Nutritional issues for Holsteins in a high-output grazing system

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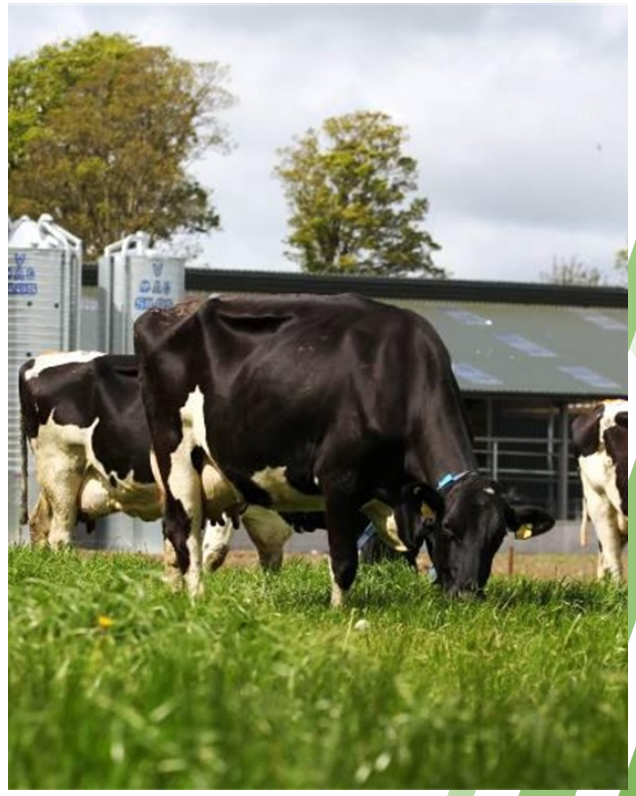
Assoc Prof Finbar Mulligan
School of Veterinary Medicine
University College Dublin

UCD Lyons High Output Grazing Herd

- To incorporate the most recent advances in grassland management for dairy farms into a high-output system
- Use a type of dairy cow that has good genetic indices for both milk production and fertility
- Employ the best practices from nutrition research and dairy cow husbandry
- To incorporate advancements which enhance dairy production sustainability



IHFA
IRISH HOLSTEIN FRIESIAN ASSOCIATION

UCD Lyons Herd Targets

Parameter	Target
Stocking rate (milking platform)	3.27 LU per ha
Stocking rate (whole farm)	2.33 LU per ha
Milk yield per cow	7,500-8,000 kg
Milk solids per cow	625 kg
6 week in calf rate	75%
Concentrate (kg/cow/yr)	1,500 kg
% diet as grazed grass	51
% diet as grazed grass and grass silage (DM basis)	75

***The annual feed budget contains 93-94% (grazed grass + grass silage) on an as-fed basis**

UCD Lyons High Output Grazing Herd Milk Performance

Parameter	Target	2016	2017	2018	2019	2020	2021	2022
Average lactation days	305	01	305	298	302	305	298	293
Yield kg/cow (305d)	7,750	7,441	7,548	6,939	7,541	7,771	7,744	7,234
Milk solids kg/cow (305d)	625	592	602	554	597	621	630	580
Yield kg/cow (actual)	7,750	7,407	7,466	6,790	7,381	7,503	7,733	7010
Milk solids kg/cow (actual)	625	588	595	544	586	606	629	562
Milk solids kg/ha MP (actual)	2,125	1,940	2,023	1,850	1,940	1,980	2,057	1838
Milk solids kg/ha Whole Farm (actual)	1,500	1,294	1,428	1,306	1,371	1,413	1,468	1311

Fertility Performance

	2016	2017	2018	2019	2020	2021	2022
Number of cows bred	58 (of 58)	59 (of 60)	55 (of 60)	58 (56 sub)	57 (54 sub)	57(55 sub)	57 (56 sub)
Submission rate 21 d%	91	90	96	95	91	95	87.5
First service conception rate %	43	49	69	60	74	72	79
6-week pregnancy rate %	59	54	83	79	87	87	84
Empty rate of total cows %*	9 (5/58)	15 (9/59)	13 (7/55)	12 (7/58)	9 (5/54)	7 (4/57)	10.5 (6/57)

