Feeding the Right Level of Concentrate

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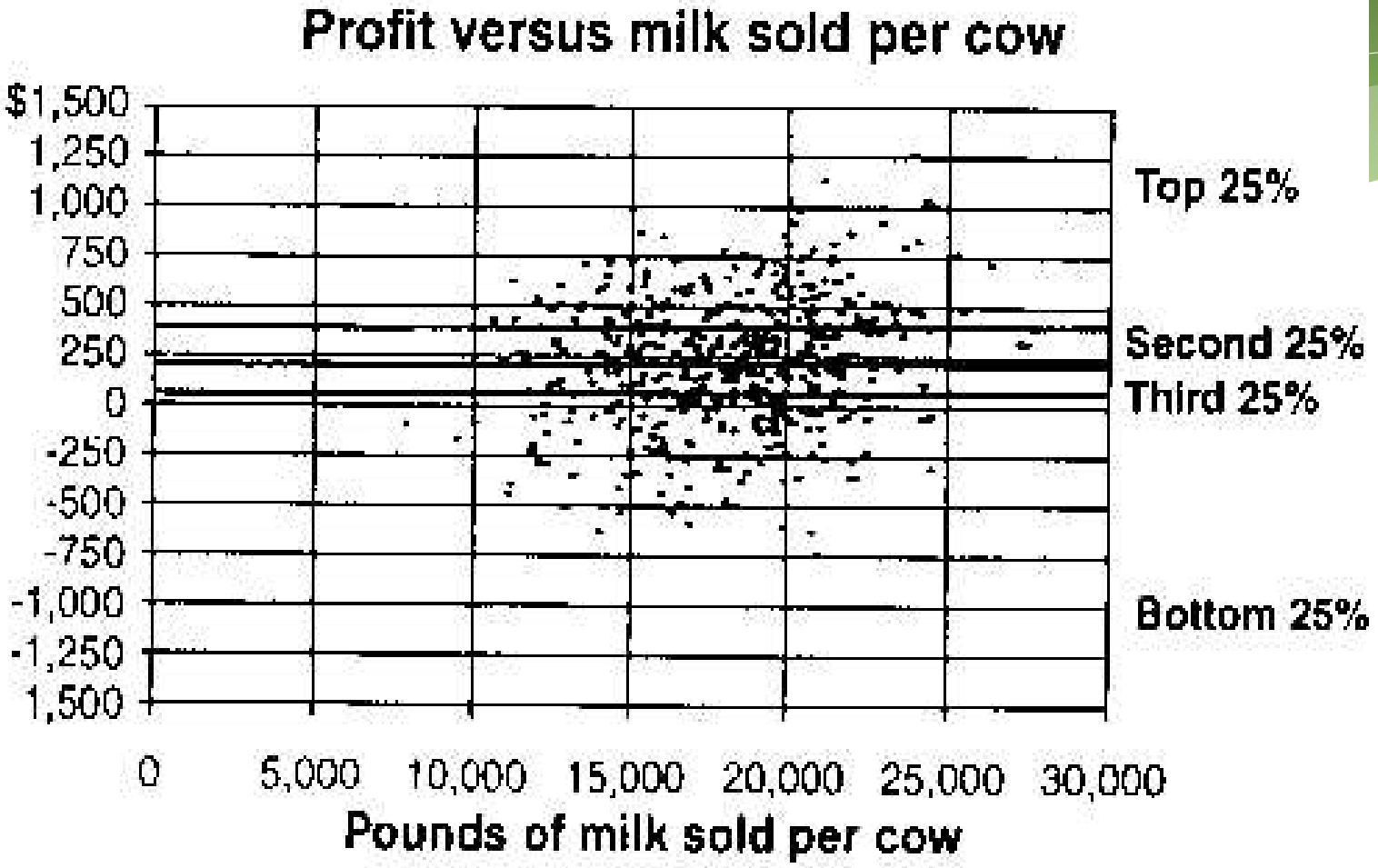
Milk yield vs profit in US



