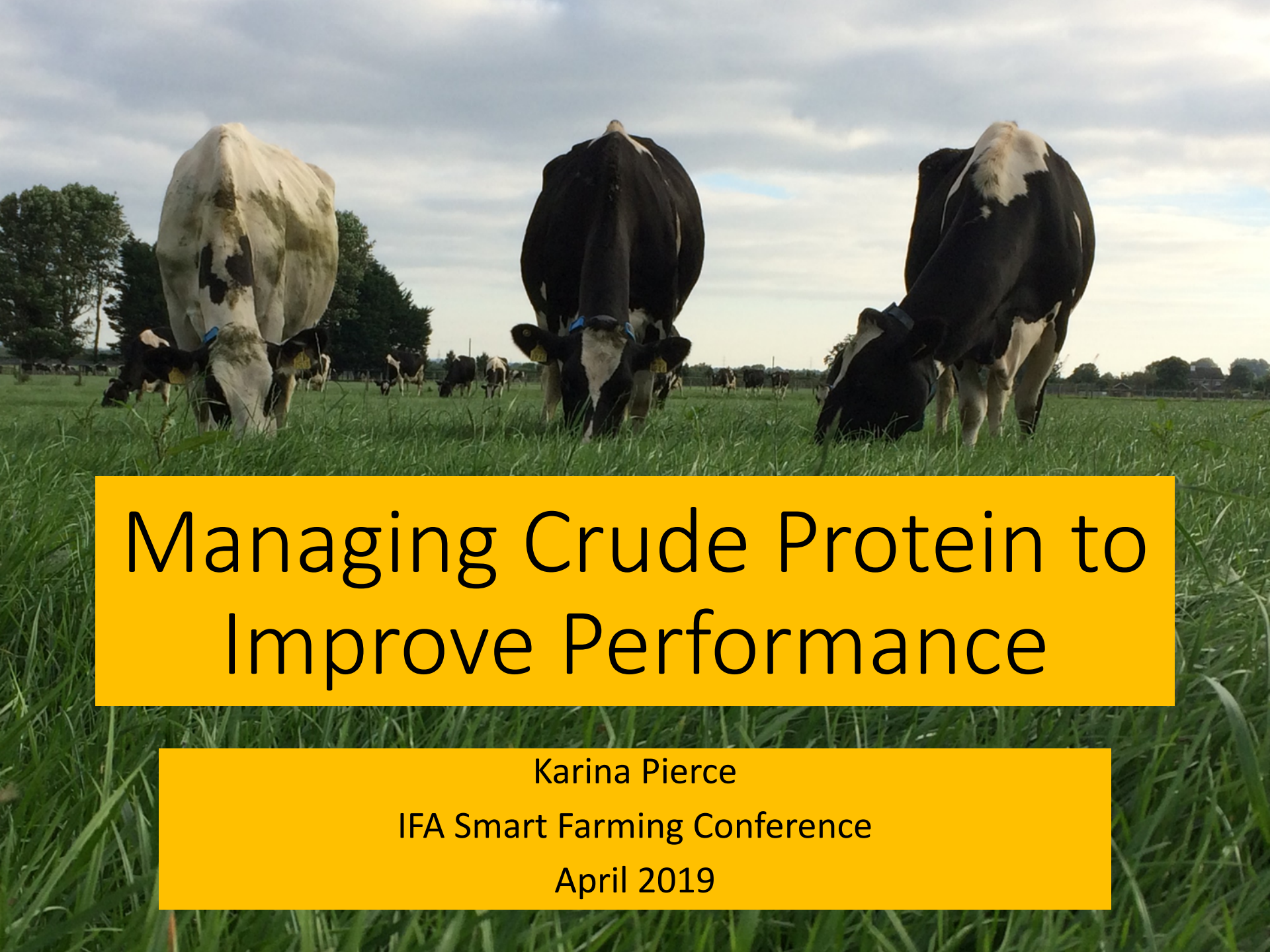


Managing Crude Protein to Improve Performance

Karina Pierce

IFA Smart Farming Conference

April 2019

Crude Protein?