Dairy Research Ireland
funded by Irish Dairy Farmers

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Nutritional issues for Holsteins in a high-output grazing system

- Optimal transition from dry to lactating
- Achieving adequate energy status in early lactation
- Consideration of minerals and trace elements
- Reducing environmental impact

- Optimal transition from dry to lactating

Most disease conditions of dairy cows are associated with the transition period

3 weeks pre- to 3 weeks post-calving!!

Difficult calving

Retained placenta

Metritis

Endometritis

Laminitis

Acidosis

Ketosis

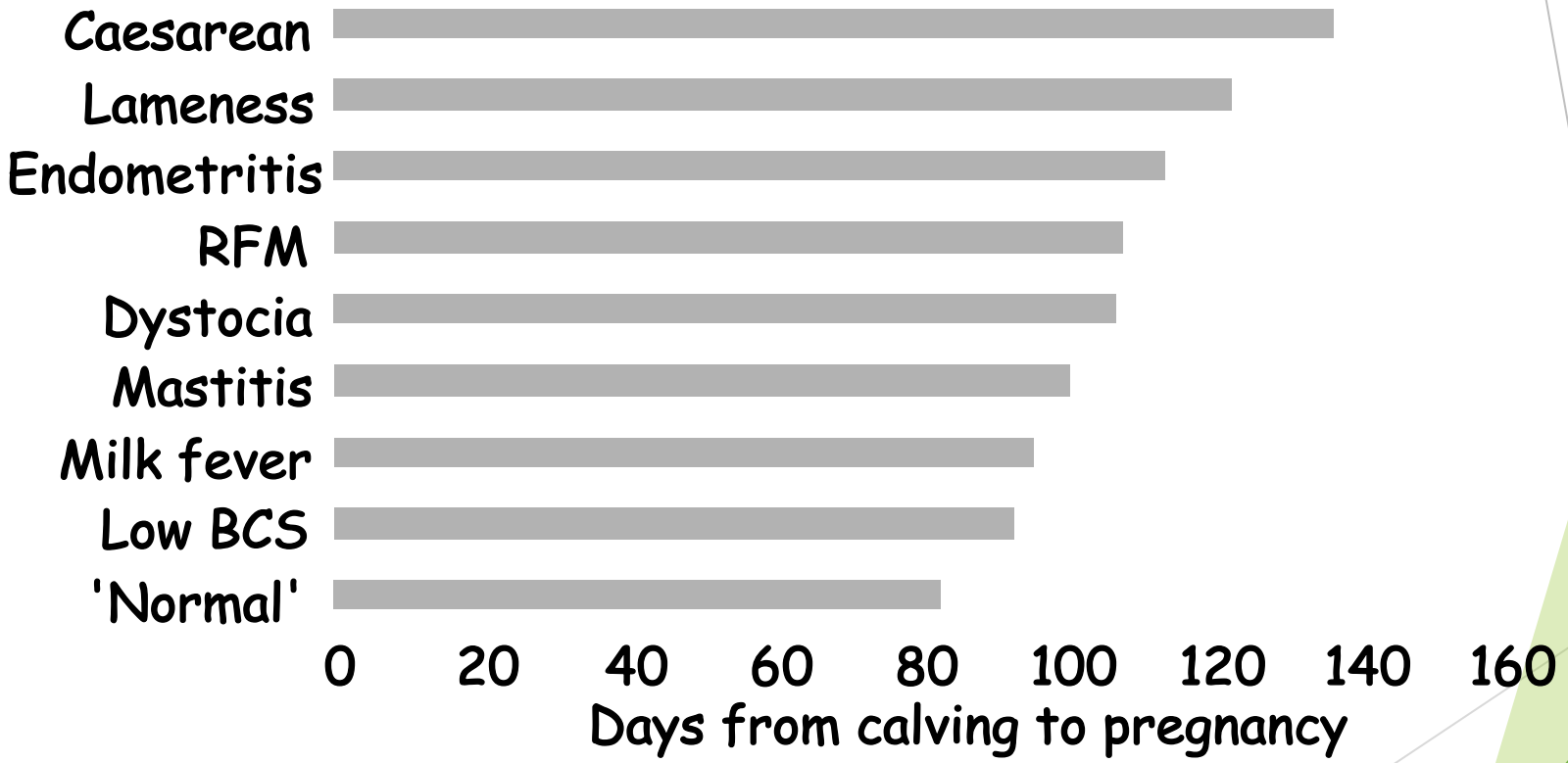
Fatty liver

Milk fever

Displaced abomasum

Mastitis

The Role of Dairy Cow Nutrition in Reproductive Performance



Collated by Hilary Dobson 2007

