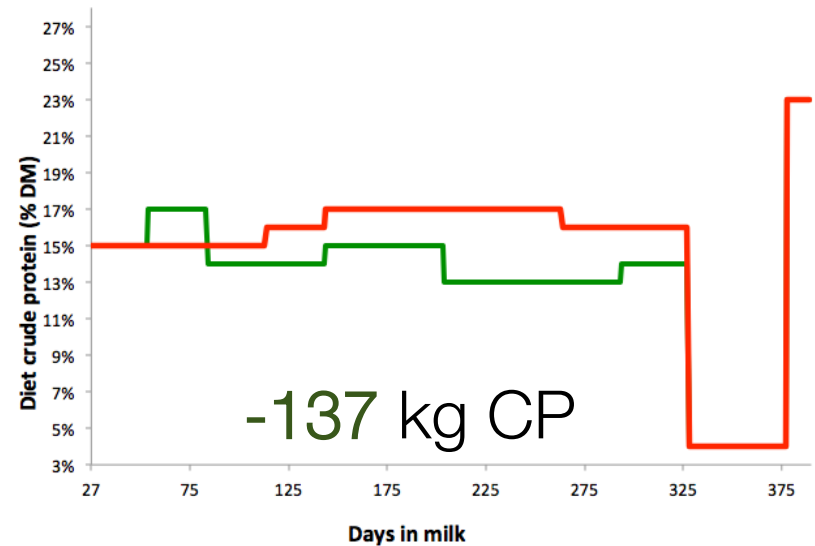
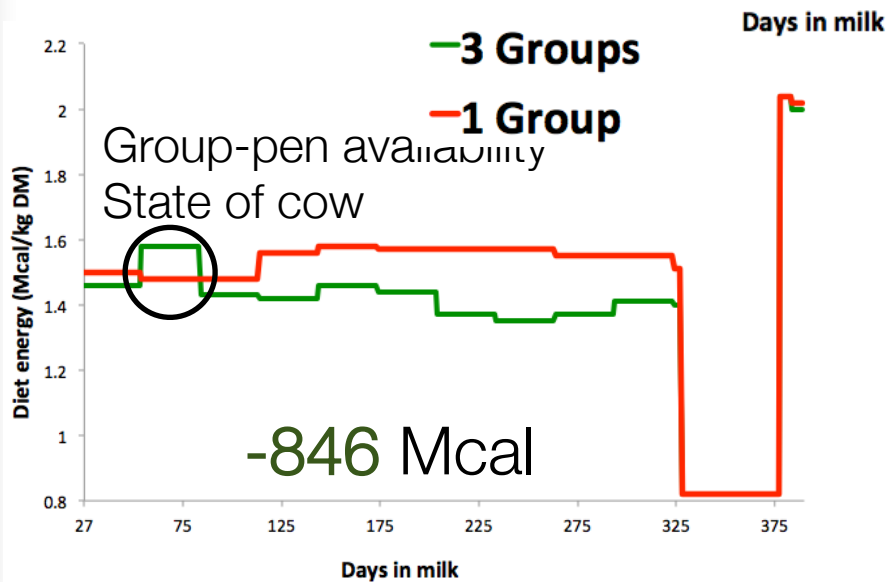
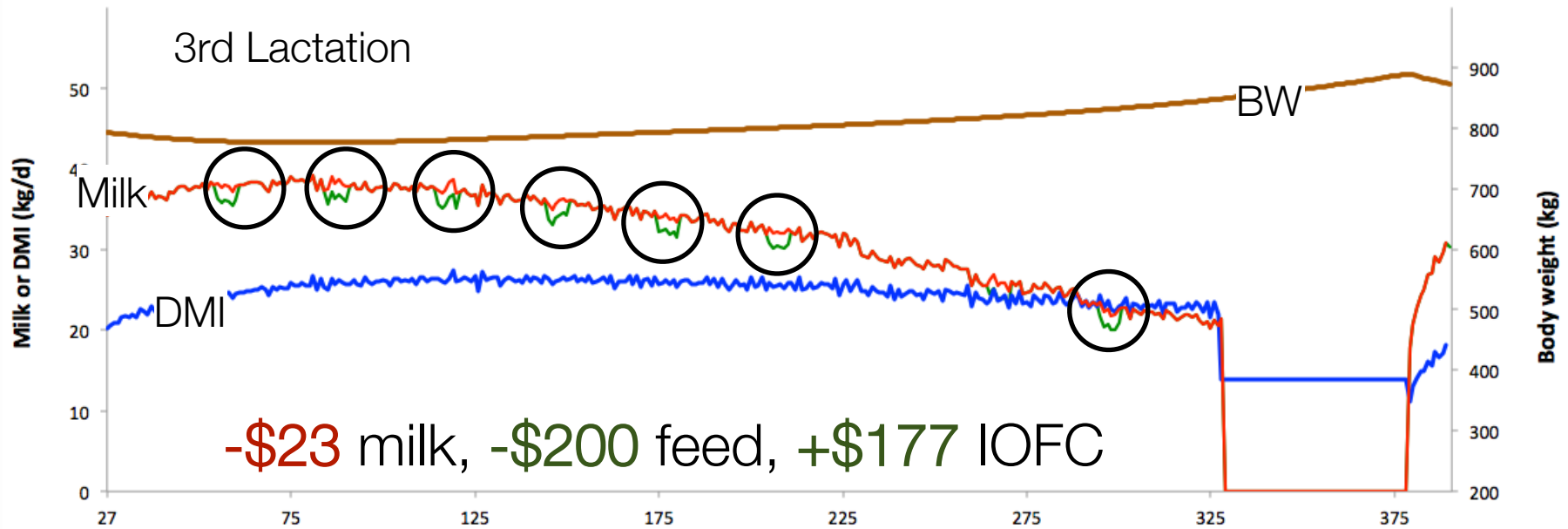
A 3D target with concentric purple and white rings. A blue arrow is shown hitting the center bullseye. The target is set within a white octagonal frame with a black border. A soft shadow is cast to the right of the target.