- Protein in beef cattle/dairy diets is commonly expressed as **crude protein**
- Crude protein depends on the **nitrogen** content of the feed
- An animal must eat a balanced diet with enough energy, **protein**, fibre, water, minerals and vitamins to cover maintenance and growth as well as milk production and the needs of a growing foetus

Background

- Current feeding practices opt for high nitrogen (N) diets in an effort to maintain high milk yield and milk protein yields

- However…
  - Response of milk yield or milk protein yield to N is limited
  - Response of N excretion to dietary N is significant

Reasons why N nutrition is important:

Environmental Issues

Inefficient use of a scarce resource

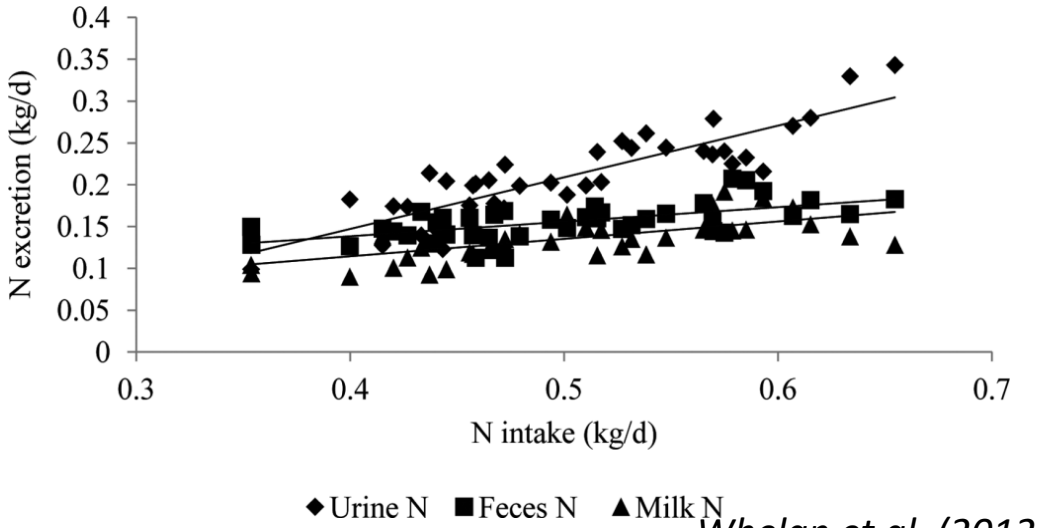
Cost

Nitrogen use efficiency in the lactating dairy cow

- High N diets are often fed to lactating dairy cows

- However…
  - Only 25-30% of the N fed is recovered in the milk
  - N retention in beef animals lower than dairy (10-20%)

- N can be lost from the production system as…
  - Ammonia
  - Nitrous Oxide
  - Nitrate Leachate



Whelan et al. (2012)

Challenge for Ireland

- Grass based system – over supply of protein to the cow
- Grass CP – 16-26%
- Limited ability to alter N excretion – low supplementation feeding levels

How Much Crude Protein?

Crude Protein (CP) % / kg fresh weight required in concentrate mixes for grass silage and ad lib meal diets for different classes of stock

Category of Animal	Grass Silage-Based Diets		
	10% CP in the Silage	14% CP in the Silage	Ad Lib meals
Weanlings (1.0 -1.5 kg feeding rate)	20%	12%	-
Weanlings (2.5 feeding rate)	16%	-	-
Suckler cows (dry)	-	-	-
Autumn Suckler cows (calves at foot)	18%	12%	-
Store cattle (500 kg+)	20%	12%	-
Growing bulls	18%	12%	12-13%
Finishing cattle (steers & heifers)	14%	11-12%	11-12%
Finishing bulls	11-12%	11-12%	11-12%

Depends on:

- type of animal
- age/growth stage of the animal

Source: Teagasc

How Much Crude Protein?

Targets for total diet composition for winter milk dairy cows

	Lactating Cow		
	Early-peak[1]	Mid-late	Dry cow
Dry matter intake (kg/day)	21.0	16.0	11.0
Energy UFL (per kg DM)	0.95-1.0	0.85-0.9	0.75
Fibre (min): NDF (%)	32	-	-
ADF (%)	21	-	-
Starch (max)	22	-	-
Oil (max)	5-6	-	-
Protein PDI (g/kg DM)	105-110	95	70
Crude protein (%)	17	15-16	13
Mineral profile (% of diet)			
Ca	0.8	0.7	0.4
P	0.4	0.35	0.3
Na	1.7	1.5	1.0
Mg	0.3	0.25	0.28