Drivers of Profit

	R^2
Cost of Production	0.70
Production /ha	0.36
Production /cow	0.19
Extra feed fed / cow	0.05

Summary of 20 years NZ Dairy Economic Survey data

Average nutrient composition for cool season grass pasture and legumes over a grazing season.[a]

	Predominantly Grass (Cool season)		Grass with Legumes	
Nutrient	Spring	Summer	Spring	Summer
Crude Protein (CP), % DM	21-25	18-22	22-26	20-24
RUP[b], % of CP	20-25	25-30	20-25	25-30
Sol. P[c], % of CP	35-40	25-30	30-35	25-30
ADF[d], % DM	24-28	28-34	21-25	25-30
NDF[e], % DM	40-45	48-55	30-36	35-45
Hemicellulose, % DM	17-21	21-25	12-16	15-19
Cellulose, % DM	16-20	21-26	16-20	18-23
NE, Mcal/lb	0.72-0.78	0.66-0.72	0.74-0.80	0.70-0.74
Non-fiber carbohydrate (NFC), %DM	15-20	12-15	18-24	15-20
Fat, % DM	3-4	3-4	3-4	3-4
Ash, %DM	7-9	7-9	8-9	7-9
Ca, % DM	0.50-0.75	0.50-0.75	1.1-1.3	1.1-1.3
P, % DM	0.30-0.35	0.30-0.35	0.30-0.35	0.30-0.35
Mg, % DM	0.15-0.20	0.15-0.20	0.18-0.24	0.18-0.24
K, % DM	2.0-3.5	2.0-3.5	2.5-3.5	2.5-3.5
S, % DM	0.16-0.22	0.16-0.22	0.18-0.26	0.18-0.26

Characteristics of Pasture

- **18 - 34% Protein**
  - **High soluble protein**

- **0.66 - 0.80 Net Energy**
- **30 – 55% NDF**
- **Low non-fiber carbohydrates**
  - **12-24%**

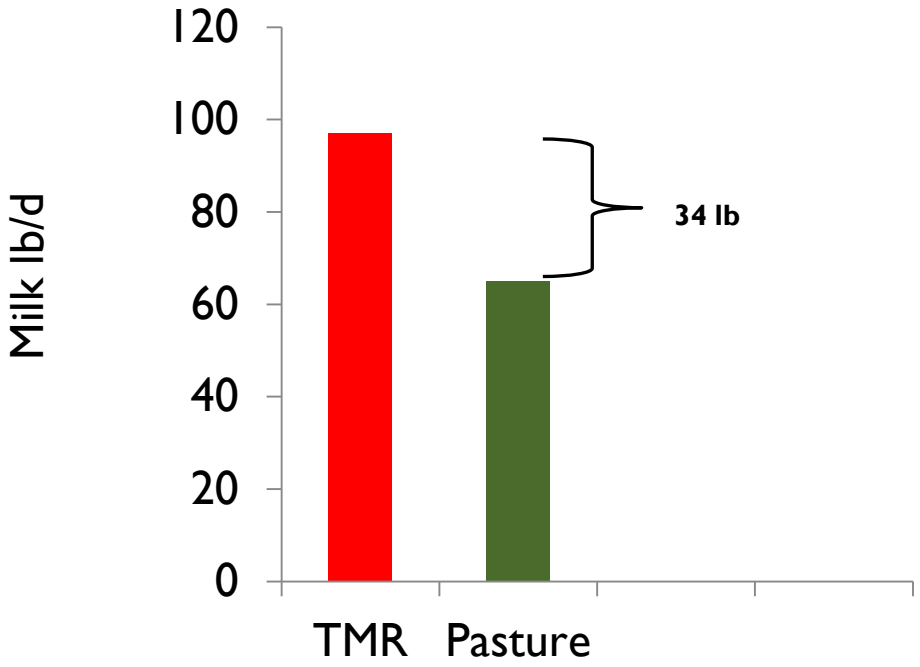
Characteristics of Pasture

	TMR
•18 - 34% Protein	16-19%
– High soluble protein	
•0.66 - 0.80 Net Energy	0.76-0.79
•30 – 55% NDF	<45%
•Low non-fiber carbohydrates	32-36%
•12-24%	

Pasture as the only Feedstuff

* Research has shown that pasture alone can support 40-50 pounds of milk in spring
* Cows will typically consume 3% BW in forages (3.25% in high producing cows?)
* Usually lose more body condition
* Long term effects on body condition and repro?????

