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Profitability. Sustainability. Competitiveness.

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Science into Practice

Supplements – How low can you go?

John Roche
Principal Scientist, Animal Science
Managing Director, Down to Earth Advice Ltd.

Annual meeting of single, good looking, straight, emotionally stable, financially-secure nutritionists aiming to make you money

How low can you go?

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How low can you go?

“It all depends on the point of view and who tells the story!”

-Aesop Maxim

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Are you

- A vet/animal scientist
  - All about cow efficiency
- A farmer driven by vanity and what others think
  - My herd average production must be greater than X
- Profit-focussed farmer but loves cows
  - Operating profit/acre important but cow focussed
- A pragmatic, profit-focussed farmer
  - Cost of production, Operating profit/acre and ROA focussed

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Why feed supplements

- Increase milk production
  - Dilution of maintenance and increased productivity
- Reduce BCS loss/increase BCS gain
  - BCS important for getting cows in calf
- Get more cows in-calf
  - Pasture not sufficient ►Supplements increase DMI
- Not enough pasture
  - Genuine feed restriction

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“About almost any subject, there are the facts ‘everyone knows’ and then there are the real ones”

-Ernest G. Ross

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Supplements and milk production

The older I get, the better I was!

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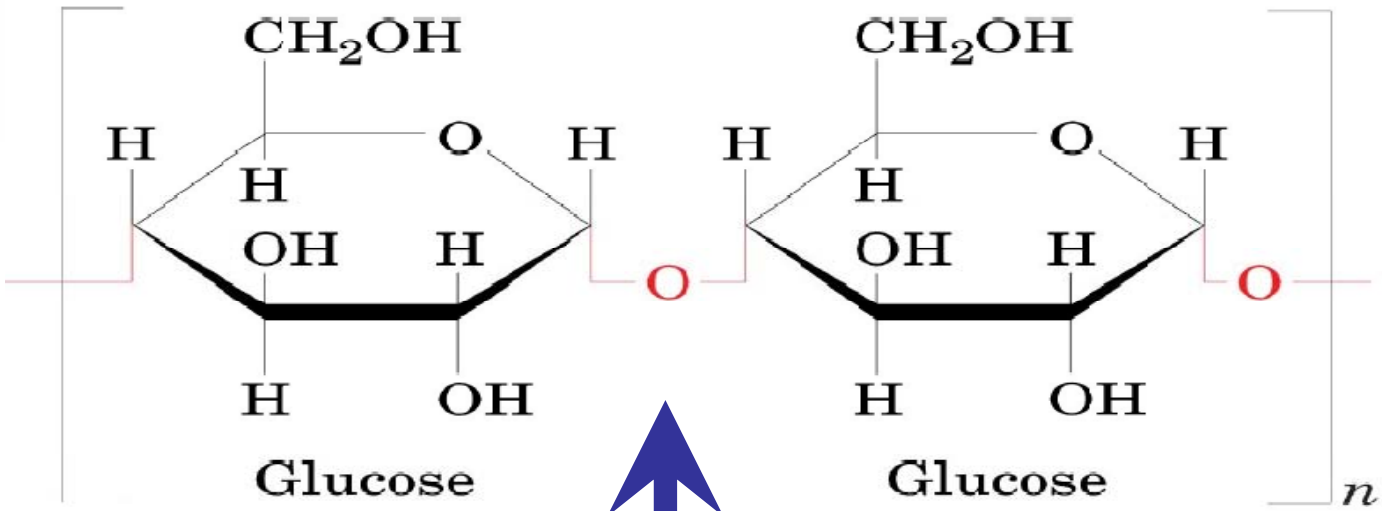
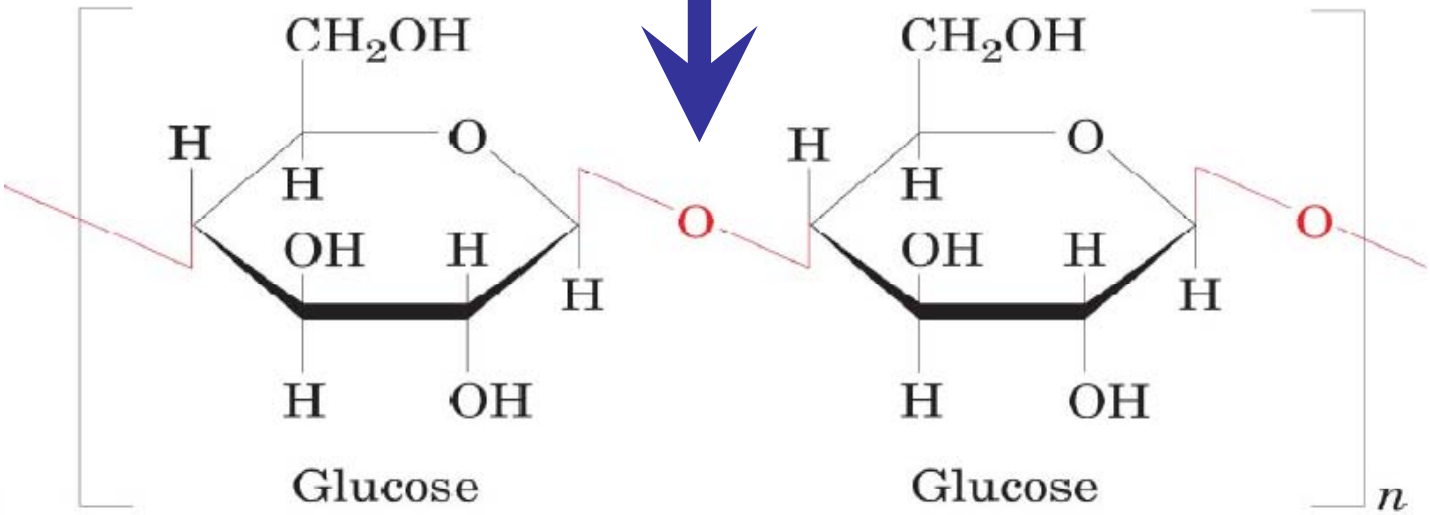
Starch



Fibre



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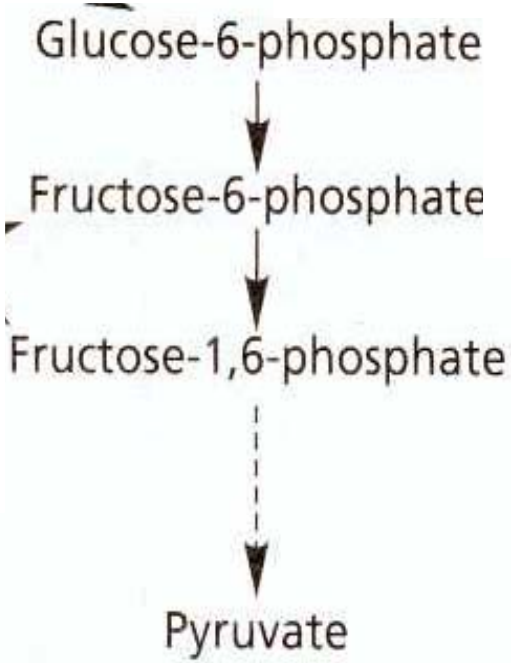
Carbohydrate Metabolism



But, what about the "*whoof*" factor

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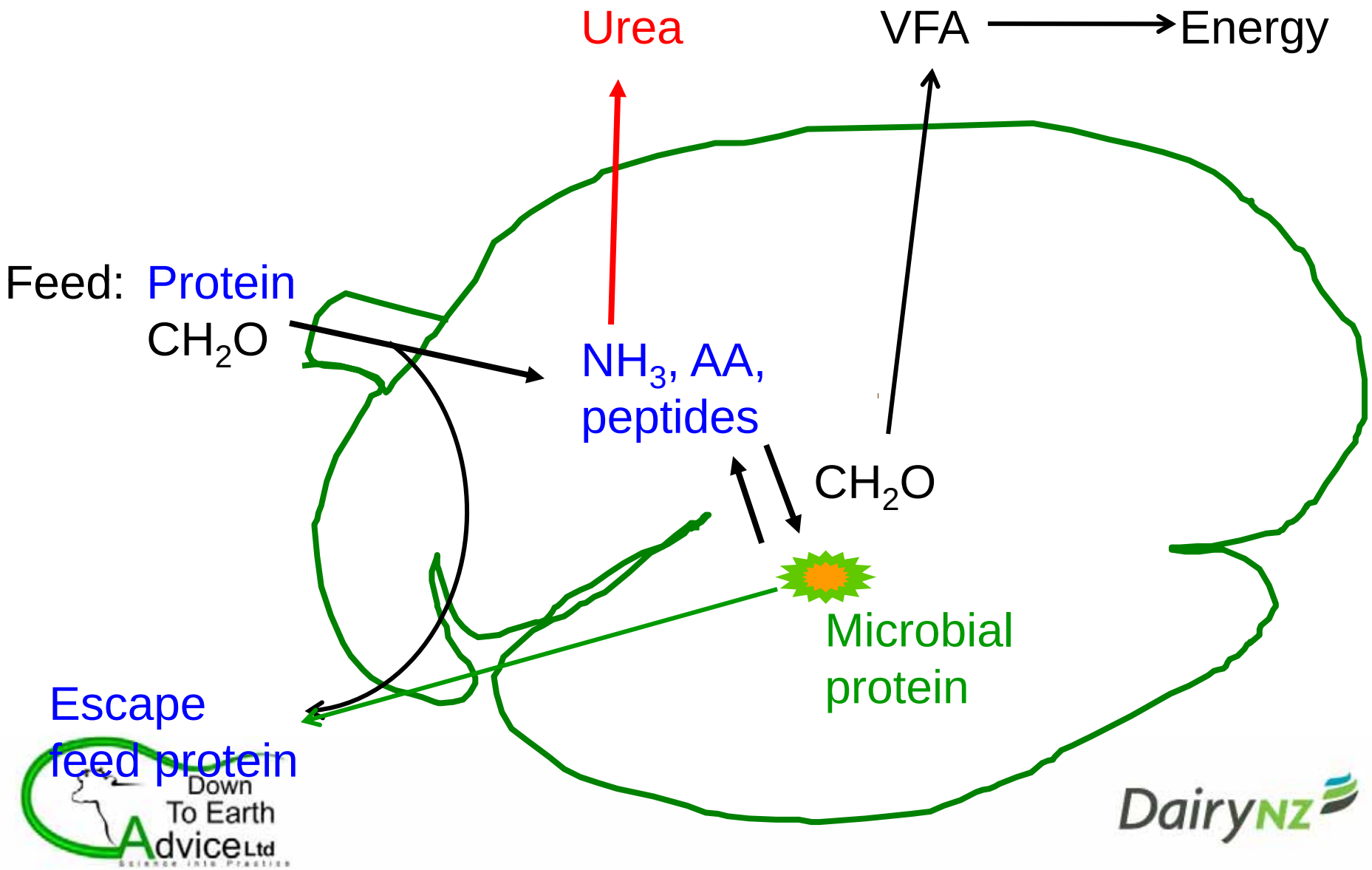
The "*whoof*" factor!



"*Whoof*" factor = speed of CH_2O release

Carbohydrate	%/hr
Corn	10 to 20
Barley	20 to 30
Wheat	35 to 45
High quality Pasture	12 to 16
Molasses	250+

Sniffen et al., 1992; Kolver, 1997

"*Whoof*" factor = speed of CH_2O release

Carbohydrate	%/hr	Protein	%/hr
Corn	10 to 20	Rapid	250+
Barley	20 to 30		
Wheat	35 to 45		
High quality Pasture	12 to 16	Slow	20 to 25
Molasses	250+		

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Sniffen et al., 1992; Kolver, 1997

Proceedings of the New Zealand Society of Animal Production 1996, Vol 56

Microbial protein synthesis and milk production in cows offered pasture diets differing in non-structural carbohydrate content

V.R. CARRUTHERS, P.G. NEIL AND D.E. DALLEY[1]

Dairying Research Corporation, Private Bag 3123, Hamilton, New Zealand.

- 100% pasture or 85% pasture +15% supplement
  - Replacement (Isoenergetic)

Or

- 100% pasture +10-15% supplement
  - Extra

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Proceedings of the New Zealand Society of Animal Production 1996, Vol 56

Microbial protein synthesis and milk production in cows offered pasture diets differing in non-structural carbohydrate content

V.R. CARRUTHERS, P.G. NEIL AND D.E. DALLEY[1]

Dairying Research Corporation, Private Bag 3123, Hamilton, New Zealand.

- No increase in efficiency of ruminal N utilisation.
- No increase in microbial protein.