[1] peaking at 38-40kg milk

Source: Teagasc

Not enough protein

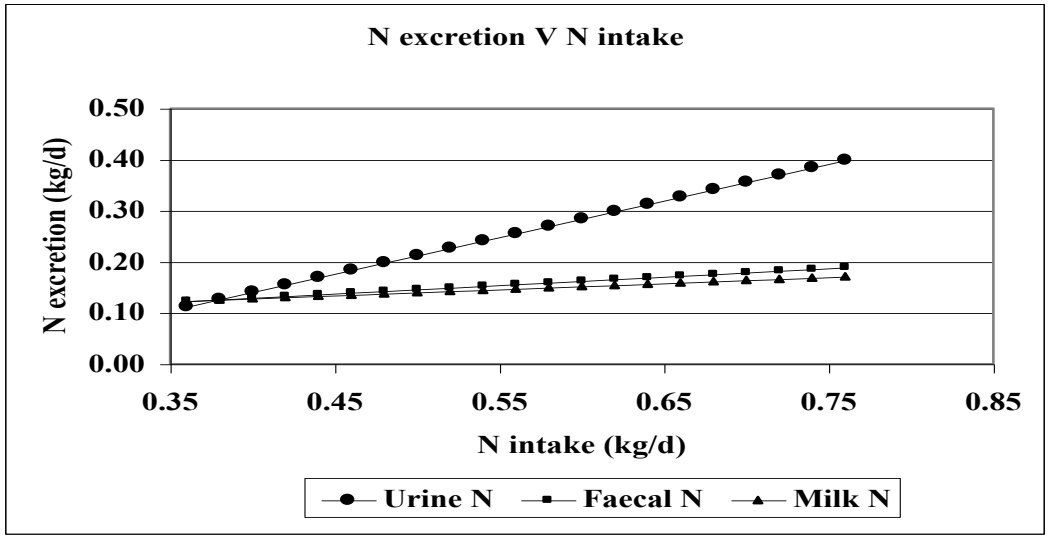
- Poor growth rates and milk protein/production
- In early spring – the level of protein in spring grass is high, but the quality may not be adequate for the freshly calved cow
- In mid-summer – during a drought situation when grass becomes stemmy, protein levels in the grass can drop and may limit production
- Examples of low protein feeds are forage maize, whole crop cereal silage, fodder beet and low protein concentrates such as citrus pulp
- Balance these with high protein feeds to ensure adequate protein in the animal's diet

Too Much Protein?

- Excessive protein can result in excessive body weight loss as the cow metabolises the extra protein

- Avoid feeding high protein diets during the breeding season

Figure 1. Pattern of urinary, fecal, and milk N excretion plotted over the N intake range observed for cows in Experiment 1.