Limits to Production on Pasture



Intake	+21	59%
Grazing/walking	+8	23%
Urea Cost	+4	11%
Milk Composition	+2	7%
Liveweight	-1.5	4%
	33.5	

Kolver & Mueller 1998

Supplements only increase milk production if they increase total energy intake.

Nothing magical!

Nutrients first-limiting milk production in high quality pastures

Pounds milk/cow/day	First-limiting nutrient
40	Energy
50	Energy
> 60	Energy & Protein

Factors affecting supplemtation

* Nutrient composition of pastures
* Dry matter intake
* Economics

Calculating dry matter intake

* Important to be accurately measured
  * Properly formulate the diet
  * Prevent underfeeding or overfeeding

Factors affecting pasture DMI

* Time spent grazing
  * Gut fill
  * 8-9 hours

* Grazing patterns
  * 2-5 major meals/day
  * 2-3 hours at dawn, 4-5 hours at dusk

Level of Supplementation

Grain DMI	0.0	11.0	22.0
Pasture DMI	30.6[a]	27.9[a]	21.6[b]
Total DMI	30.6[c]	38.9[b]	43.6[a]
Milk, lb/d	48.0[c]	59.0[b]	66.9[a]
FCM, lb/d	48.2	51.0	51.5
Fat %	3.89[a]	3.50[b]	3.08[c]
Protein %	2.85[c]	2.95[b]	3.05[a]
Milk/DMI	1.60	1.54	1.54

Reis & Combs, J..Dairy Sci. 83:2888, 2000

Summary of Grazing Studies

Cows/Trt	Supplement	Milk	%Fat	% Protein
13 H	8 # corn-min	51.5	3.5	3.2
	12# corn-min	52.5	3.3	3.1
	16# corn-min	54.5	3.2	3.2
8 H	16# corn-min	51.5	3.1	2.9
	TMR-50# limit	49.7	3.2	2.8
5 H & 3 J	10# corn-soy/cg	54.1	3.7	3.2
	15# corn-soy/cg	54.8	3.6	3.2
	20# corn-soy/cg	54.1	3.8	3.3
	15# corn-soy/Alfg	56.1	3.8	3.3
8 H	12# hi fiber	61.4	3.6	3.0
8 J	12# hi fiber	51.0	4.8	3.4
8 H	20# hi fiber	67.8	3.6	2.9
8 J	20# hi fiber	52.4	4.5	3.5
9 H	15# coarse corn	66.2	3.2	3.0
	15# fine corn	65.3	2.9	3.0
	17# hi moisture corn	67.8	3.1	3.0
	11# hi moisture corn	67.1	3.1	3.0

Grazing Behavior, intake and milk yield, supplemented and unsupplemented at two pasture allowances

	Low Pasture Allowance (55 lb/cow/day)		High Pasture Allowance (90 lb/cow/day)	
	0 Suppl.	**19# Suppl.**	**0 Suppl.**	**19# Suppl.**
Grazing Behavior				
Grazing Time, min/d	609	534	626	522
Bites/min	56	54	56	55
Intake/bite, g DM/bite	0.55	0.55	0.60	0.59
Total bites/day	34,400	28,500	35,200	28,600
Intake (lb/day)				
Pasture	38.5	34.1	45.1	35.4
Supplement	-	19.1	--	19.1
Total	38.5	53.2	45.1	54.6
Milk Yield, lb/day	42.1	65.3	48.8	65.8