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Proceedings of the New Zealand Society of Animal Production 1996, Vol 56

Microbial protein synthesis and milk production in cows offered pasture diets differing in non-structural carbohydrate content

V.R. CARRUTHERS, P.G. NEIL AND D.E. DALLEY[1]

Dairying Research Corporation, Private Bag 3123, Hamilton, New Zealand.

Experiment 1

	Pasture	Conc. Replace	Conc. Extra
Milk, lb/d	48.2	47.5	49.3
Fat, %	4.74	4.51	4.46
Protein, %	3.37	3.39	3.42

Experiment 2

	Pasture	Conc. Replace	Conc. Extra
Milk, lb/d	22.7	24.0	25.5
Fat, %	5.08	4.83	4.80
Protein, %	3.53	3.51	3.55

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Supplementation with concentrates either pre- or post-partum does not affect milk production when diets are iso-energetic

J.R. ROCHE, J.M. LEE, P.W. ASPIN, A.J. SHEAHAN, C.R. BURKE, E.S. KOLVER, B. SUGAR AND A.R. NAPPER

Dexcel Ltd., Private Bag 3221, Hamilton New Zealand

- Isoenergetic diets
  - Replaced pasture energy with concentrate energy (12.5 lb/d)

	Pasture	Concentrates
NE_L Intake, MCal/d	12	12
Milk, lb/d	50.4	53.2
Fat, %	4.99	4.40
Protein, %	3.48	3.53

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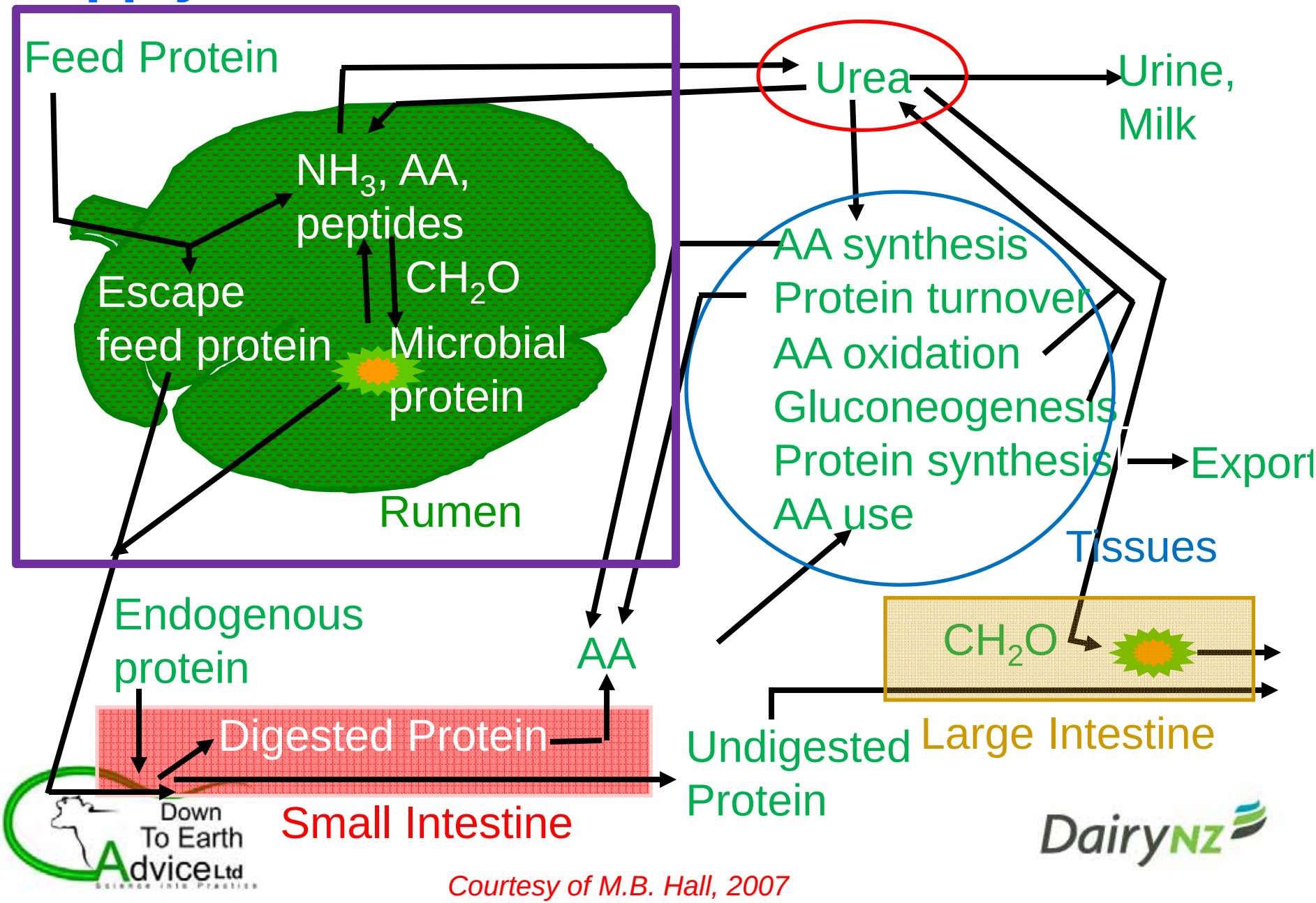
Supply and Demand



Courtesy of M.B. Hall, 2007

Supplements only increase milk production if they increase energy intake.

There is nothing magical happening.

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Let's assume energy intake is increased.

What is the milk production response to supplements?

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Ruakura Farmers Conference, 1999

Determining How To Make Inputs Increase Your Economic Farm Surplus

Farms stocked at 1.8 cows/ac

Kevin Macdonald
Dairying Research Corporation
Hamilton

Table 2: Milksolids responses to N boosted pasture and supplements @ $3.50/kg MS.

Herd	Extra feed source	g MS/kg DM fed		g MS/MJ ME fed
2	N boosted pasture	108		
3	N boosted pasture	79		
6	Maize grain	99	**1.17 lb milk/lb fed**	7.6
7	Maize silage	78		7.4
8	Balanced ration	99	**1.17 lb milk/lb fed**	7.9

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Animal Science 2002, 75: 433-445

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]

[1]*Dairy Production Department, Teagasc, Moorepark Production Research Centre, Fermoy, Co. Cork, Ireland*
[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

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J. Dairy Sci. 86:610–621

Effect of Genetic Merit and Concentrate Supplementation on Grass Intake and Milk Production with Holstein Friesian Dairy Cows

J. Kennedy,*† P. Dillon,* L. Delaby,‡ P. Faverdin,‡ G. Stakelum,* and M. Rath†
*Dairy Production Department, Teagasc,
Moorepark Production Research Center, Fermoy, Co. Cork, Ireland
†Department of Animal Science, Faculty of Agriculture,
University College Dublin, Belfield, Dublin 4, Ireland
‡INRA, UMR Production du Lait, 35590 St. Gilles, France

- 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

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J. Dairy Sci. 88:1231–1243

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]
[1]Dairy Production Department, Teagasc, Dairy Production Research Centre Moorepark, Fermoy, Co. Cork, Ireland
[2]Department of Animal Science, Faculty of Agriculture, University College Dublin, Belfield, Ireland
[3]3INRA, 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

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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

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Animal (2009), 3:6, pp 891–905 © The Animal Consortium 2009
doi:10.1017/S1751731109004212

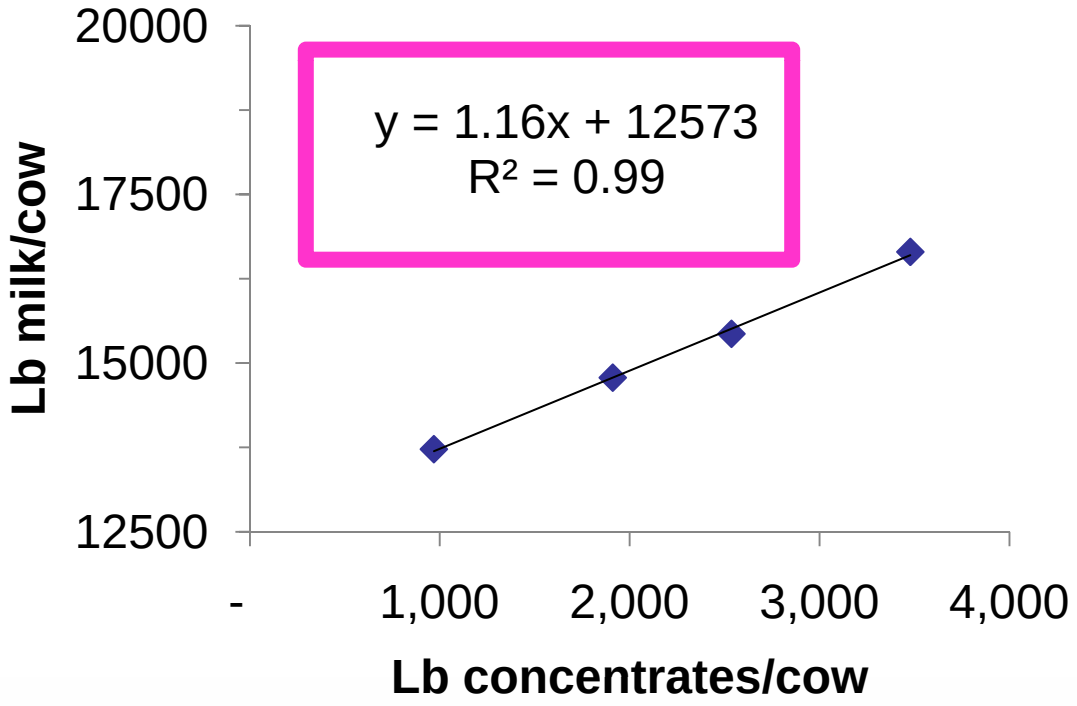
animal

Effect of different feeding strategies on lactation performance of Holstein and Normande dairy cows

L. Delaby[1†], P. Faverdin[1], G. Michel[2], C. Disenhaus[1] and J. L. Peyraud[1]

[1]*INRA, AgroCampus Ouest, Dairy Production Research Unit, UMR1080, 35590 Saint Gilles, France;* [2]*INRA, Experimental farm, UE326, Le Pin-au-Haras, Borculo, 61310 Exmes, France*

- 969 to 3,478 lb supplement
- 13,724 to 16,647 lb/cow



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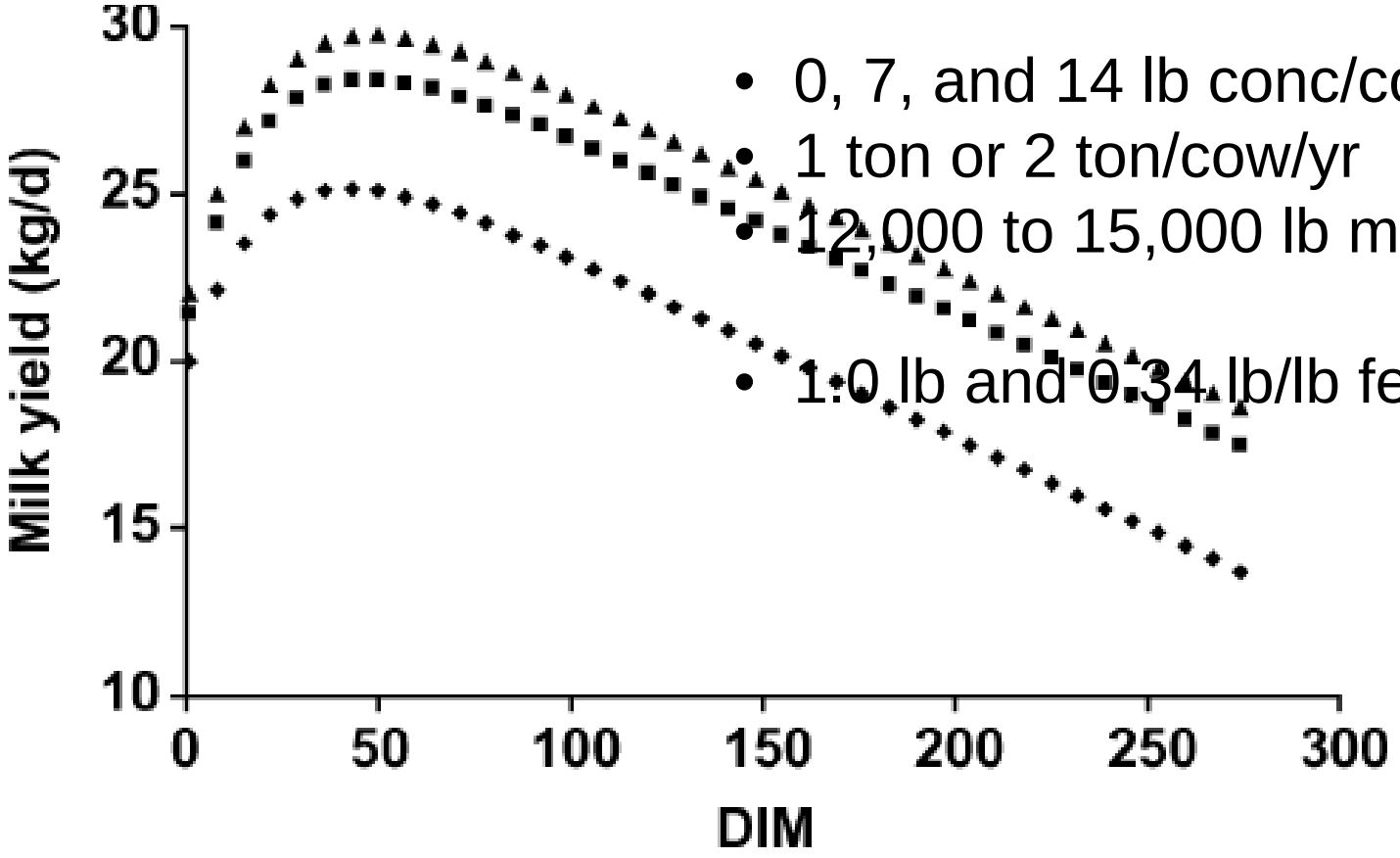
J. Dairy Sci. 89:3532–3543

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

J. R. Roche,*[1,2] D. P. Berry,† and E. S. Kolver*
*Dexcel, Hamilton, New Zealand
†Teagasc Moorepark, Fermoy, Co. Cork, Ireland



- 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.