...And we are finding

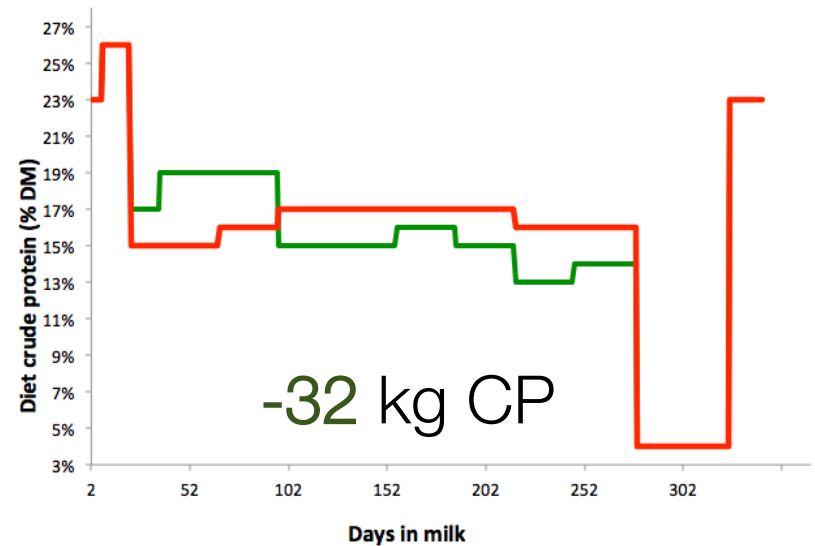
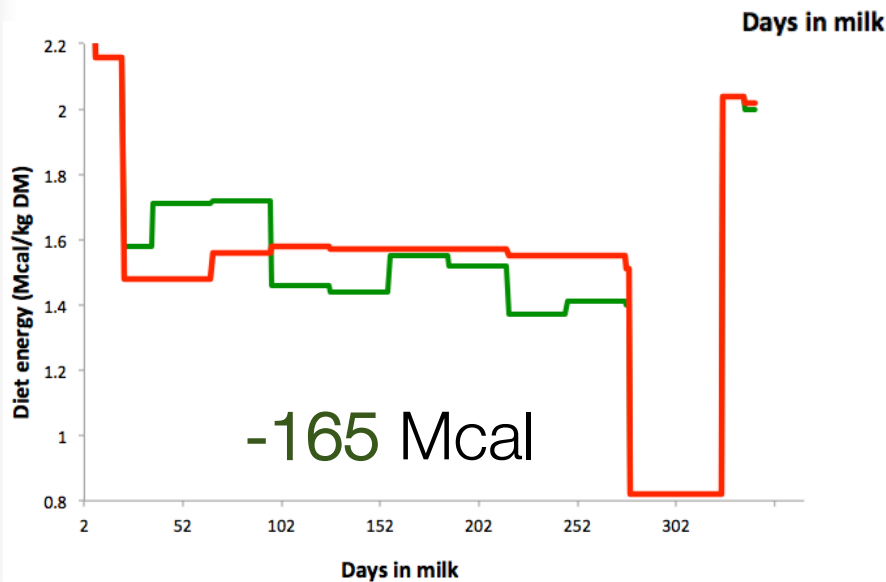
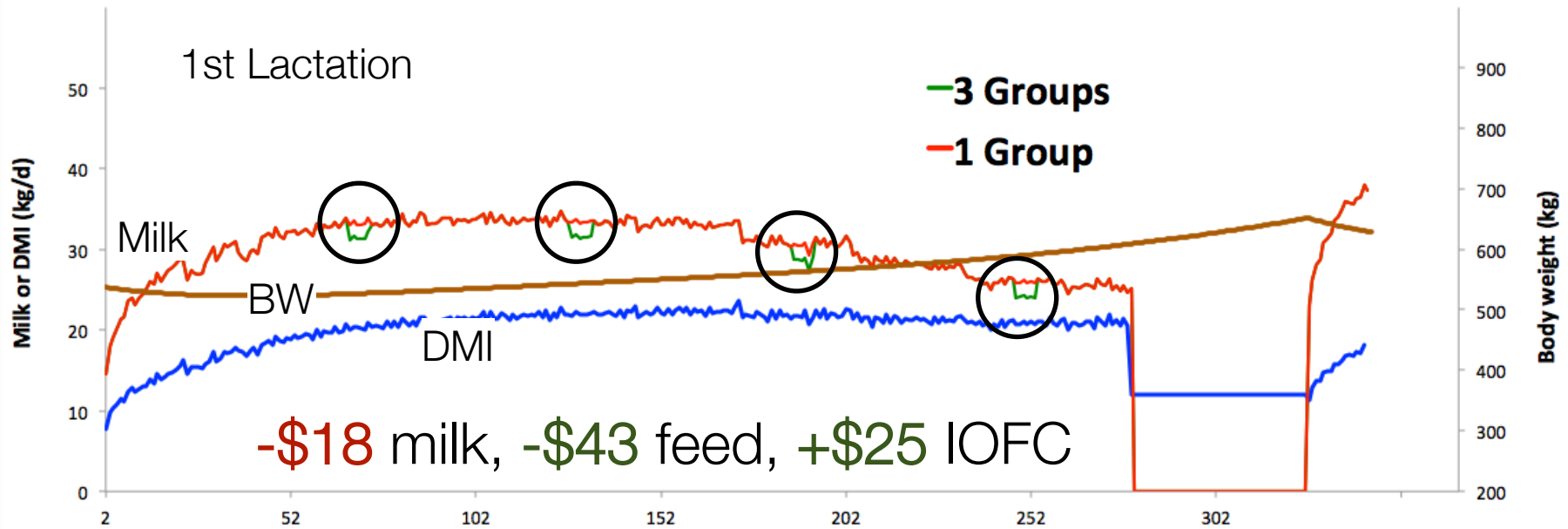
Herd 787, nutritional diets