Bargo et al, J Dairy Sci. 85:1777-1792 (2002)

Effect of Pasture Allowance and Supplementation[1]

	Feeding System				P≤[2]		
	LPA-	LPAC	HPA-	HPAC	CS	PA	CSxPA
Milk	**42.0**	**65.3**	**48.8**	**65.8**	**<.01**	**.04**	**.03**
% BF	3.87	3.23	3.78	3.28	Did not evaluate %		
% Pro	2.62	2.79	2.66	2.81	Did not evaluate %		
Dry Matter Intake							
Supplement	1.8	18.9	1.5	19.1	<.01	0.56	0.36
Pasture	38.4	34.1	45.1	35.4	<.01	<.01	<.01
TOTAL DMI	40.2	53.0	46.6	54.5	<.01	<.01	<.01

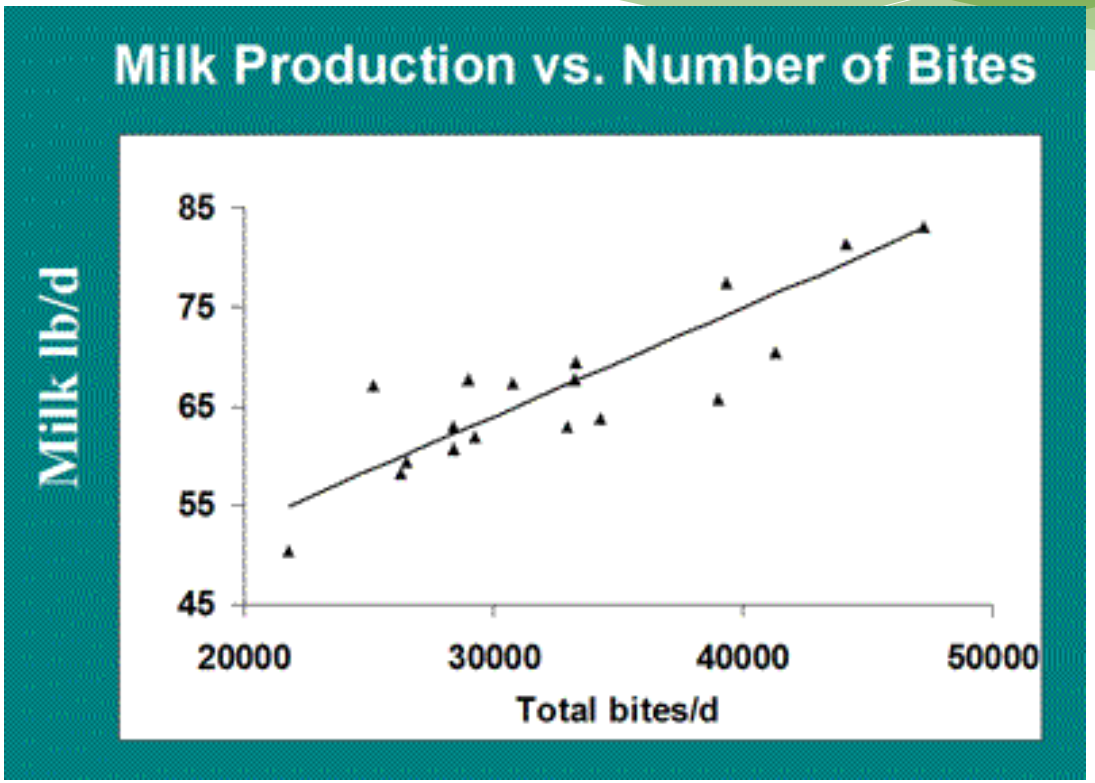
[1]As adapted from Tozer et.al. J. Dairy Sci. 87:2902-2911
[2]CS Concentrate Effect; PA Pasture Allowance Effect; CSxPA interaction

Effect of Pasture Allowance and Supplementation[1]