J. Dairy Sci. 86:1–42

Invited Review: Production and Digestion of Supplemented Dairy Cows on Pasture

F. Bargo,*,[1] L. D. Muller,* E. S. Kolver,† and J. E. Delahoy*
*Department of Dairy and Animal Science,
The Pennsylvania State University, University Park, PA 16802
†Dexcel Ltd., Private Bag 3221, Hamilton, New Zealand

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

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Response to supplements

Residual lb/ac	Response Lb milk
1,200 to 1,350 (6.0 to 7.0 clicks)	1.0 to 1.2

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But what about the 1 in 200 rule

J. Dairy Sci. 89:3532–3543

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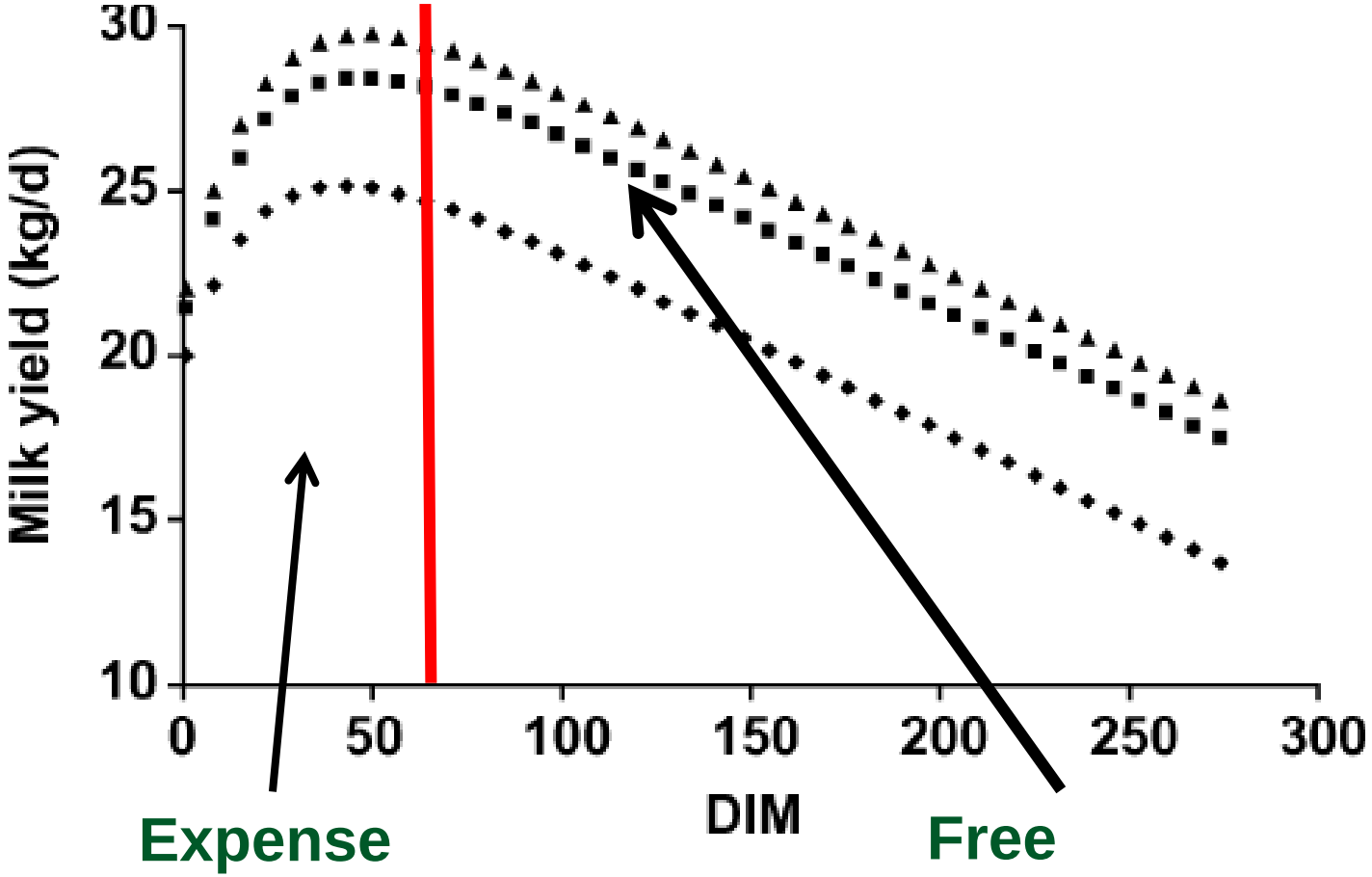

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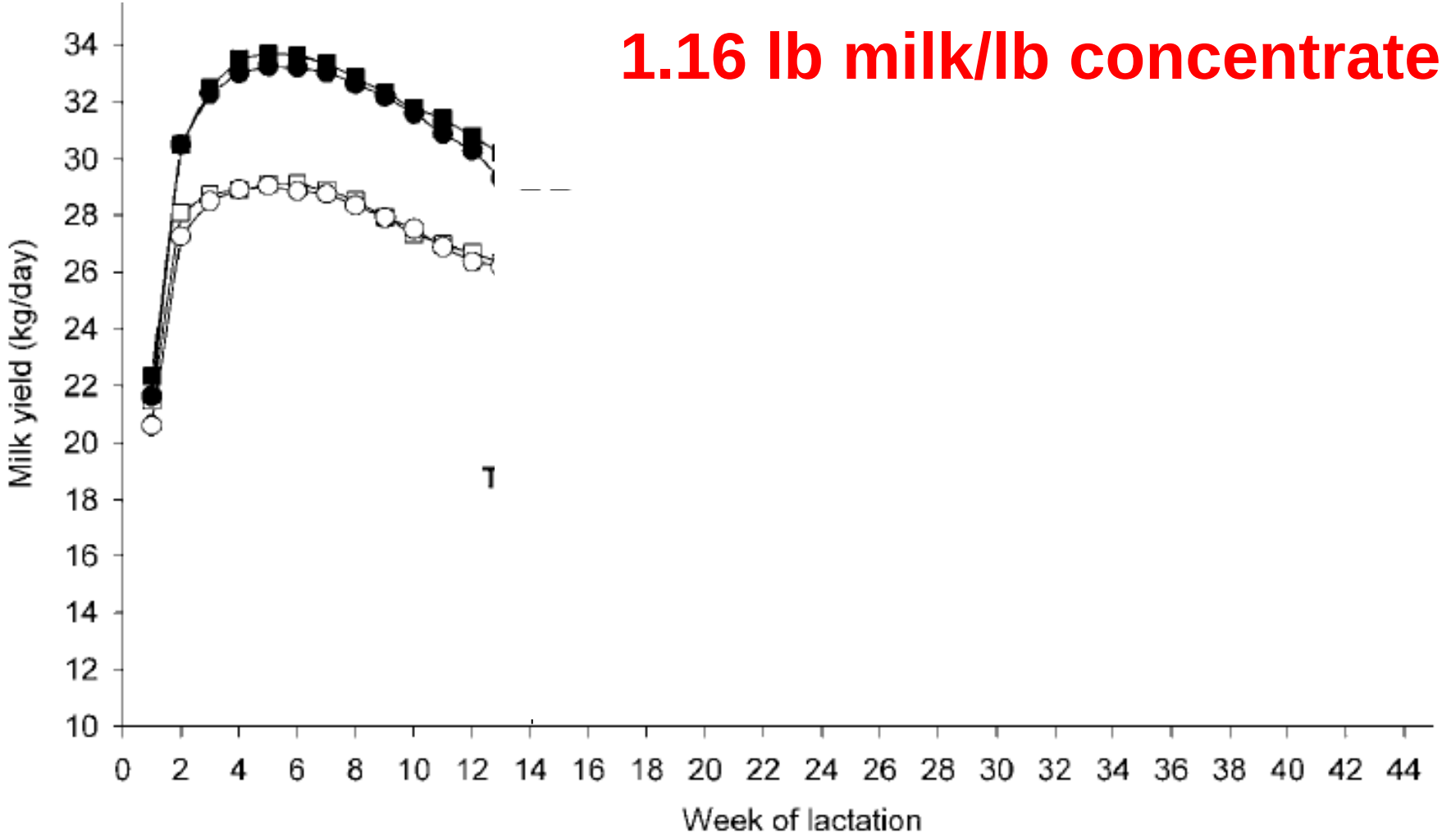
animal

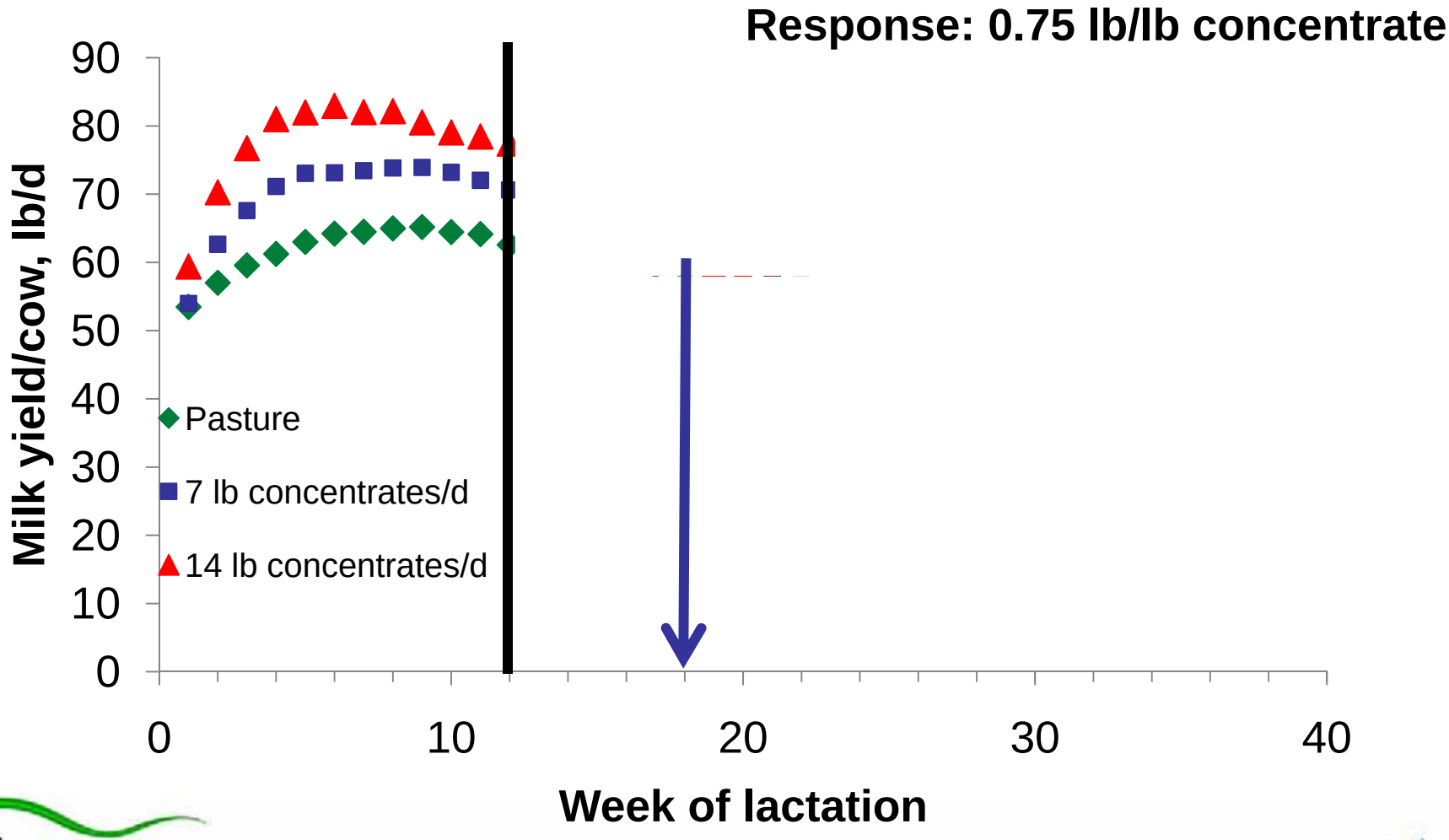
Effect of different feeding strategies on lactation performance of Holstein and Normande dairy cows

L. Delaby[1†], P. Faverdin[1], G. Michel[2], C. Disenhaus[1] and J. L. Peyraud[1]

1.16 lb milk/lb concentrates



Cows supplemented for 12 Wk



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Roche et al., unpublished

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Well that's research trials.