Nutritional issues for Holsteins in a high-output grazing system

- Grass silage quality can be high
- Dry period length can be long
  - High BCS pre-calving

Finbar Mulligan

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High BCS pre-calving

More transition cow problems

Increases risk of Ketosis

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In poor grass growing years or with lack of grass silage low BCS at calving is also possible!!

Low BCS in transition cows

Increases transition cow problems

Increases risk of culling

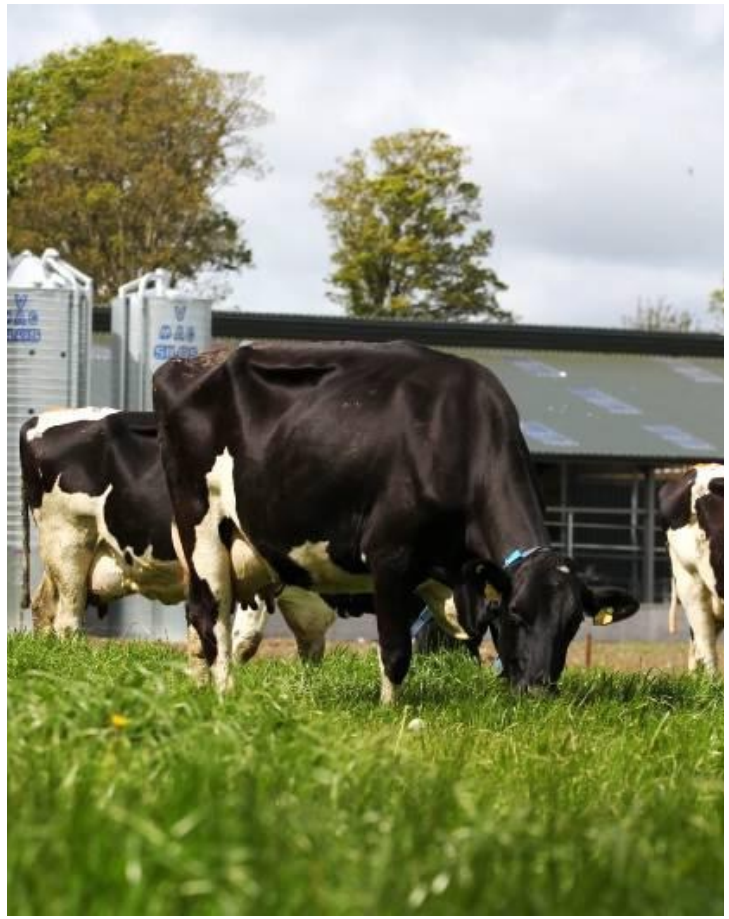
Reduces fertility

Nutritional issues for Holsteins in a high-output grazing system

- **Grass silage can have higher than desired K content**
- **Low Mg content is also possible**
- Both make milk fever prevention very difficult!!