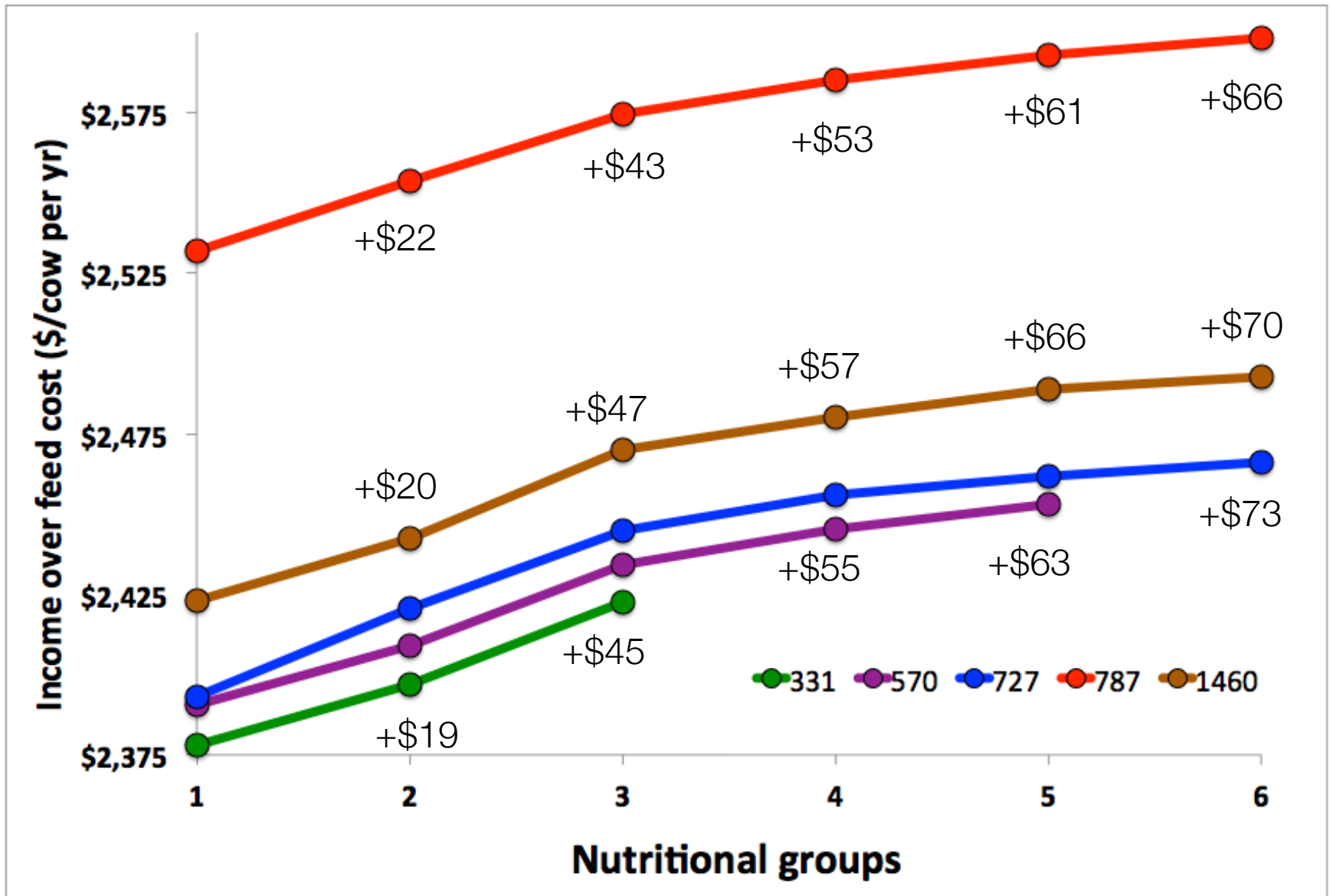
Cow 6338(727) = 78% milk, 1 yr



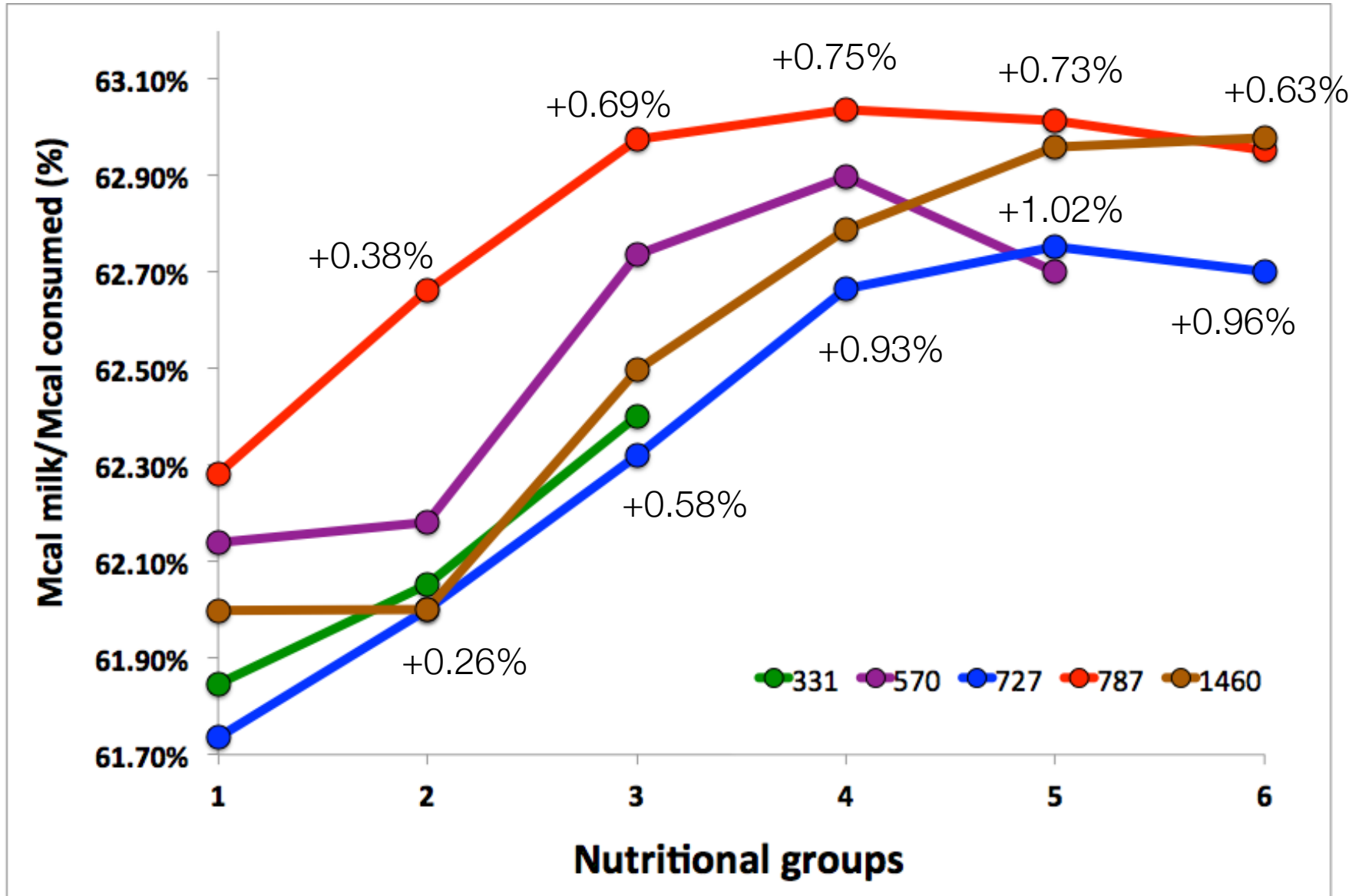
Cow 10020(727) = 92% milk, 1 yr



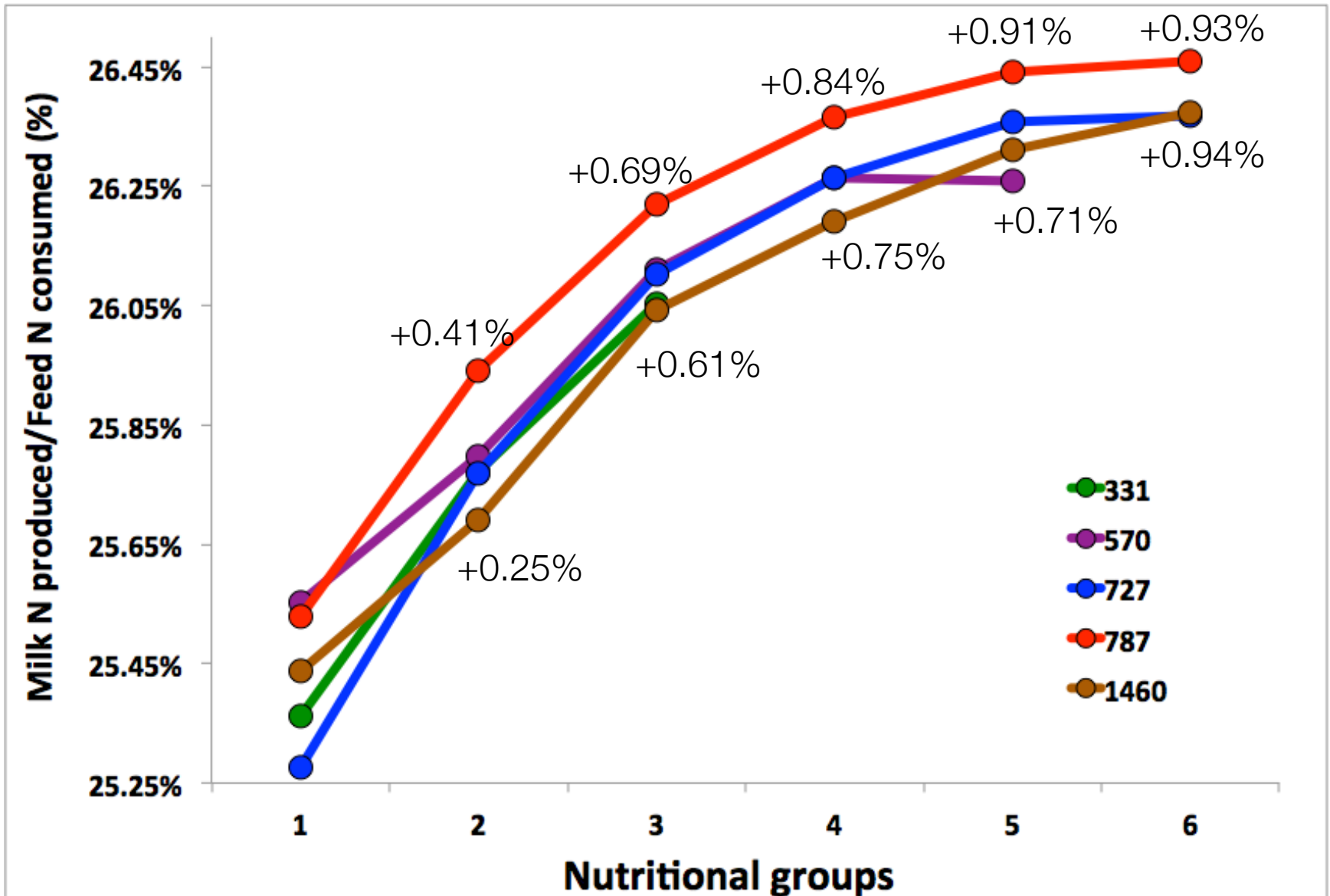
Economic efficiency



Energy efficiency

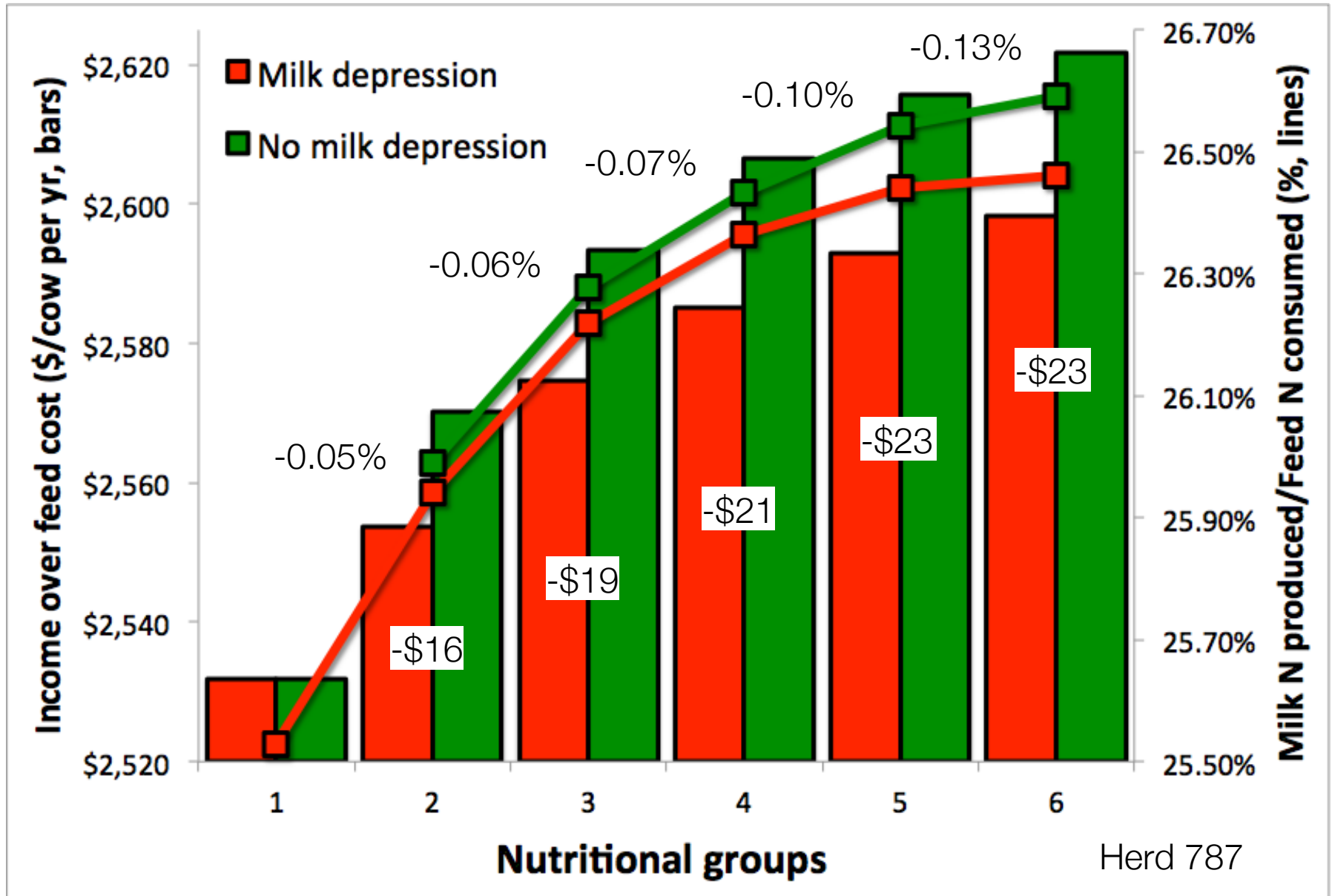


Nitrogen efficiency



Impact of milk depression

$$\frac{9.1 \text{ kg}}{\Delta \text{group}}$$





UW-Dairy Management
Decision Support TOOLS

Decision support tool...

<http://DairyMGT.info>

A simplified online tool