What about on-farm responses.

Average: 0.4 to 0.5 lb/lb supplement fed

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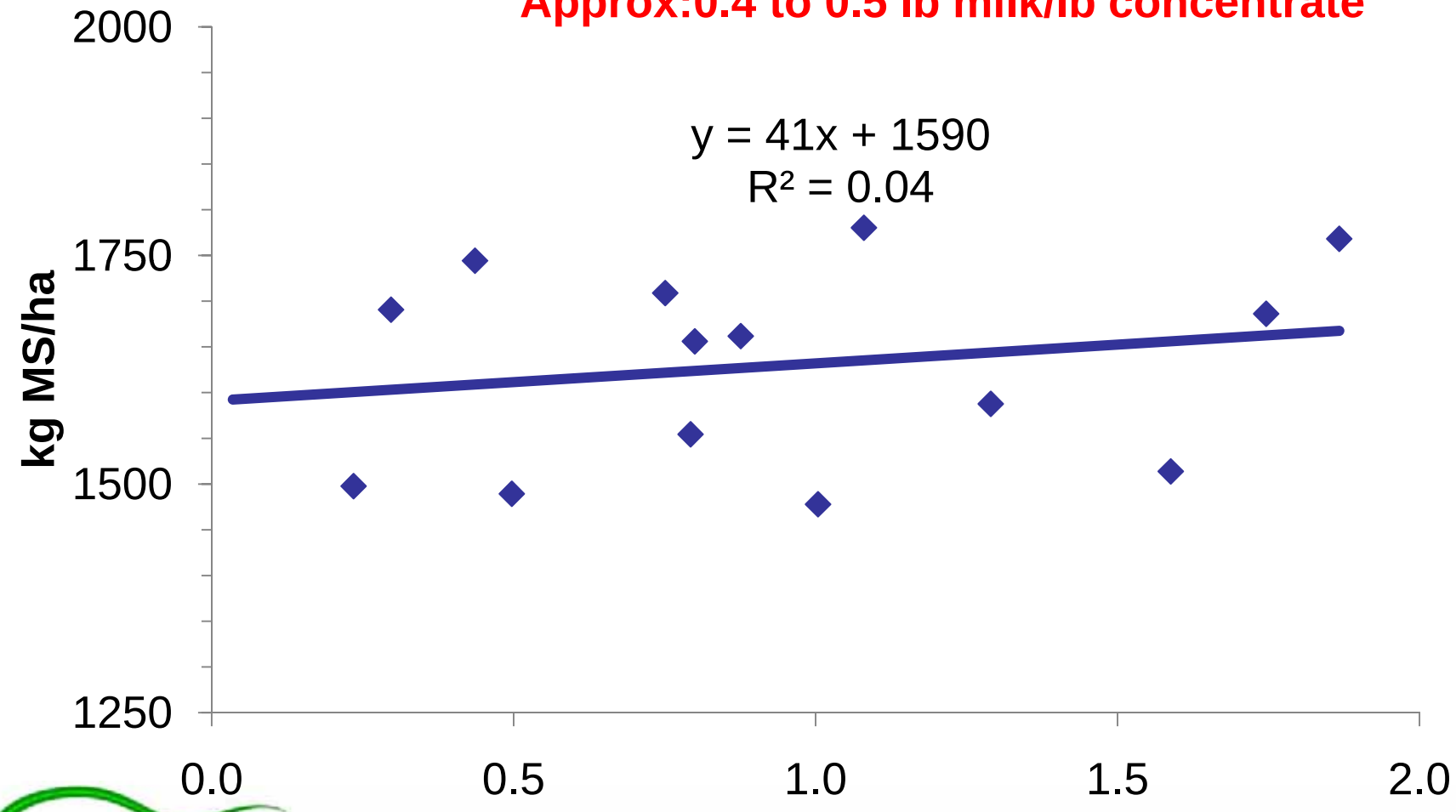
Canterbury data: Average response to supplements per ha

Approx:0.4 to 0.5 lb milk/lb concentrate



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“The problem with facts is that you can prove anything with facts!”

-Homer J Simpson

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So: what's your response rate?

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Body condition score

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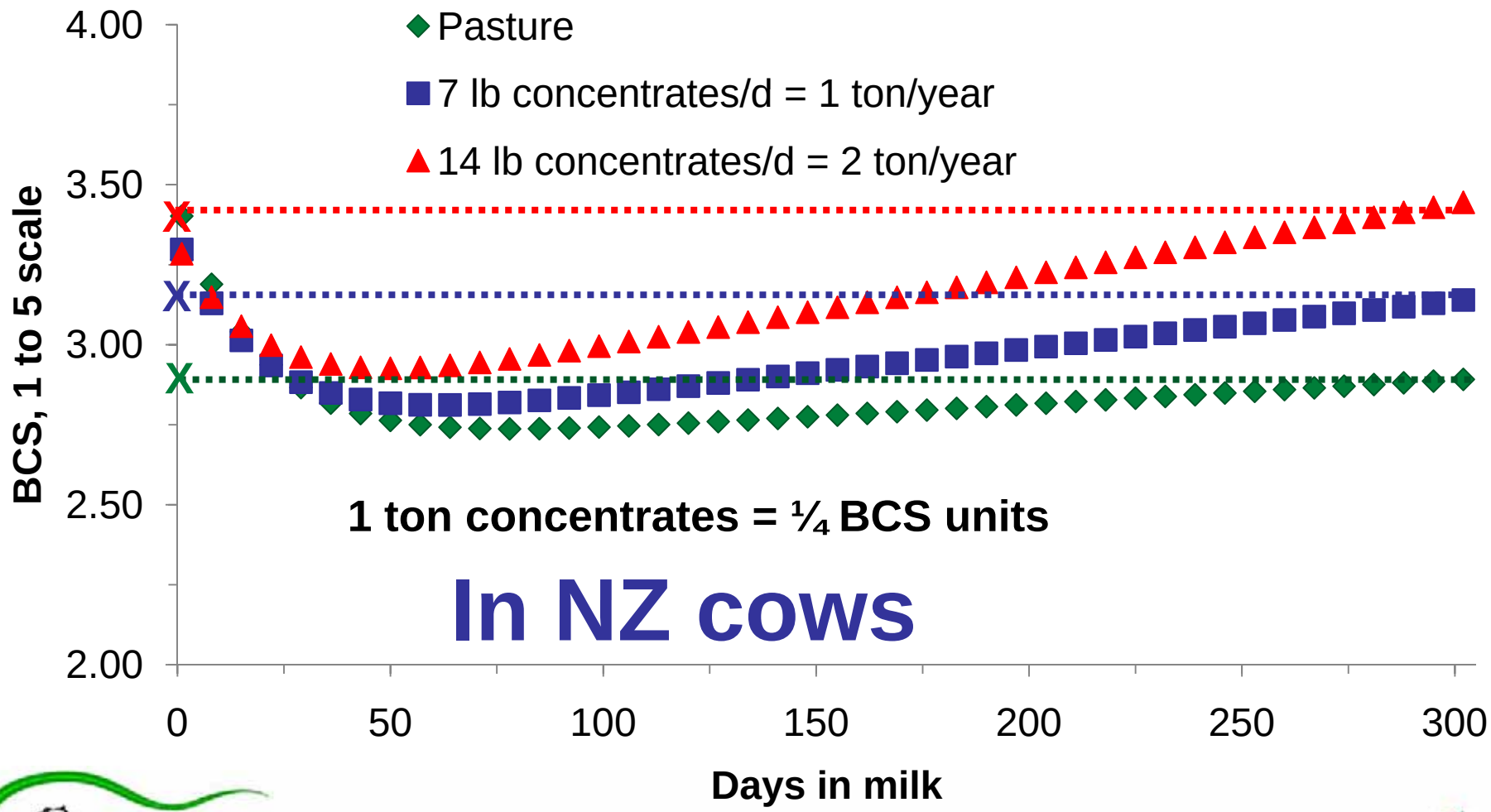
J. Dairy Sci. 89:3532–3543

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

J. R. Roche,*[1,2] D. P. Berry,† and E. S. Kolver*
*Dexcel, Hamilton, New Zealand
†Teagasc Moorepark, Fermoy, Co. Cork, Ireland

Effect of concentrates on BCS



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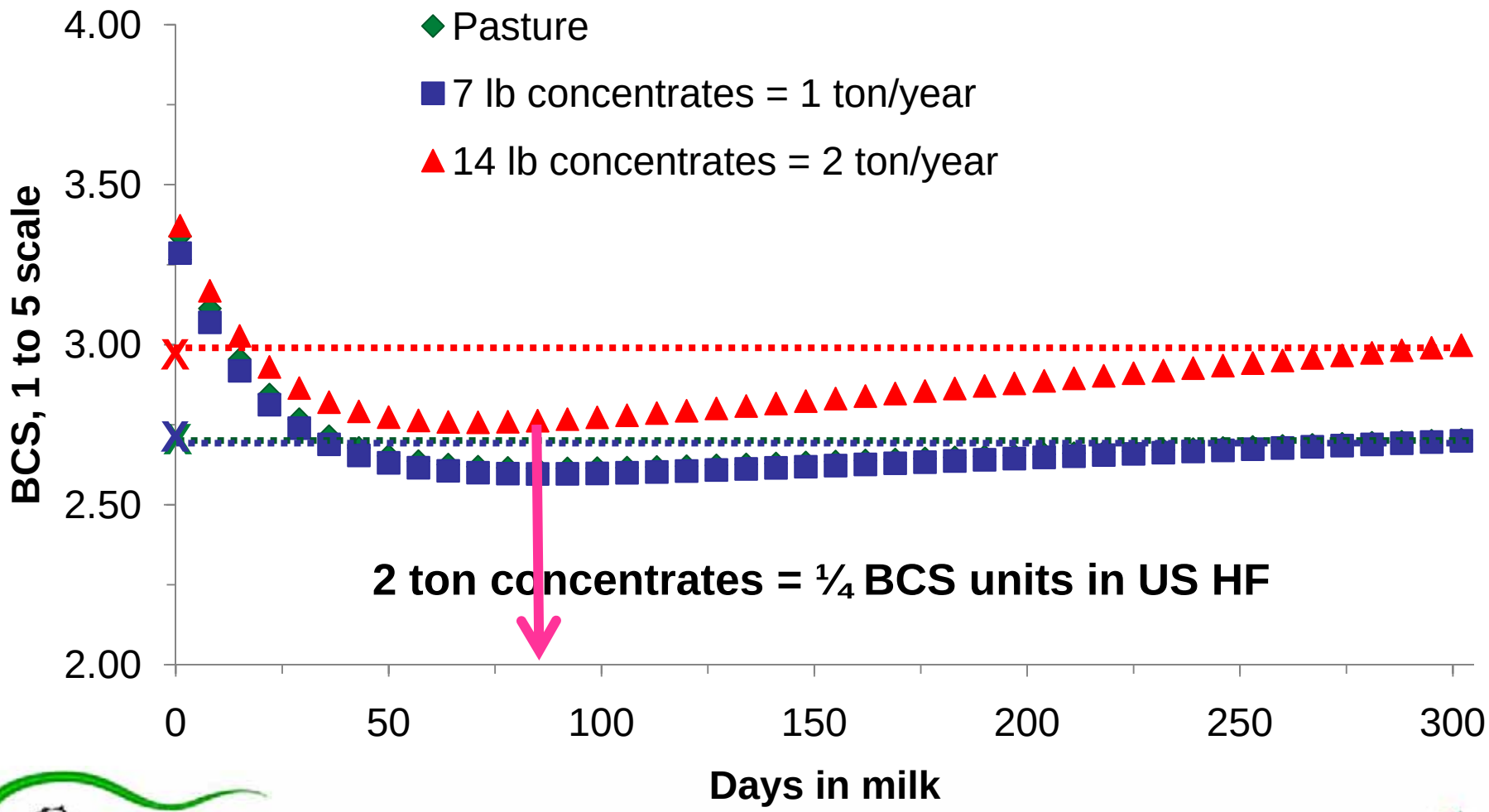
Effect of concentrates on BCS