	Feeding System			
	LPA-	LPAC	HPA-	HPAC
Milk	**42.0**	**65.3**	**48.8**	**65.8**
Income $/c/d	4.89	7.24	5.66	7.34
Expenses $/c/d				
-Rations	0.23	1.52	0.20	1.53
-Pasture	1.36	1.21	2.35	1.85
-Total Cost	1.59	2.72	2.55	3.38
IOFC $/c/d	3.30	4.51	3.10	3.96

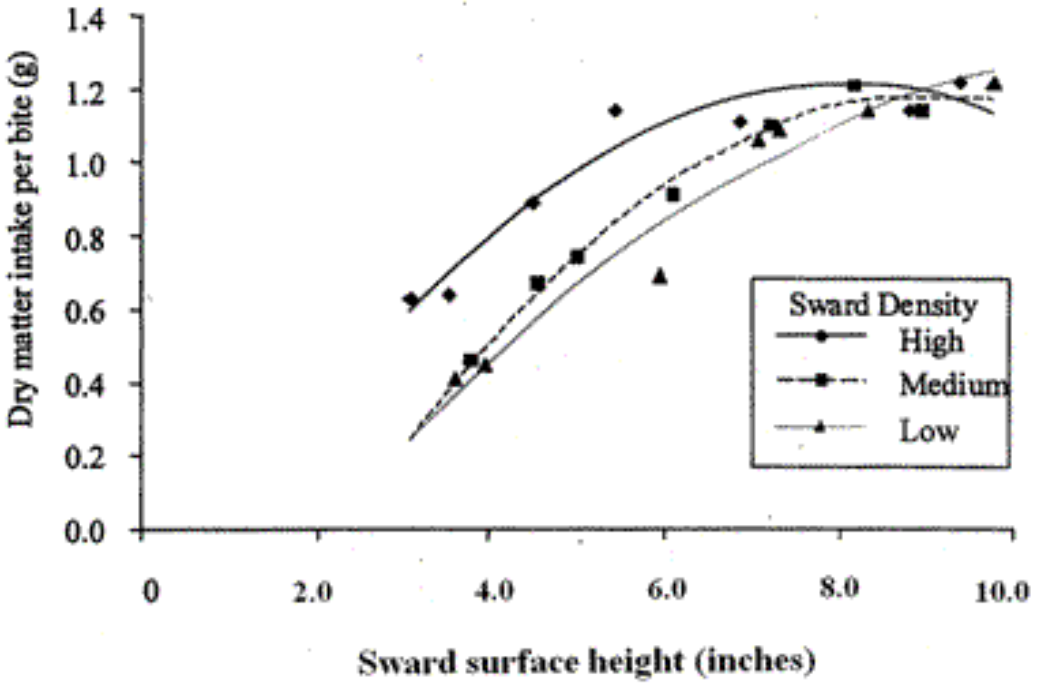
[1]As adapted from Tozer et.al. J. Dairy Sci. 87:2902-2911

Milk Production vs Number of Bites at 2 Pasture Allowances



Mueller 2004

Effect of Sward Height & Denisity on Bite Mass



Mayne et al, XVII Grassland Congress, 1997

Organic Herd 2012*

	Grass Only	Lo Supplement 6 lb Grain	Hi Supplement 12 lb Grain
Milk	**32.2[a]**	**40.4[b]**	**39.4[b]**
% BF	3.82[a]	3.78[b]	3.38[b]
% Protein	3.20[a]	3.24[a]	3.20[a]
MUN	14.25[a]	10.06[b]	7.33[c]
Energy CM	32.2[a]	37.2[b]	36.3[b]
TMR Costs $	0.00[a]	3.18[b]	4.21[c]
IOFC $	3.61[a]	2.20[b]	0.38[c]