Herd-specific assessments (DairyMGT.info)

Home
Tools
Projects
Publications
Presentations
LGM-Dairy
Links

About
Contact
Comments
News
People
Opportunities
Gallery

Grouping Strategies for Feeding Lactating Dairy Cattle

Overview
Upload Farm Details
Group Cows
Reap Benefits

Sample Farm: Total Cows = 470

Prices

	CP%	Nel, MCal/lb	\$(Unit)
Corn	<input type="text" value="10"/>	<input type="text" value="0.9"/>	6.72 (\$/bu)
Soybean Meal	<input type="text" value="50"/>	<input type="text" value="0.88"/>	350 (\$/ton)

Please note that the values highlighted with this color will be used by the tool.

Calculated Values		
\$/lb CP	0.14337	<input type="button" value="Edit"/>
\$/Mcal NEL	0.1174	<input type="button" value="Edit"/>

Milk Price: (\$/cwt)

Download Parameter Excel File (xls or xlsx version)
 or

Upload Parameters as Excel File
 Upload the Excel File: No file chosen

Current File/Data Status
Using Data from Default Parameters File on Server

Grouping Strategy	Net Return (Approximate)
No Grouping	1,150,000
CLUSTER	1,350,000
DIM*	1,320,000
FCM*	1,340,000
DAIRYMERIT	1,350,000

Group Criteria	Group Number	Number of Cows	NEL* (Mcal/lb)	CP* (%)
NO GROUPING (No Optimization)	1	470	0.82	18.00
	Mean		0.82	18.00
CLUSTER	1	270	0.71	16.05
	2	200	0.65	14.04
	Mean		0.68	15.20
DIM	1	200	0.72	16.19
	2	270	0.67	14.85
	Mean		0.69	15.42
FCM	1	270	0.71	16.03
	2	200	0.66	14.37
	Mean		0.69	15.33
DAIRYMERIT	1	270	0.71	16.05
	2	200	0.65	14.09
	Mean		0.68	15.22