High K grass silage Dry Cow Diet 2022

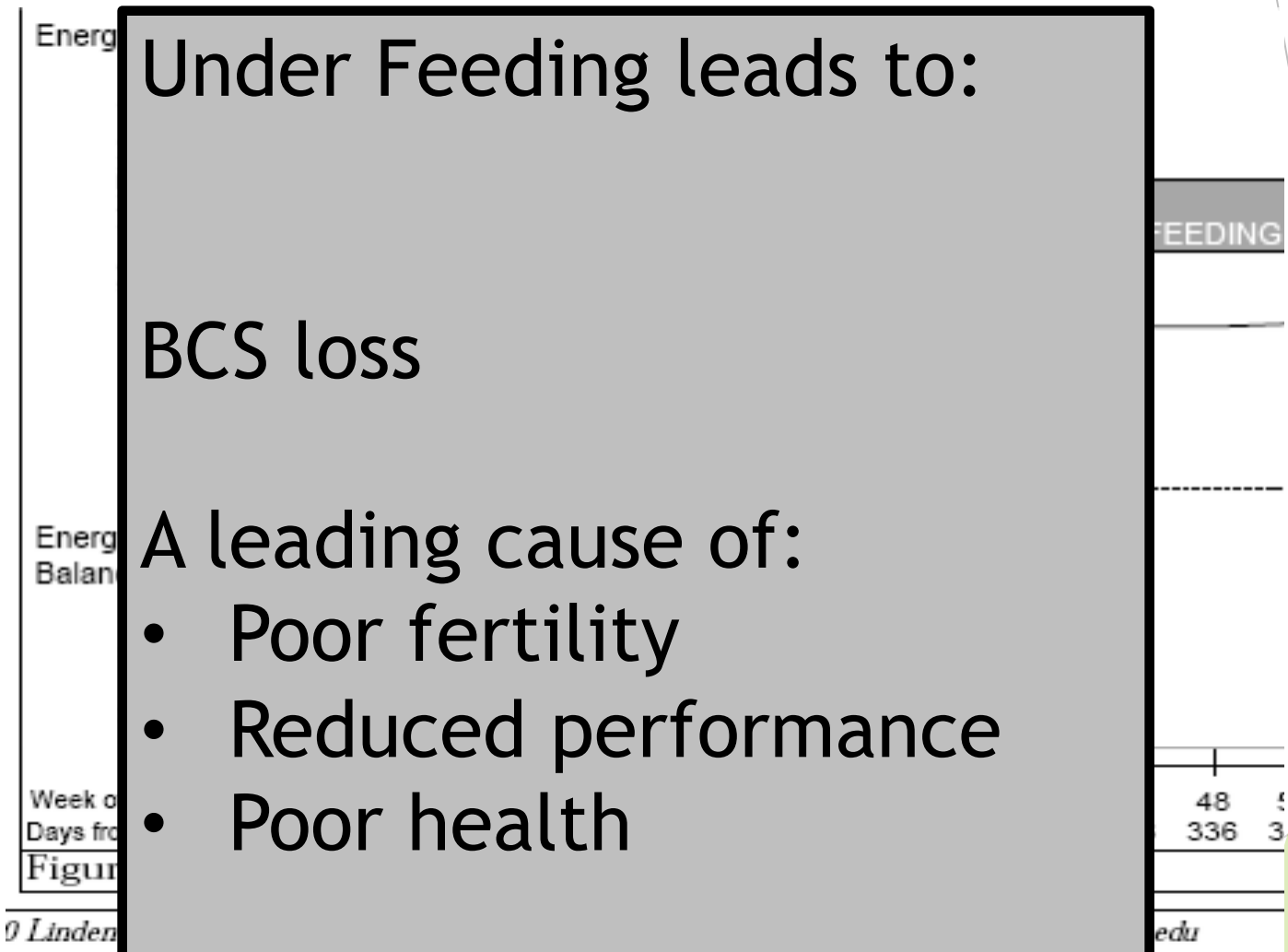
		kg DM	Kg as fed	DM%/100	UFL/kg DM	UFL_Total	DCAD	CP	Ca	P	Mg	Na	Cl	K	S
Lyons pit 4 1i90753		8.31	30.00	0.28	0.79	6.56	512.00	19.30	1.40	0.33	0.24	0.01	1.0	3.71	.24
						0.00									
						0.00									
Barley		1.74	2.00	0.87	1.16	2.02	40.00	10.00	0.06	0.24	0.08	0.01	0.08		0.10
Soya		0.00	0.00	0.87	1.18	0.00	500.00	53.00	0.38	0.71	0.31	0.08			
Soychlor		0.79	0.90	0.88	0.89	0.70	-2870.00	20.00	4.54	0.30	2.84	0.04	10.30	0.48	0.35
Mineral		0.14	0.15	0.95	0.00	0.00	500.00	0.00	0.00	0.00	10.00	8.00	11.90	0.00	0.00
						0.00									
MgCl		0.14	0.15	0.95	0.00	0.00	-9830.00	0.00	0.00	0.00	12.00	0.00	35.00	0.00	0.00
						0.00	DCAD	CP	Ca	P	Mg	Na	Cl	K	S
SUM	DMI kg/d	10.98	33.20		UFL/d	9.29	65.71	17.63	1.40	0.31	0.68	0.12	2.16	2.84	0.22
	DMI % BW	0.017													