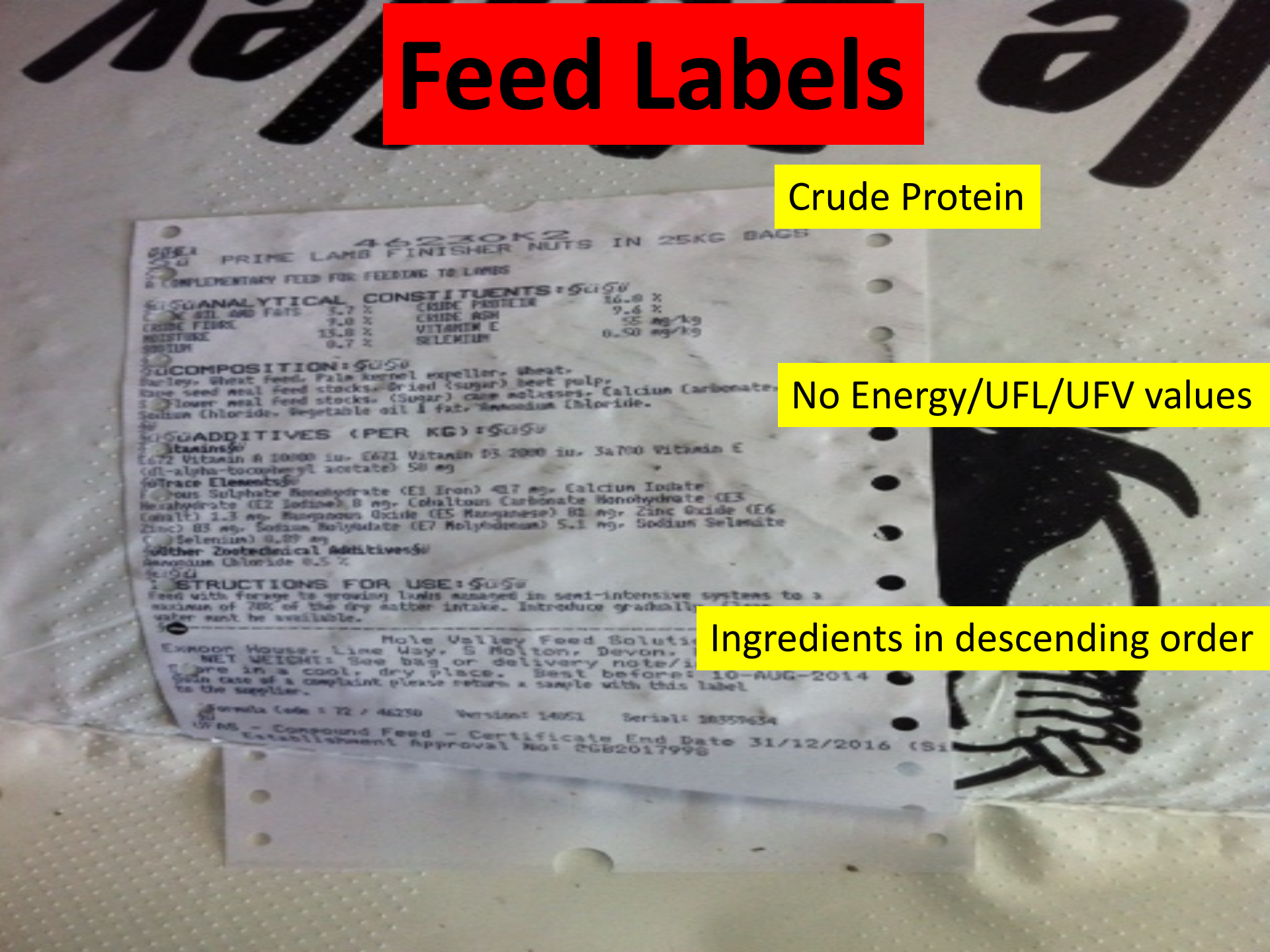


Feed Labels

Crude Protein

No Energy/UFL/UFV values

Ingredients in descending order

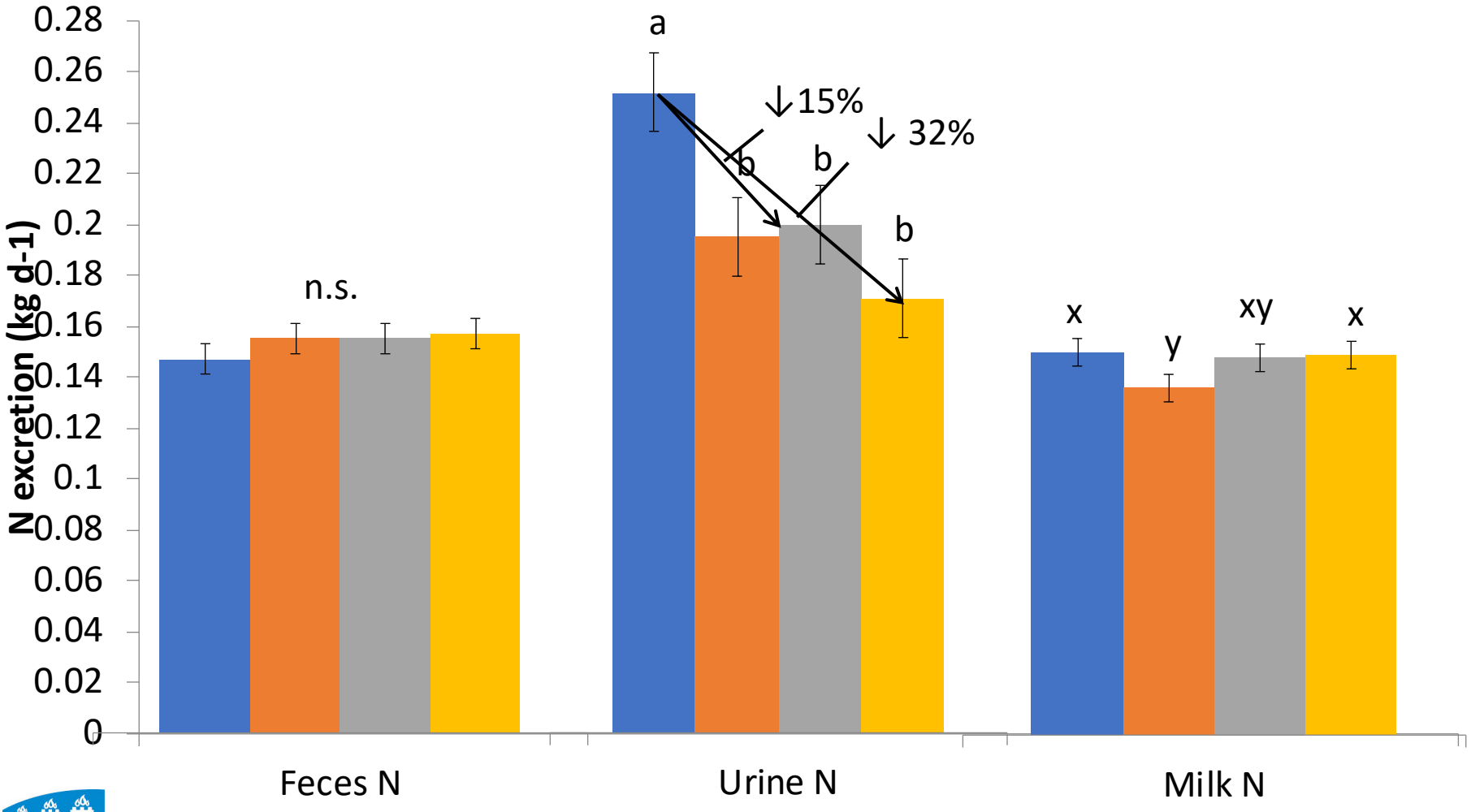


Evaluation of Concentrate Type on N Excretion Grazing cows

Table 4. Effect of supplementary concentrate type on nitrogen (N) balance

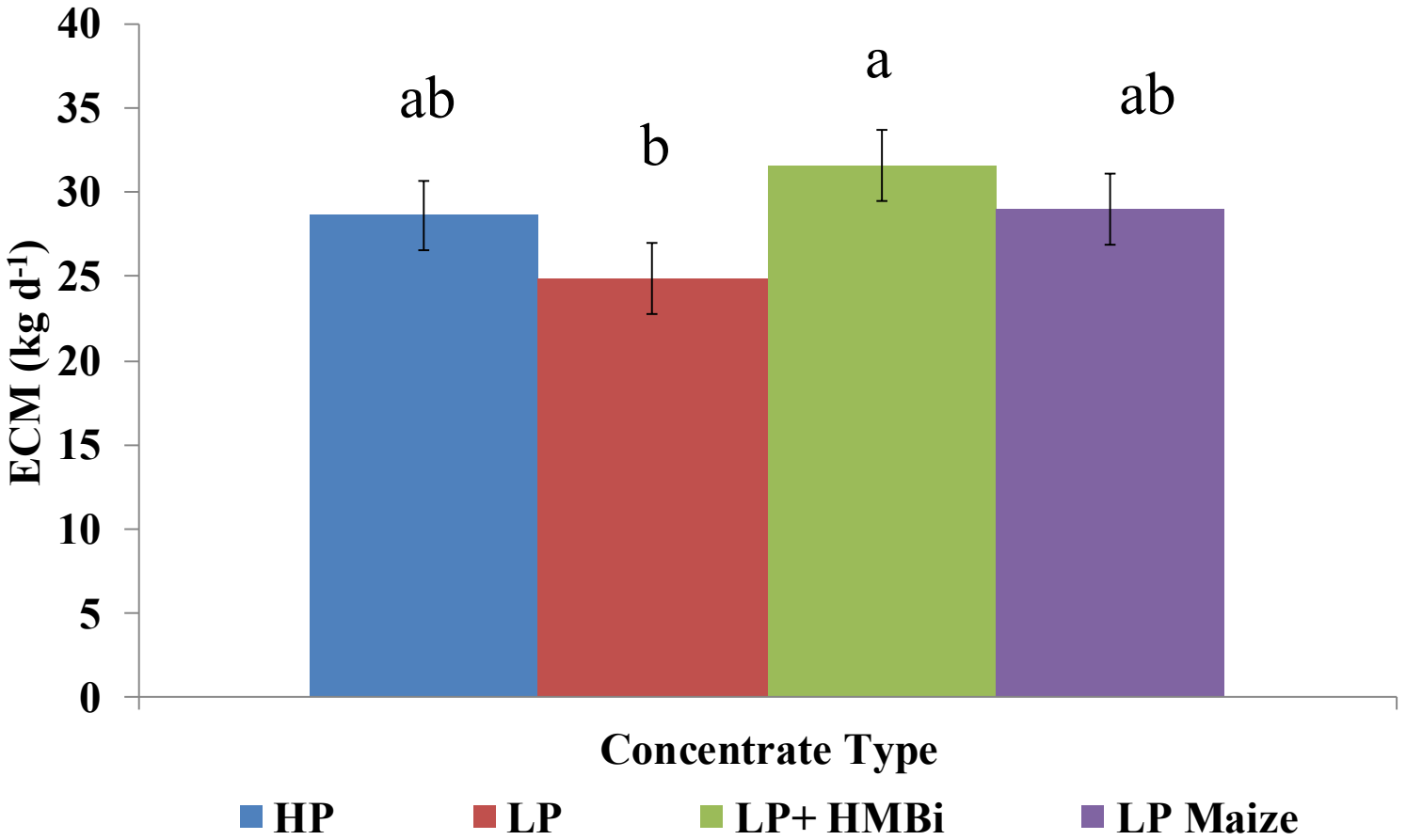
	Hi-Pro[1]	Lo-Pro[2]	Lo-Pro + HMBi[3]	Lo-Pro Corn[4]	LSM± sem
Intake (kg d^{-1})					
Feed N	0.663^{a}	0.609^{b}	0.612^{b}	0.583^{b}	0.017
PDI[4]	2.260^{a}	2.103^{b}	2.098^{b}	2.153^{ab}	0.048
N output (kg d^{-1})					
Feces	0.173	0.169	0.176	0.162	0.007
Urine	0.349^{a}	0.308^{b}	0.301^{b}	0.283^{b}	0.015
Milk	0.139^{a}	0.128^{b}	0.133^{ab}	0.137^{ab}	0.004
PDI milk[5]	1.400	1.321	1.344	1.329	0.058
N recovery[6]					
Feces	0.259^{b}	0.283^{a}	0.287^{a}	0.280^{a}	0.009
Urine	0.523^{a}	0.504^{ab}	0.491^{b}	0.482^{b}	0.014
Milk	0.214^{b}	0.213^{ab}	0.220^{ab}	0.236^{a}	0.007
PDI Balance[5]	0.486	0.494	0.408	0.465	0.057
Milk Urea N *(mmol l^{-1})*	1.828	1.771	1.900	1.755	0.119
RDP[5] balance	0.381^{a}	0.295^{ab}	0.304^{ab}	0.173^{b}	0.048