Home
Tools
Projects
Presentations
Publications
LGM-Dairy
Links

© 2013 Dairy Management-UW Extension

Additional costs and benefits

Impacts grouping feeding strategies

Management cost

- Additional labor
- Extra management

Avoid costs

- Additives and supplements savings

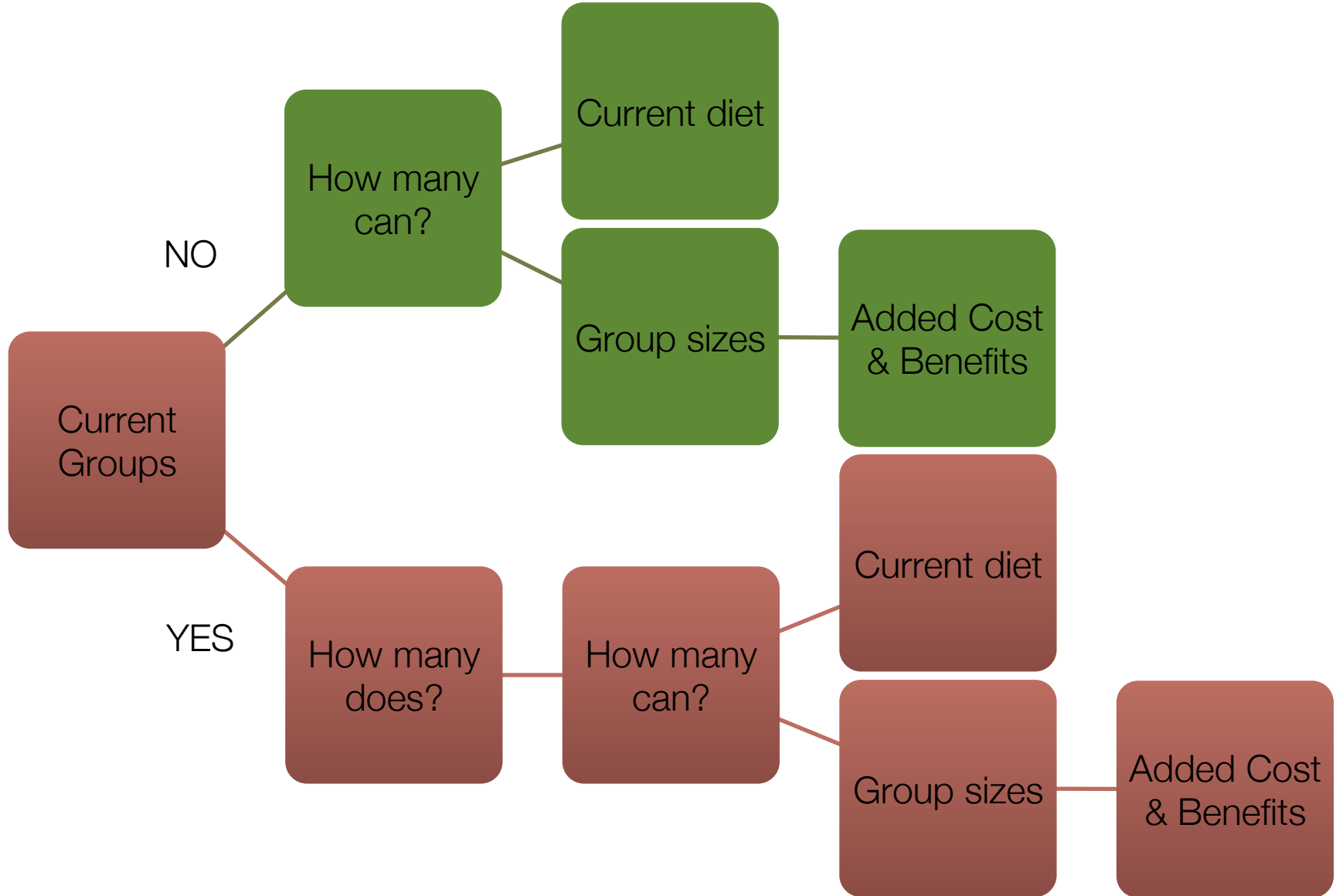
Milk depression

- Cow social interactions



Grouping Strategies

Farm/herd possibilities and decision-making





Tool demonstration

Online simulator

> Grouping Strategies for Feeding Lactating Dairy Cattle

Evaluates grouping strategies for feeding lactating dairy cattle

[HTML Online Tool \(Open\)](#)

[Instructions and Documentation \(Download\)](#)

[Presentation 1 \(Download\)](#)

[Presentation 2 \(Download\)](#)

[Paper \(Download\)](#)

[Demo \(Click to View/Hide the Video\)](#)



[Home](#)

[Tools](#)

[Projects](#)

[Publications](#)

[Presentations](#)

[LGM-Dairy](#)

[Links](#)

[About](#)

[Contact](#)

[Comments](#)

[News](#)

[People](#)

[Opportunities](#)

[Gallery](#)

Grouping Strategies for Feeding Lactating Dairy Cattle

[Overview](#)

[Upload Farm Details](#)

[Group Cows](#)

[Reap Benefits](#)

Sample Farm: Total Cows = 470

Prices

	CP%	Nel, MCal/lb	\$(Unit)	
Corn	<input type="text" value="10"/>	<input type="text" value="0.9"/>	<input type="text" value="6.72"/>	(\$/bu)
Soybean Meal	<input type="text" value="50"/>	<input type="text" value="0.88"/>	<input type="text" value="350"/>	(\$/ton)

Please note that the values highlighted with this color will be used by the tool.