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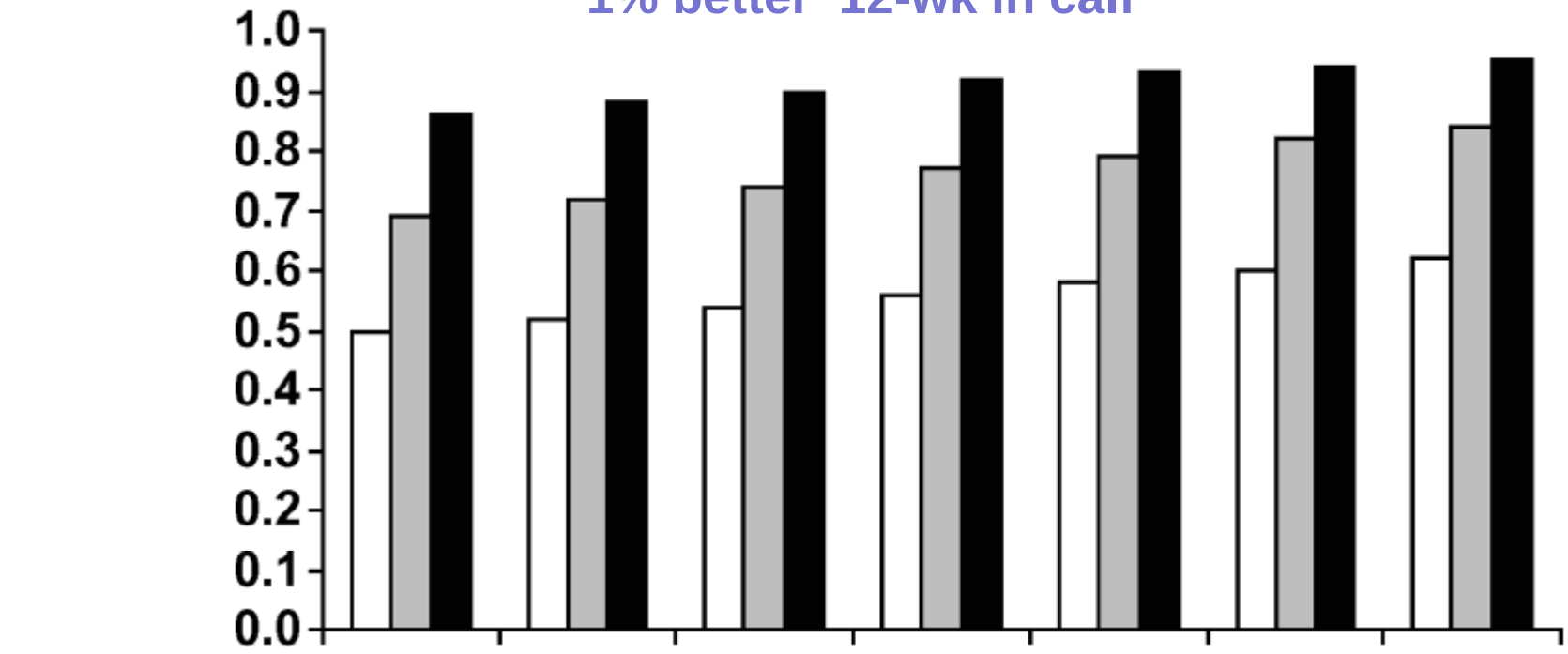
J. Dairy Sci. 90:376–391

Associations Among Body Condition Score, Body Weight, and Reproductive Performance in Seasonal-Calving Dairy Cattle

J. R. Roche,*[1,2] K. A. Macdonald,* C. R. Burke,* J. M. Lee,* and D. P. Berry†
*Dexcel Ltd., Hamilton, New Zealand
†Teagasc, Moorepark Dairy Production Research Centre, Fermoy, Co. Cork, Ireland.

Every 1/8 BCS increase at nadir: 1% better PFS, 1% better 6-wk in calf

1% better 12-wk in calf



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But, don’t I need concentrates to get cows in calf

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Supplements not required to get cows in calf

(from Macdonald 1999)

	Optimal all-pasture	Pasture + maize grain	Pasture + maize silage	Pasture + balanced ration
SR, cows/ac	**1.35**	**1.8**	**1.8**	**1.8**
Supplement, lb DM/cow	**409**	**3,069**	**2,814**	**3,208**

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InCalf Project:

Supplements not associated with reproduction

(Morton 2001)

37 Australian herds with low and high levels of supplementation on pasture had the same:

- 3-week submission rates (76%)
- First insemination conception rates (50%)
- 6-week in-calf rate (66%)
- 21-week in-calf rate (92%)

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What about profit?

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Registered at the G.P.O., Melbourne, for transmission by post as a Newspaper.

The Victorian

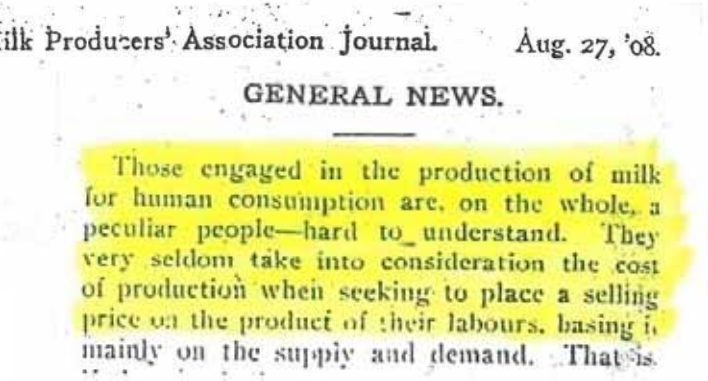
Wholesale Milk Producers'

Association Journal

Issued by the Victorian Wholesale Milk Producers' Association.

Vol. 2. No. 5. Melbourne, Aug. 27th, 1908. Price 3d.

"Those engaged in the production of milk for human consumption are a peculiar people - hard to understand.

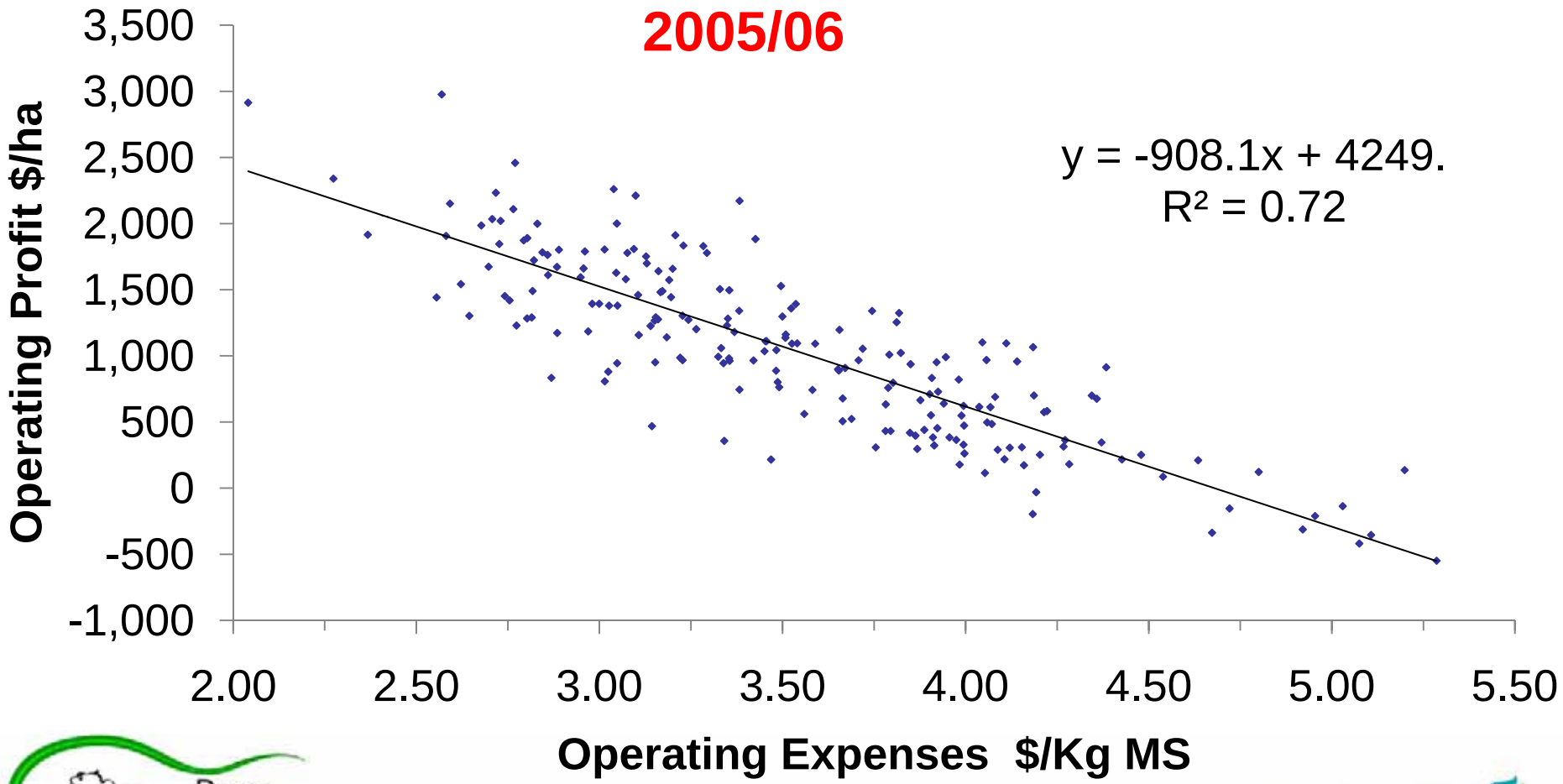


The Victorian Wholesale Milk Producers' Association Journal. Aug. 27, '08.

GENERAL NEWS.

Those engaged in the production of milk for human consumption are, on the whole, a peculiar people—hard to understand. They very seldom take into consideration the cost of production when seeking to place a selling price on the product of their labours, basing it mainly on the supply and demand. That is