Nitrogen Output



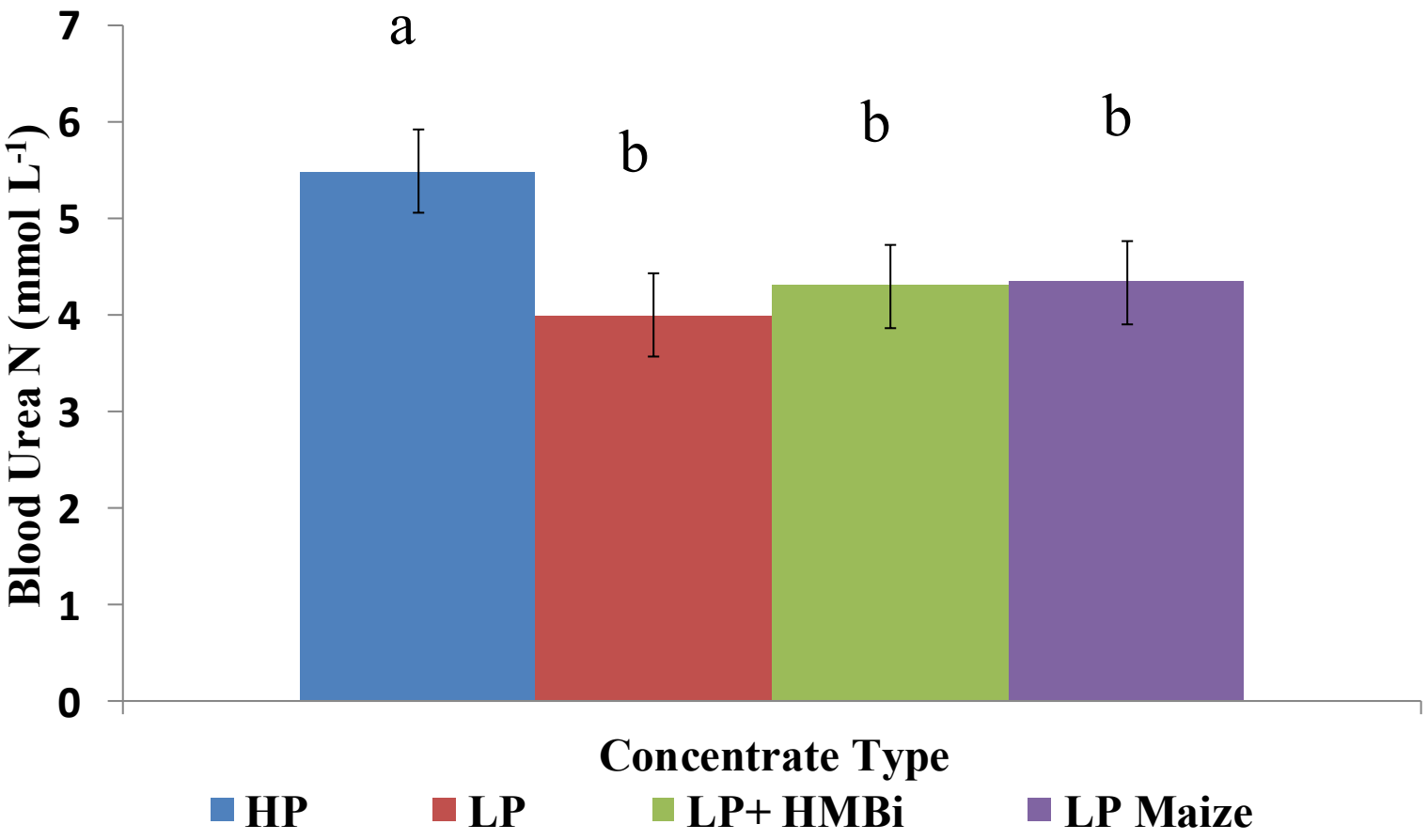
a vs. b ($P < 0.05$)
x vs. y ($P > 0.05$ but < 0.10)