Calculated Values

<input type="text" value="\$/lb CP"/>	<input type="text" value="0.14337"/>	<input type="button" value="Edit"/>
<input type="text" value="\$/Mcal NEL"/>	<input type="text" value="0.1174"/>	<input type="button" value="Edit"/>

Milk Price: (\$/cwt)

[Download Parameter Excel File \(xls or xlsx version\)](#)

or

[Upload Parameters as Excel File](#)

Upload the Excel File: no file selected

[Current File/Data Status](#)

Using Data from Default Parameters File on Server

Anatomy of Grouping Strategies for Feeding Lactating Dairy Cattle

Overview **Upload Farm Details** **Group Cows** **Reap Benefits** **Sample Farm:**

Prices

	CP%	Nel, MCal/lb	\$/ (Unit)
Corn	<input type="text" value="10"/>	<input type="text" value="0.9"/>	<input type="text" value="6.72"/> (\$/bu)
Soybean Meal	<input type="text" value="50"/>	<input type="text" value="0.88"/>	<input type="text" value="350"/> (\$/ton)

Please note that the values highlighted with this color will be used by the tool.

Calculated Values	
\$/lb CP	0.14337 <input type="button" value="Edit"/>
\$/Mcal NEL	0.1174 <input type="button" value="Edit"/>

Milk Price: (\$/cwt)

Download Parameter Excel File (xls or xlsx version)

or

Upload Parameters as Excel File

Upload the Excel File: no file selected

Current File/Data Status

Using Data from Default Parameters File on Server

Navigation tabs

No. cows

Overview Upload Farm Details Group Cows Reap Benefits **Sample Farm:**

Prices

	CP%	Nel, MCal/lb	\$(Unit)
Corn	<input type="text" value="10"/>	<input type="text" value="0.9"/>	<input type="text" value="6.72"/> (\$/bu)
Soybean Meal	<input type="text" value="50"/>	<input type="text" value="0.88"/>	<input type="text" value="350"/> (\$/ton)

Please note that the values highlighted with this color will be used by the tool.

Calculated Values

\$/lb CP	0.14337	<input type="button" value="Edit"/>
\$/Mcal NEL	0.1174	<input type="button" value="Edit"/>

Milk Price: (\$/cwt)

Download Parameter Excel File (xls or xlsx version)

or

Upload Parameters as Excel File

Upload the Excel File: no file selected

Current File/Data Status

Using Data from Default Parameters File on Server

Herd Farm Data

Nutrient price

Milk price

Identification

Lactation

Days in milk

Milk butterfat

Milk protein

Body weight

Grouping Illustration

Economic impact of nutritional grouping

Current Situation

Lactating Cows 470

Current Groups None

NEL Mcal/lb 0.80

CP, % 17



Possible Situation

Groups 3

Group Sizes 100, 100, 270

Milk loss 2.27 kg/d x 4 d

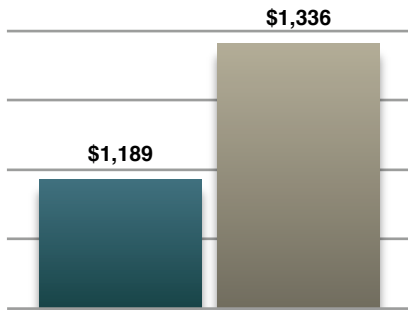
Added Costs \$1,000/month

Saved costs None

Decision Support System Illustration

Cluster grouping criteria

Current Situation				
Group	Cows	NEL	CP	IOFC
	#	Mcal/lb	%	\$/cow.d
All	470	0.80	17.00	6.9



Annual value of grouping
\$135,000/herd

Possible Situation				
Group	Cows	NEL	CP	IOFC
	#	Mcal/lb	%	\$/cow.d
1	100	0.62	13.07	4.7
2	100	0.65	14.18	7.2
3	270	0.71	16.05	9.3
All	470	0.68	15.02	7.9

Wisconsin herds analysis



Analysis from dairy farm records

30 Wisconsin dairy farms

No grouping vs. 3 groups

- Same size groups

Grouping criterion

- Cluster



Same prices for all

- \$0.35/kg milk
- \$0.315/kg CP
- \$0.1174/Mcal NEI

Projected body weight

- 500 kg primiparous
- 600 kg multiparous

Analysis from dairy farm records

30 Wisconsin dairy farms

	Lactating cows (n=30)	No grouping	3 Groups	Gain
				Income Over Feed Cost \$/cow.yr
Minimum	<200	697	1,059	161
Mean	788	2,311	2,707	396
Maximum	>1,000	2,967	3,285	580

Increase of IOFC
(\$/cow per year)

- Between 7 and 52%
- Mean = \$396
- Range = \$161 to \$580

Acknowledgements

**This project is 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



Thanks

© 2011 Wisconsin Milk Marketing Board, Inc.