*Heins, University of Minnesota

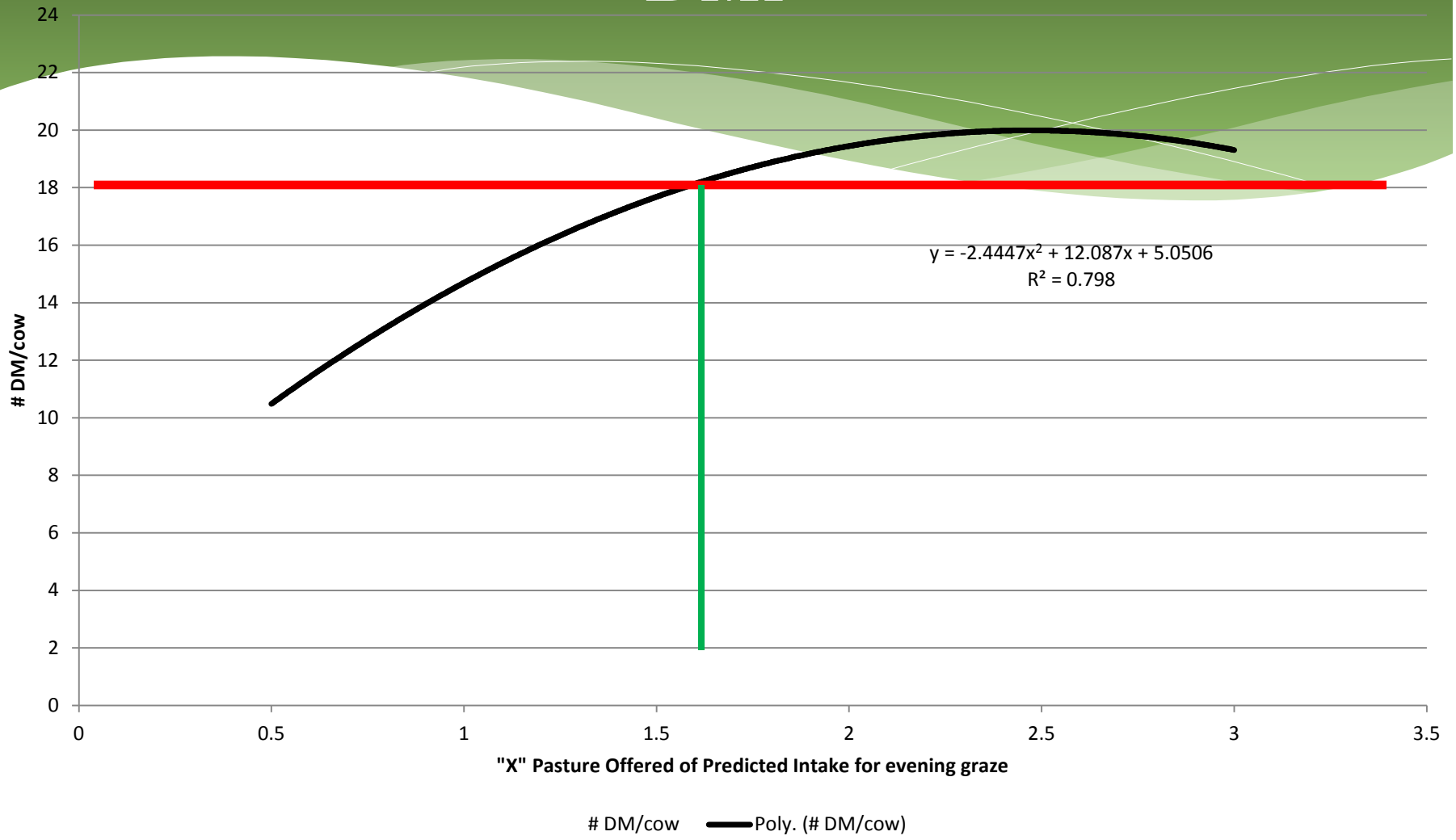
[abc]Means within a row with different superscripts different P<0.05

Effects of NSC on Ruminal Ammonia Levels*

	Hi N		Lo N		p-values		
	+NSC	-NSC	+NSC	-NSC	N	NSC	NxNSC
NH3-N	**13.2**	**17.6**	**5.4**	**7.5**	**<.001**	**<.001**	**<.05**
pH	6.05	6.19	6.11	6.17	NS	<.001	<.05