Energy Corrected Milk

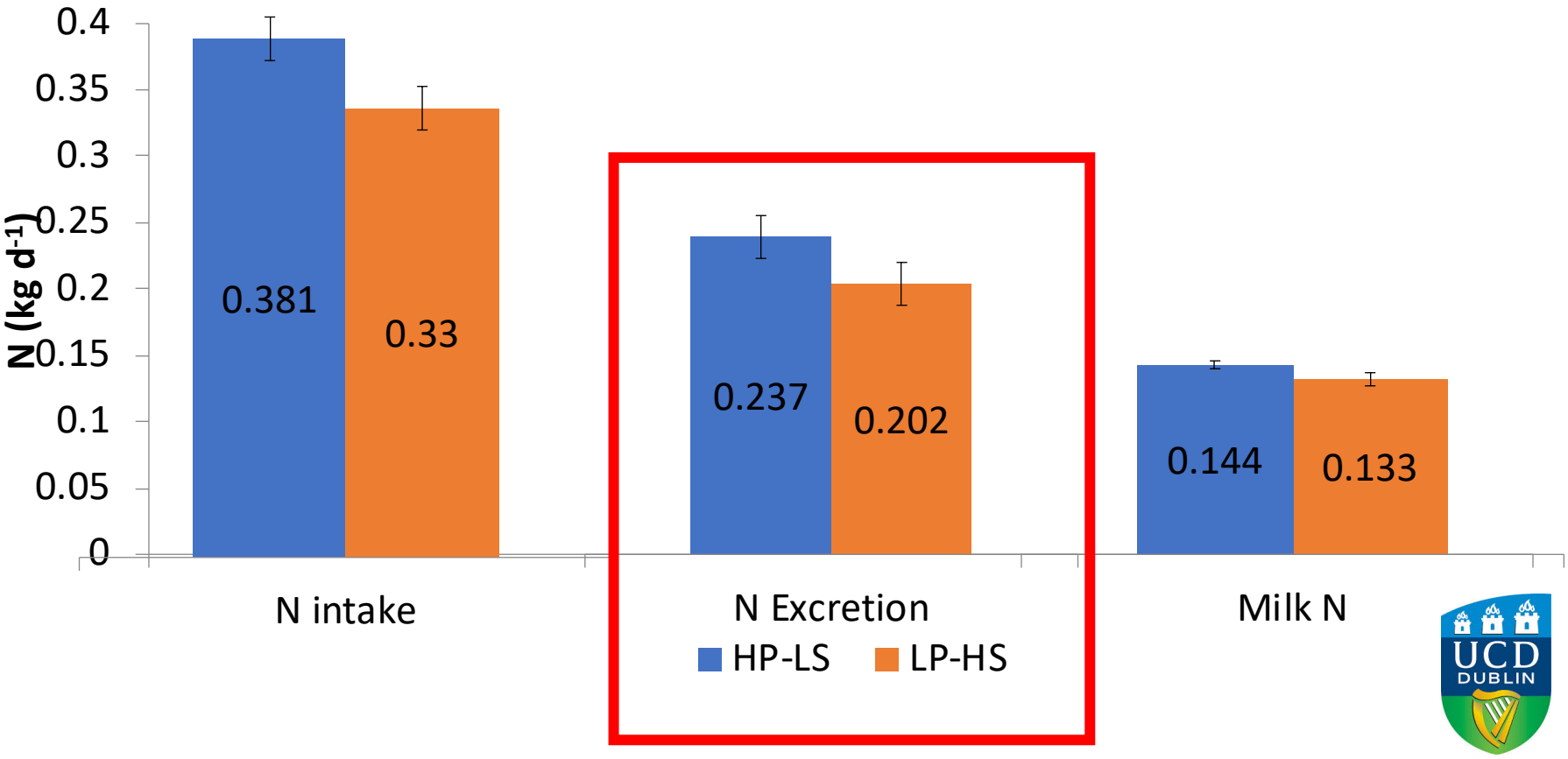


a vs. b, $P < 0.05$

Blood Urea Nitrogen



Nitrogen Balance



Profit Monitor per hectare analysis (1,568 farms)