Cost of production is the No. 1 driver of profit in NZ



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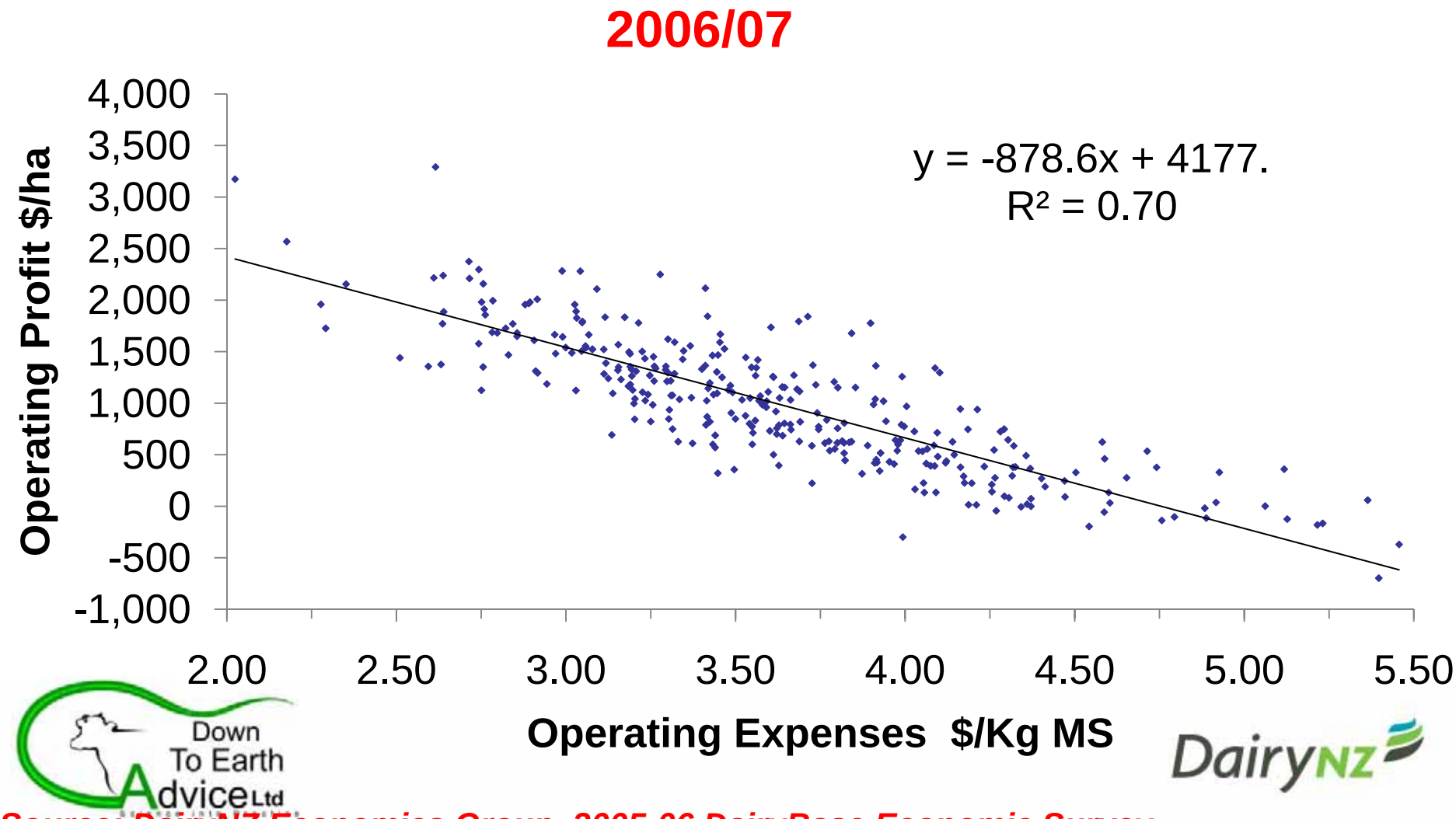
Source: DairyNZ Economics Group, 2005-06 DairyBase Economic Survey

Cost of production is the No. 1 driver of profit in NZ



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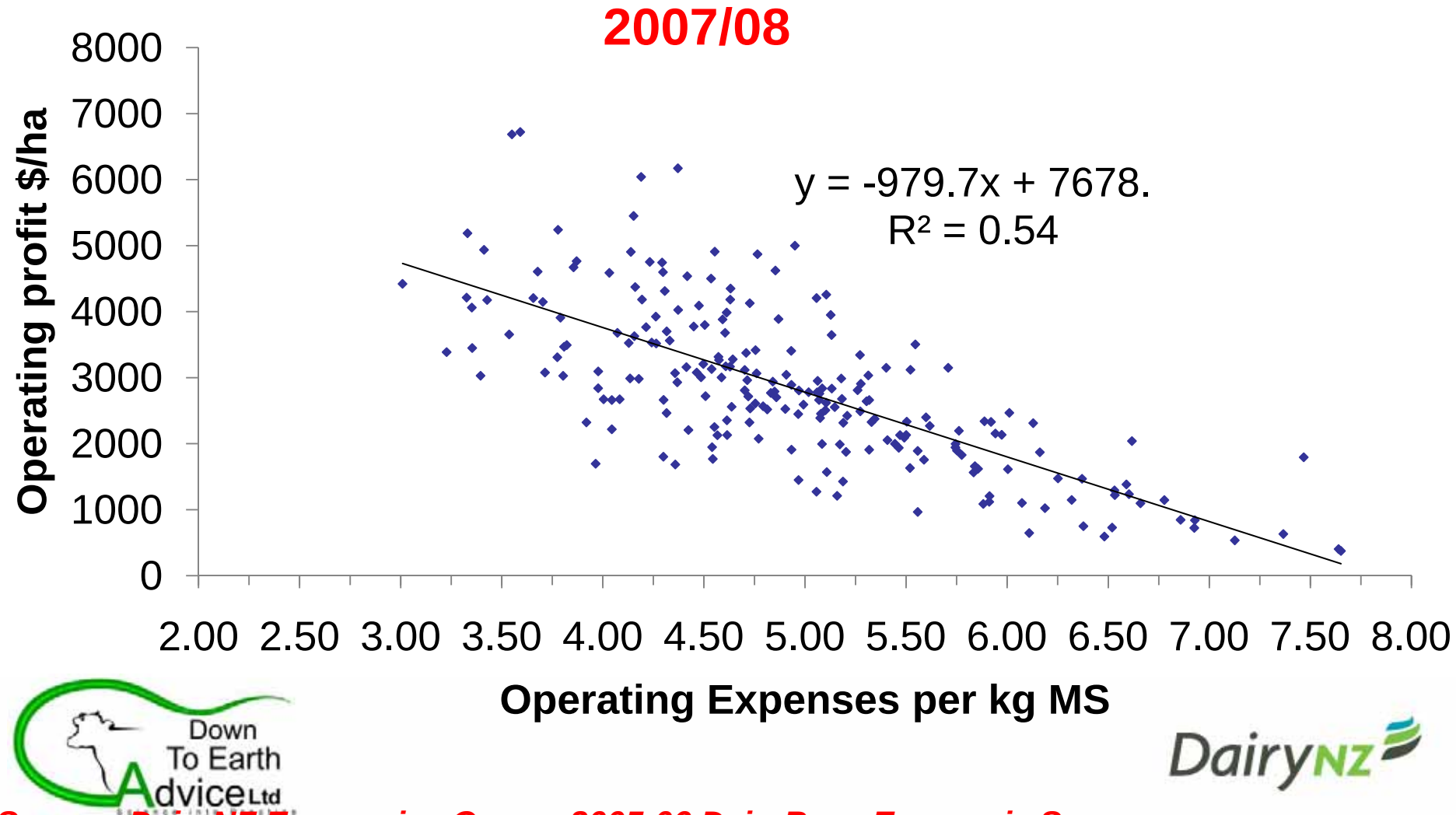
Source: DairyNZ Economics Group, 2005-06 DairyBase Economic Survey

Cost of production is the No. 1 driver of profit in NZ



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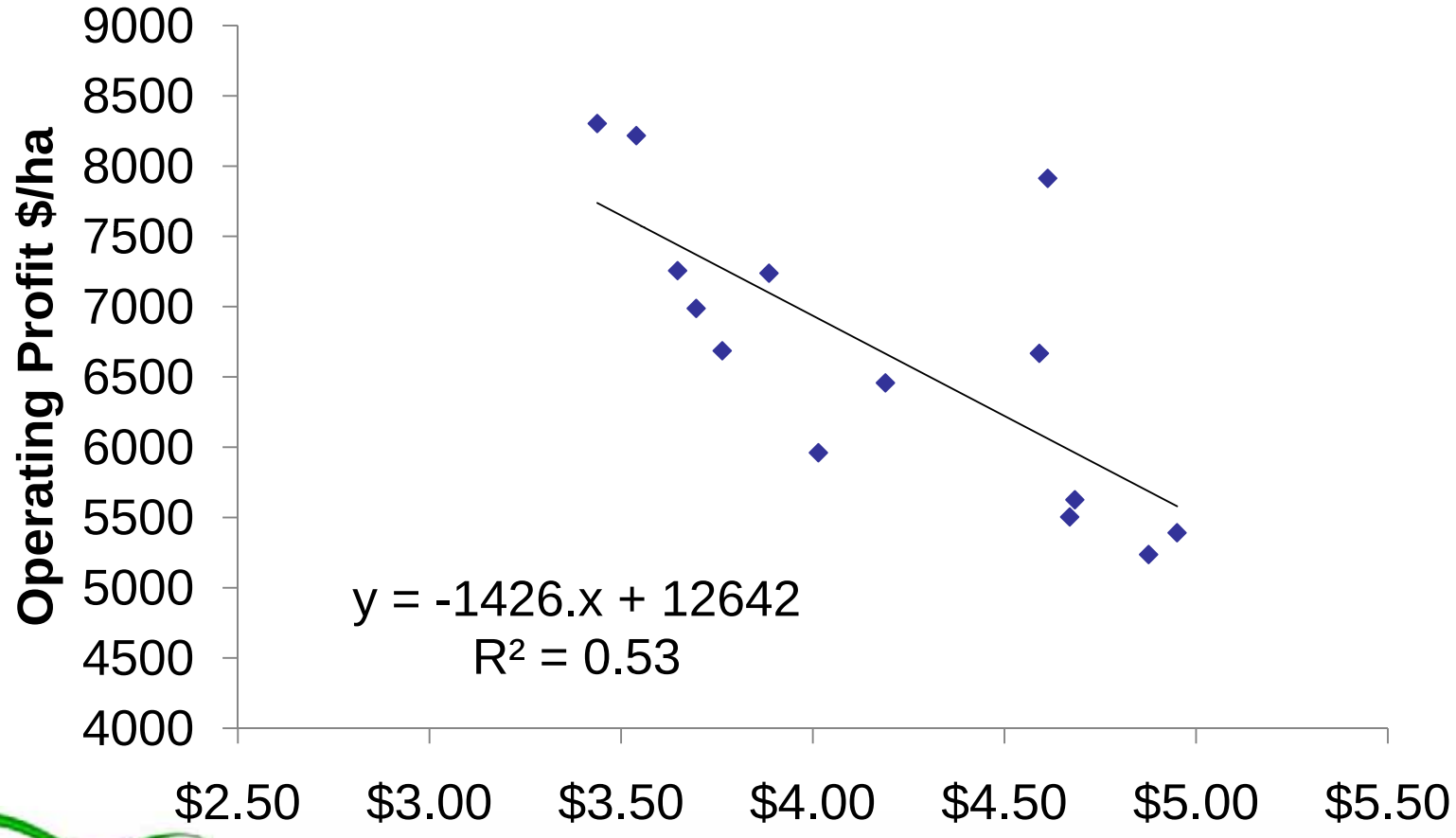
Source: DairyNZ Economics Group, 2005-06 DairyBase Economic Survey

Operating expenses explain more than 50% operating profit in on-farm Canterbury study