Hall, US Dairy Forage Research Center
Hi N – fertilized with urea
+NSC cows drenched 4x/day with 50:50 mix of dextrose and cornflour

Comparison of "50-300%" of Predicted DMI



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Unpublished data Hamilton & Rickard, 2011

Pasture allowance is a double edged sword

* Too much results in
  * Well fed cows
  * Poor pasture quality??
  * Low utilization
* Too little results in:
  * Hungry cows
  * Excellent pasture quality
  * Less milk
  * Higher utilization
* Have to balance out the good, the bad and the ugly!

J. Dairy Sci. 88:1231–1243
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The Interaction of Strain of Holstein-Friesian Cows and Pasture-Based Feed Systems on Milk Yield, Body Weight, and Body Condition Score

B. Horan,[1,2] P. Dillon,[1] P. Faverdin,[3] L. Delaby,[3] F. Buckley,[1] and M. Rath[2]
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[2]Department of Animal Science, Faculty of Agriculture, University College Dublin, Belfield, Ireland
[3]INRA, UMR Production du Lait, 35590 St Gilles, France

- NA-type HF and NZ HF cows
- either 900 or 3,600 lb/cow

- **NA HF** response = 0.99 lb milk/lb concentrates fed
- **NZ HF** response = 0.51 lb milk/lb concentrates fed

Animal Science 2002, 75: 433–445
© 2002 British Society of Animal Science

The influence of cow genetic merit for milk production on response to level of concentrate supplementation in a grass-based system

J. Kennedy[1,2†], P. Dillon[1], P. Faverdin[3], L. Delaby[3], F. Buckley[1] and M. Rath[2]

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[2]*Department of Animal Science, Faculty of Agriculture, University College Dublin, Belfield, Dublin 4, Ireland*
[3]*INRA, UMR Production du lait, 35590 St Gilles, France*

Multiyear project → System response (BCS included)

- 929, 2,002, or 3,807 lb concentrates/year
- 14,000 to 18,000 lb milk/cow/year

- **Medium Merit** = 0.6 to 0.7 lb milk/lb concentrates fed
- **High Merit** = 0.8 to 1.0 lb milk/lb concentrates fed

Influence of dairy cow genotype on milksolids, body condition and reproduction response to concentrate supplementation

E.S. KOLVER, J.R. ROCHE, C.R. BURKE, and P.W. ASPIN

Dexcel Limited, Private Bag 3221, Hamilton, New Zealand

- NA HF and NZ HF cows
- 0, 2076, or 4,077 lb/cow
- 0, 7, or 14lb/cow/d

- **NA HF** response = 1.1 lb milk/lb concentrates fed
  0.8 lb milk/lb concentrates fed
- **NZ HF** response = 0.8 lb milk/lb concentrates fed
  0.3 lb milk/lb concentrates fed

J. Dairy Sci. 86:610–621
© American Dairy Science Association, 2003.

Effect of Genetic Merit and Concentrate Su
Grass Intake and Milk Production with Hol

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–42
Science Association, 2003.

iew: **Production and Digestion of Supplemented on Pasture**

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*Department of Dairy and Animal Science,
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†Dexcel Ltd., Private Bag 3221, Hamilton, New Zealand

- High Merit and Low merit cows
- 1, 6 or 12 lb concentrates/cow/d

- **Medium merit** response = 0.90 lb milk/lb concentrates fed
- **High merit** response = 0.95 lb milk/lb concentrates fed

- Supplementation reduced grazing time by 12 min/kg concentrate
- Response to supplements = 0.9 lb milk/lb concentrate

J. Dairy Sci. 89:3532–3543
© American Dairy Science Association, 2006.

Holstein-Friesian Strain and Feed Effects on Milk Production, Body Weight, and Body Condition Score Profiles in Grazing Dairy Cows