	Top 25%[1]			Average		
Physical						
Herd Size (No. cows)	139			117		
Dairy Hectares	53			52		
Stocking rate (LU/ha)	2.64			2.27		
Grass used (t DM/ha)	11.6			9.3		
	/ha	/cow		/ha	/cow	
Feed	628	238	4.01	563	248	4.46
Fertiliser	323	112	2.06	287	126	2.27
Vet	163	62	1.04	143	63	1.13
AI	77	29	0.49	68	30	0.54
Contractor	238	90	1.52	222	98	1.76
Other Var. Costs	265	100	1.69	228	101	1.81
Total variable costs	1,693	641	10.8	1,531	674	12.1
Gross margin	4,489	1,700	28.7	3,304	1,456	26.2

Feed costs are the biggest cost on livestock farms

Source: Teagasc

Profit Monitor per hectare analysis (1,568 farms)

	Top 25%[1]			Average		
Physical						
Herd Size (No. cows)	139			117		
Dairy Hectares	53			52		
Stocking rate (LU/ha)	2.64			2.27		
Grass used (t DM/ha)	11.6			9.3		
	/ha	**/cow**		**/ha**	**/cow**	
Milk yield (litres)	15,658	5,931		12,623	5,561	
Milk solids (kg)	1,270	481		1,008	444	
Fat/Protein		4.28/ 3.61			4.21/ 3.55	
Financial (€/ha)	**/ha**	**/cow**	**c/litre**	**/ha**	**/cow**	**c/litre**
Gross Output	6,182	2,342	39.48	4,831	2,128	38.27
Co-op price			38.42			37.60
Variable Costs						
Feed	628	238	4.01	563	248	4.46
Fertiliser	323	112	2.06	287	126	2.27
Vet	163	62	1.04	143	63	1.13
AI	77	29	0.49	68	30	0.54
Contractor	238	90	1.52	222	98	1.76
Other Var. Costs	265	100	1.69	228	101	1.81
Total variable costs	1,693	641	10.8	1,531	674	12.1
Gross margin	4,489	1,700	28.7	3,304	1,456	26.2

Source: Teagasc

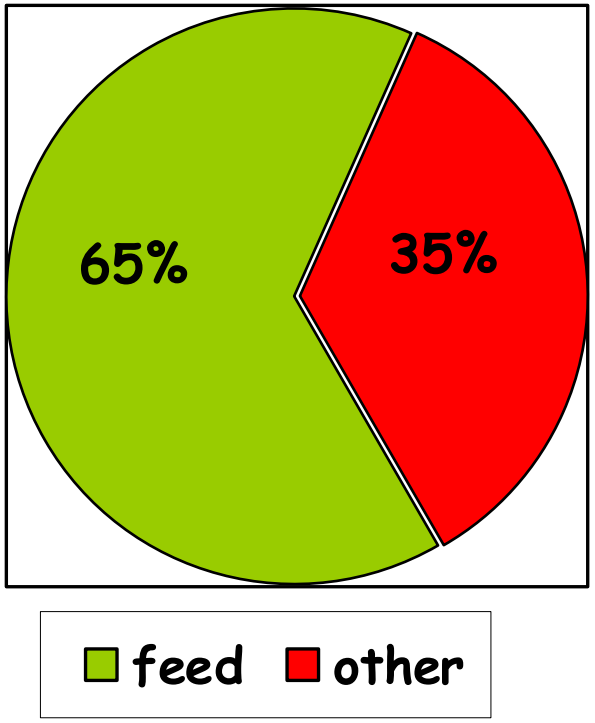
Feed costs - Beef

- *"Conversion of feed to product"*

- Providing feed - particularly during the indoor winter period - is the LARGEST variable cost in BEEF production:

70%+

Variable costs
Grange suckler
calf-to-beef system



The cheapest ration does not always mean the best value!

<u>Rations should be bought on the basis of:</u>

- 1) Energy Content
- 2) Protein Content
- 3) Mineral Content
- 4) Fibre Content

- **ENERGY IS GENERALLY THE MOST LIMITING NUTRIENT IN GRASS BASED LIVESTOCK DIETS**

- High protein does not mean high energy

- High crude protein does not tell us anything about the quality of protein

- Diets often too high in protein – protein is expensive!

Potential Cost Savings

Varies year to year

Example:

Protein %	
20%	Starting with 20% protein as base
18%	- €8/ton
16%	-€7/ton
14%	-€4/ton
12.5	-€2/ton

Summary: a saving of €21/ton to go from 20% to a 12.5% protein using same energy and raw material range on offer.

Ingredients offered:
Barley, Maize, Gluten, Distillers, PK, Hulls, Beet Pulp & Wheatfeed

Take Home Messages

- Lower protein diets can be fed without negatively impacting on animal performance

- Lower protein diets:
- Reduce N excretion, especially urinary N
- Reduce feed costs
- Reduce reliance on imported feedstuffs

- Reducing crude protein in animal diets contributes to sustainability of Irish agriculture


Thank You