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What about milk yield/cow

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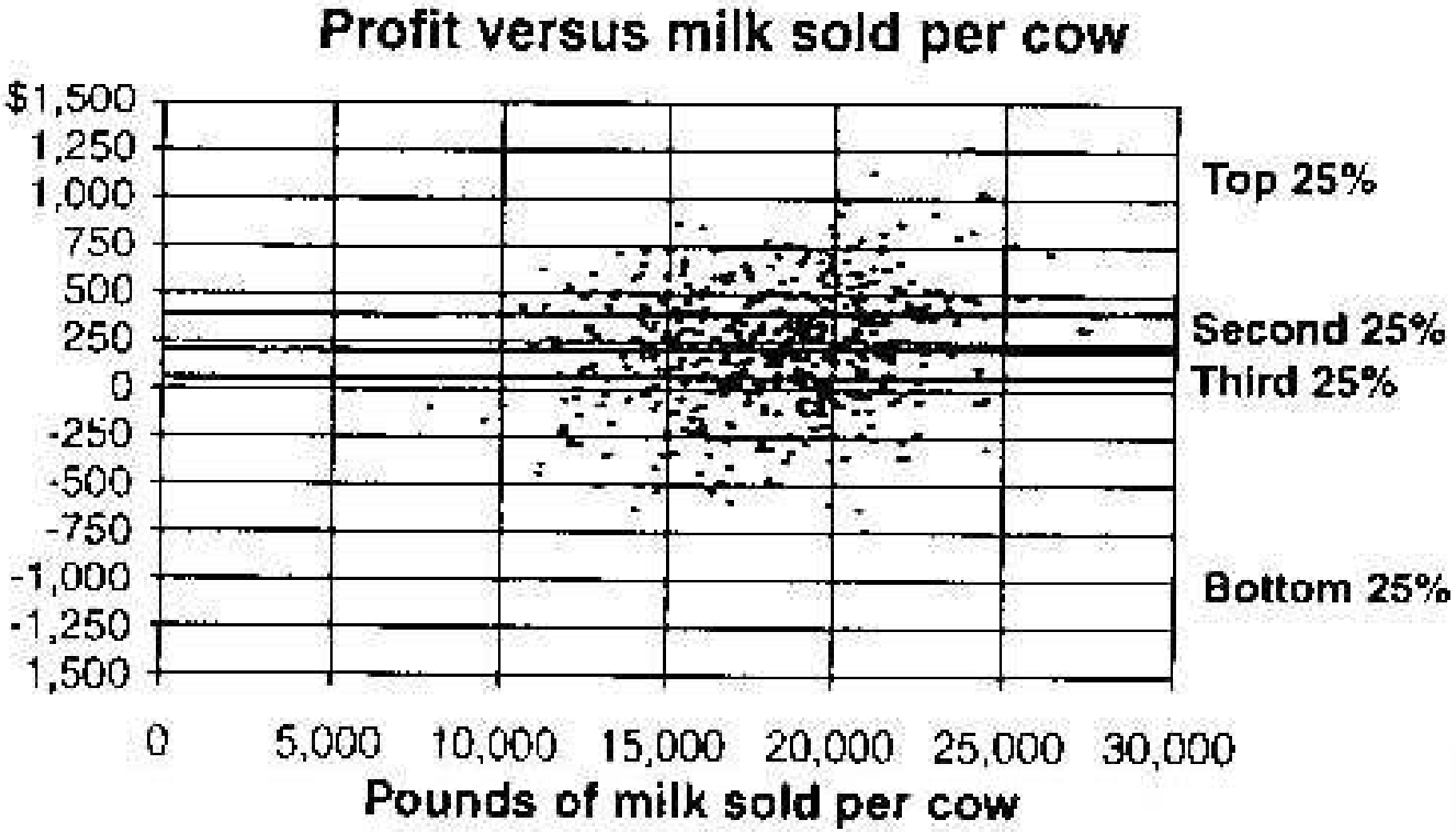
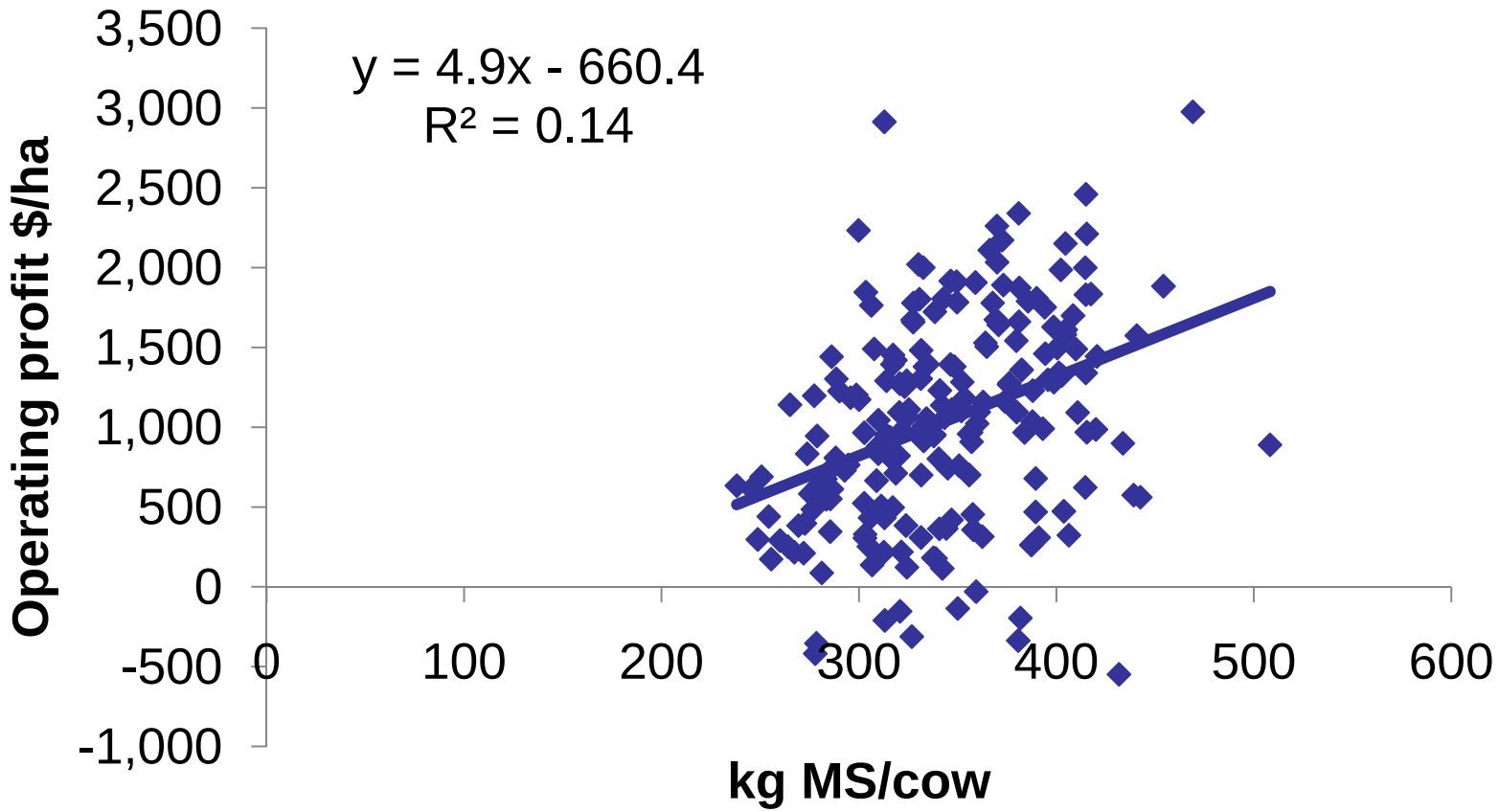
Milk yield vs Profit in the USA



Operating profit vs Milk yield/cow



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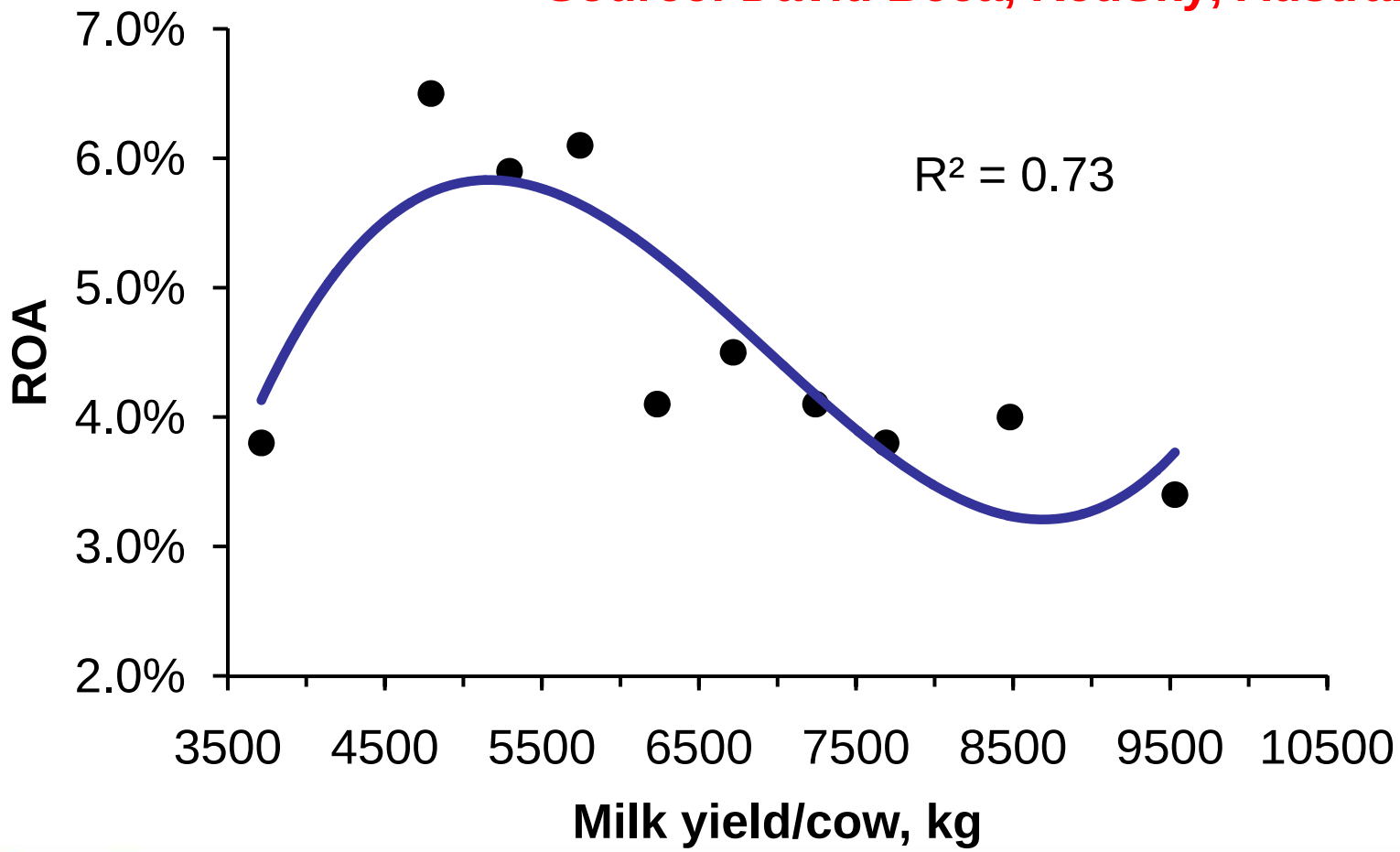
ROA vs Milk yield/cow

Source: David Beca, RedSky, Australia



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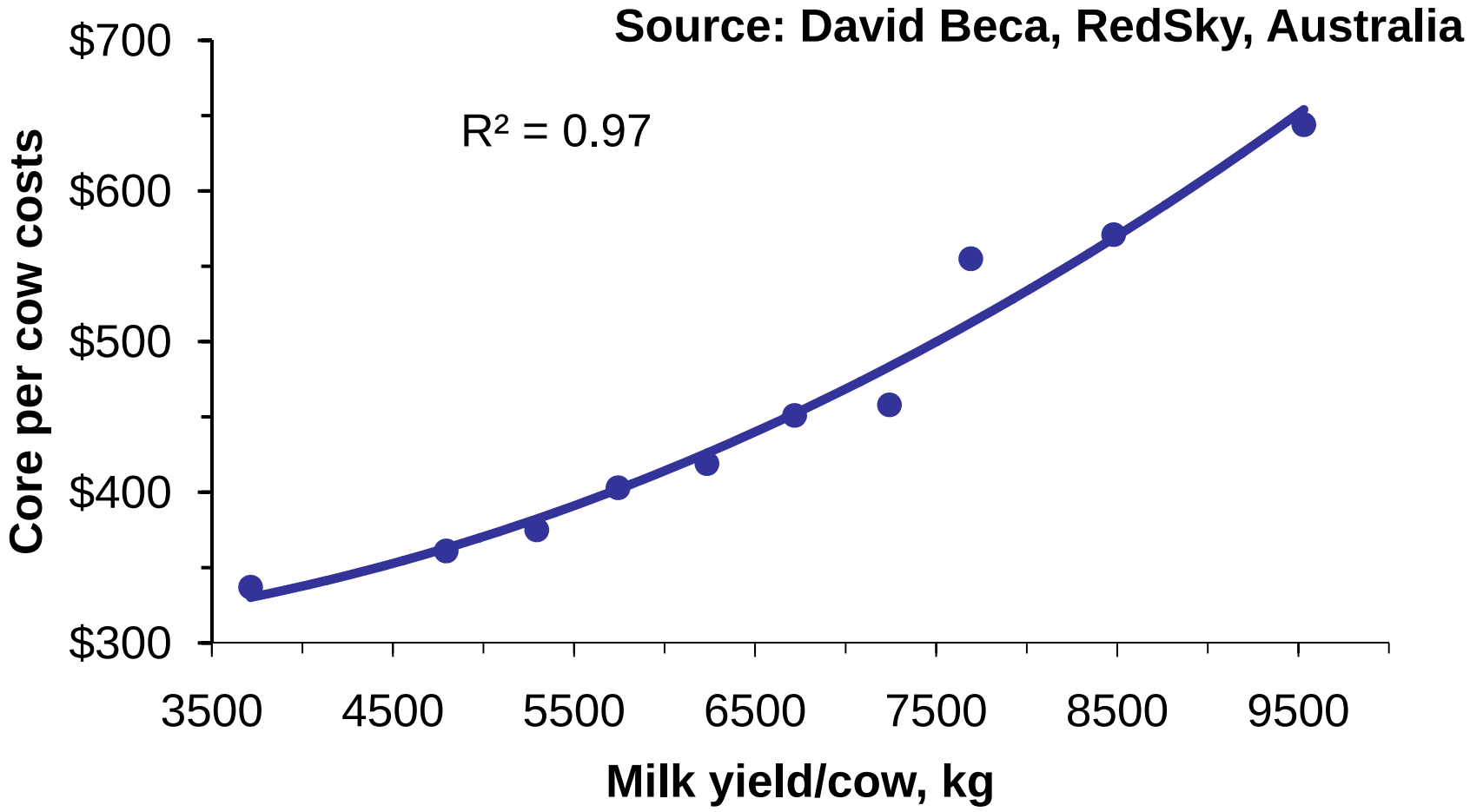
Core per cow costs vs Milk Yield/cow