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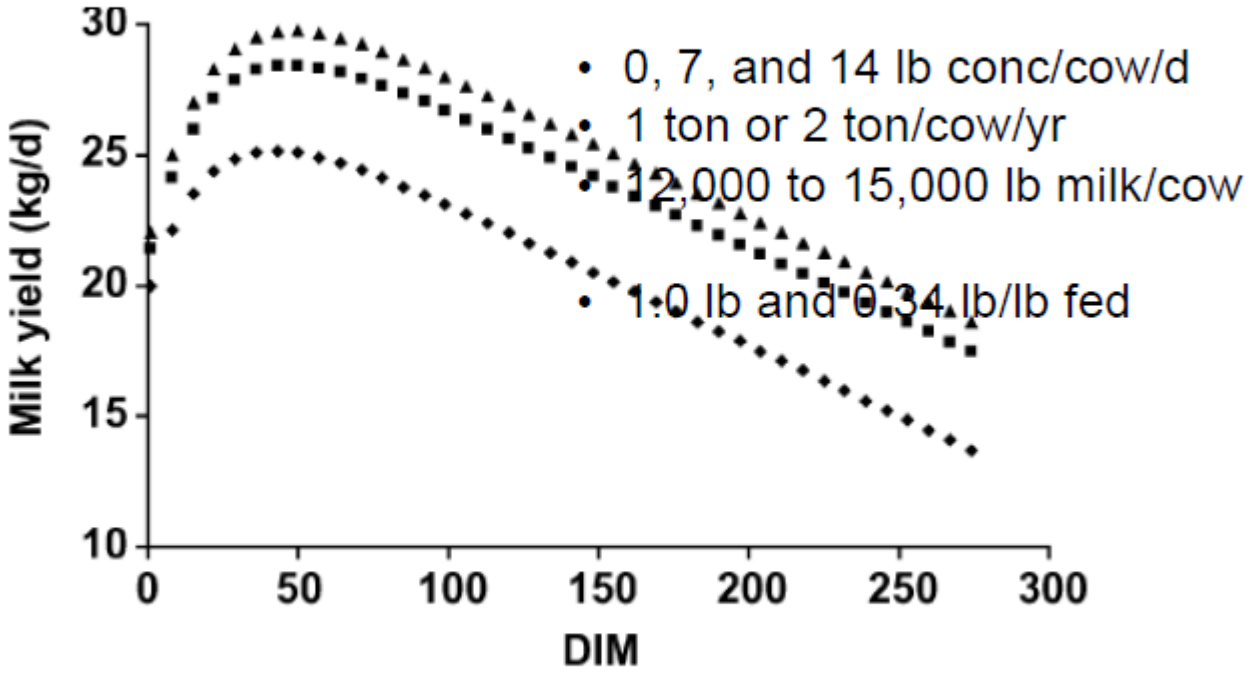

- 0, 7, and 14 lb conc/cow/d
- 1 ton or 2 ton/cow/yr
- 12,000 to 15,000 lb milk/cow
- 1.0 lb and 0.34 lb/lb fed

Figure 3. Effect of level of concentrate supplementation on the lactation profile for milk yield in cows receiving 0 (◆), 3 (■), or 6 (▲) kg of DM of a concentrate pellet daily throughout lactation.

Level of supplementation

* Research on supplementation ranges of 1.8 – 19.1 lb/day
  * Pasture DMI decreased by 13%
  * Average all studies and supplementation increases milk production about 9.7 lb/d, or 22% compared with pasture only
  * Does not take into account pasture DMI

Considering a no grain program?

* Nothing drastic
  * HIGH QUALITY PASTURES ABSOLUTELY ESSENTIAL
  * Gradually decrease supplements, allow systems (animals, management) to adjust
  * Decrease supplements by 2-3 pounds/day, wait 5-6 days before repeating
  * May need ~ 50% more pasture for no grain diet

Progress begins…..

Progress begins at the **END** of your comfort zone