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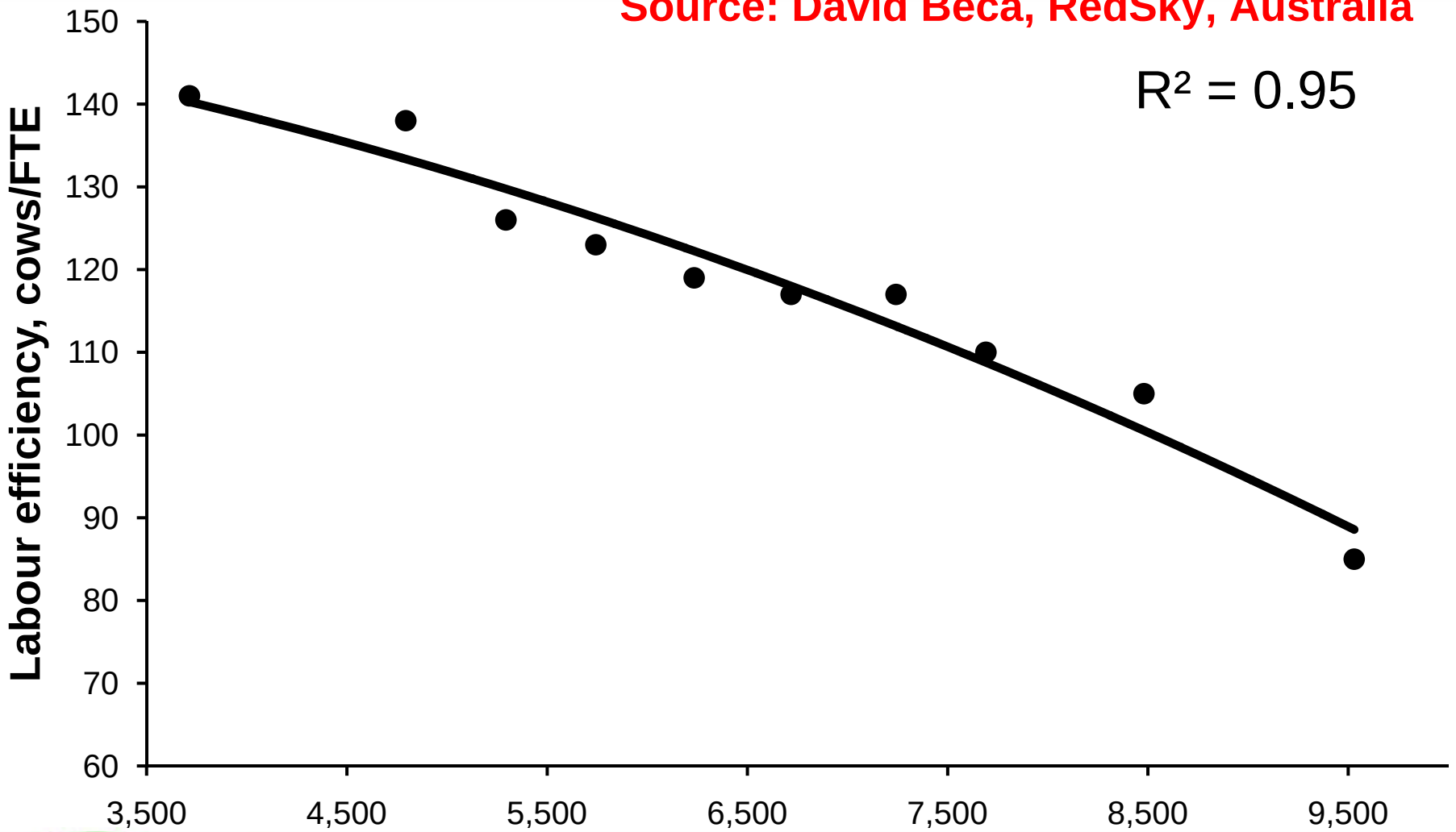
Labour use efficiency vs Milk yield/cow

Source: David Beca, RedSky, Australia



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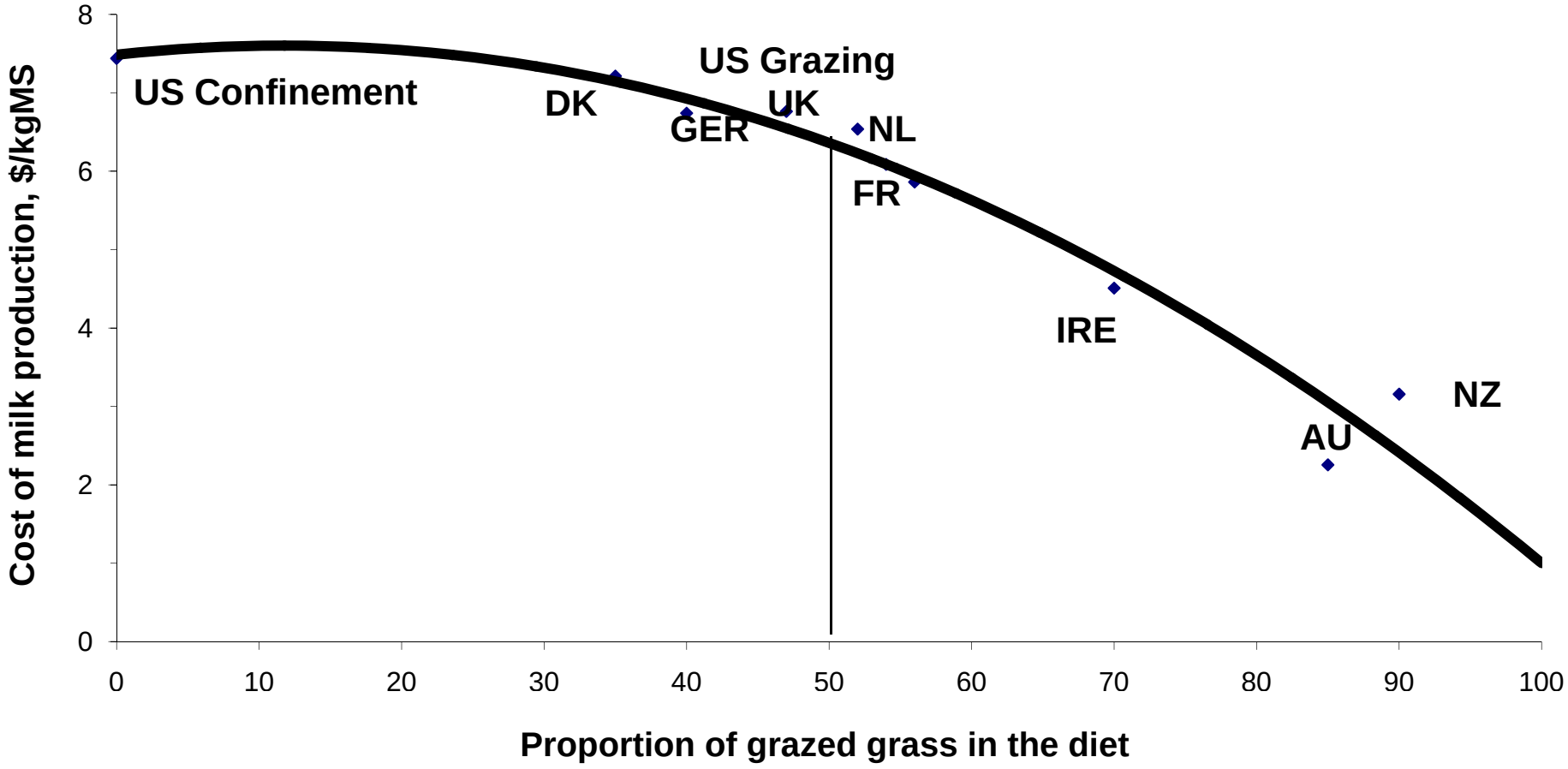
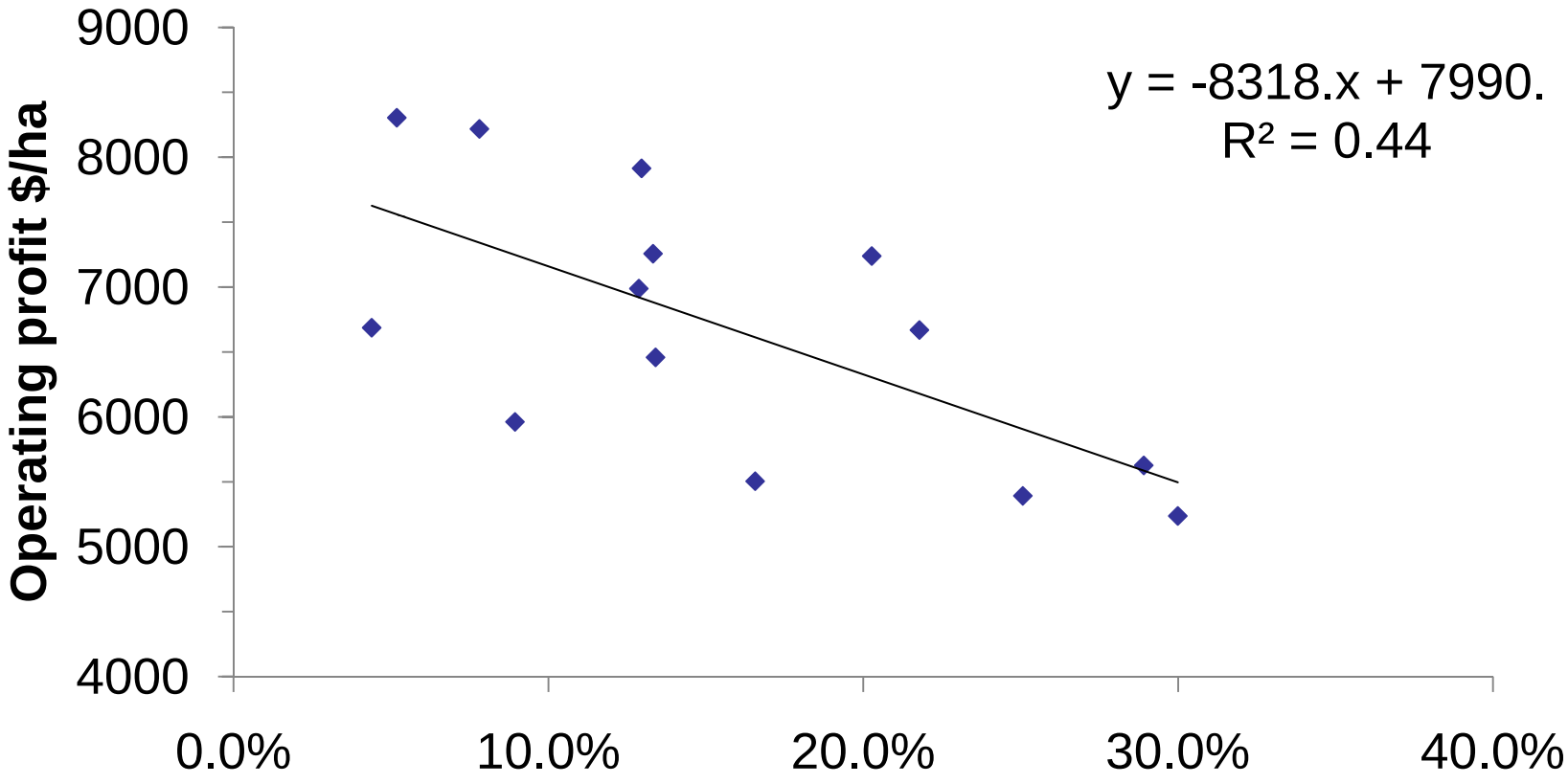
The more pasture in the diet, the lower the cost of milk production



Dillon, P., et al. 2005.

Supplements vs. Op. Profit in on-farm Canterbury study



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To conclude

How low can you go?

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Are you

- A vet/animal scientist — **10+lb/d**
  - All about cow efficiency
- A farmer driven by vanity and what others think — **8 to 10 lb/d**
  - My herd average production must be greater than X
- Profit-focussed farmer but loves cows — **4 to 6 lb/d**
  - Operating profit/acre important but cow focussed
- A pragmatic, profit-focussed farmer — **<0 lb/d**
  - Cost of production, Operating profit/acre and ROE focussed

"Milk yield is vanity. Profit is sanity!"

-Michael Murphy

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"*He who doesn't learn from history is doomed to repeat it.*"

– Old Chinese Proverb

"*Many receive advice. Only the wise profit from it*"

– Old Roman Proverb

"Supplements will fill the bucket and empty the wallet"

– New Irish Proverb