Achieving adequate energy status in early lactation

Negative energy balance in early lactation

Source: Wattiaux Babcock Institute



Under Feeding leads to:

BCS loss

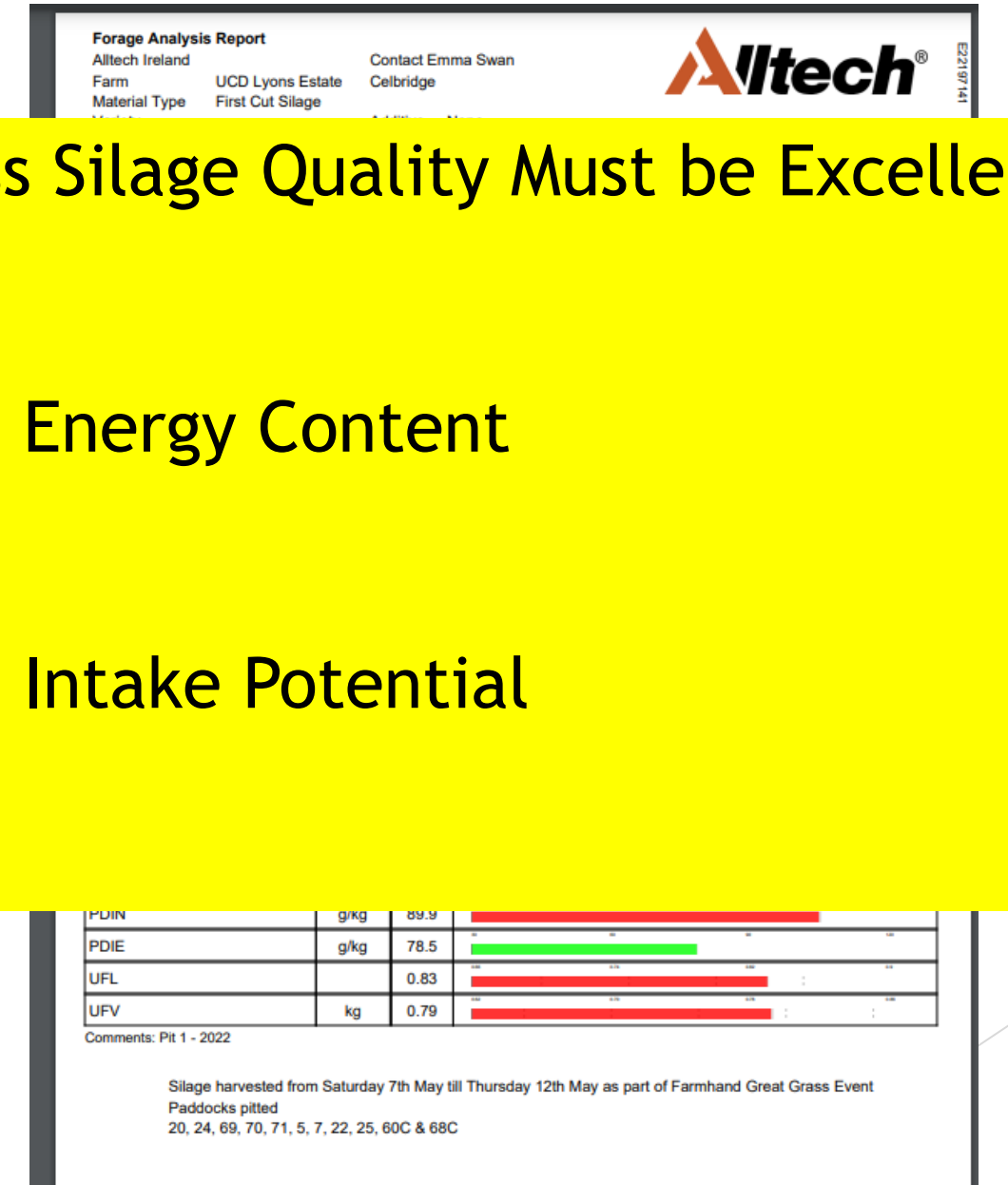
A leading cause of:

- Poor fertility
- Reduced performance
- Poor health

Nutritional issues for Holsteins in a high-output grazing system

- Early lactation
- Focus on energy status of the cow
- In comparison to other confined dairy production systems, grazing cows often have low energy allowance offered by circumstance or by design:
  - Low grass growth in spring
  - Poor climatic conditions
  - Rationing of grass available in spring
  - Medium or poor grass silage quality
  - Advice to offer only low levels of concentrate feeding

Grass silage quality for lactation



Forage Analysis Report

Alltech Ireland — Contact Emma Swan

Farm — UCD Lyons Estate — Celbridge

Material Type — First Cut Silage

Alltech®

E22197141

PDIN	g/kg	89.9	
PDIE	g/kg	78.5	
UFL		0.83	
UFV	kg	0.79	

Comments: Pit 1 - 2022

Silage harvested from Saturday 7th May till Thursday 12th May as part of Farmhand Great Grass Event
Paddocks pitted
20, 24, 69, 70, 71, 5, 7, 22, 25, 60C & 68C

Grass Silage Quality Must be Excellent

High Energy Content

High Intake Potential

Grazing cows must be adequately supplemented!

Required concentrate feed allowance: grazing cows in early lactation

(Milk is 3.8% Fat; 3.2% Protein; BCS on Target)

Grass DM intake kg/cow/day	Milk Yield kg/day							
	20	**22**	**24**	**26**	**28**	**30**	**32**	**34**
10	5.2	6.2	7.2	8.2	9.2	10.2	11.2	12.2
11	4.1	5.1	6.1	7.1	8.1	9.1	10.1	11.1
12	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
13	1.9	2.9	3.9	4.9	5.9	6.9	7.9	8.9
14	0.8	1.8	2.8	3.8	4.8	5.8	6.8	7.8
15	0.0	0.7	1.7	2.7	3.7	4.7	5.7	6.7
16	0.0	0.0	0.6	1.6	2.6	3.6	4.6	5.6

Nutritional issues for Holsteins in a high-output grazing system

- Grazing full time

- Lyons Farm Late March 19
- Daily Feed budget includes 18 kg of grass DM allocated
- 8 kg of concentrate
- Estimated intake is 23 kg DM per day (16.3 grass and 7 feed)

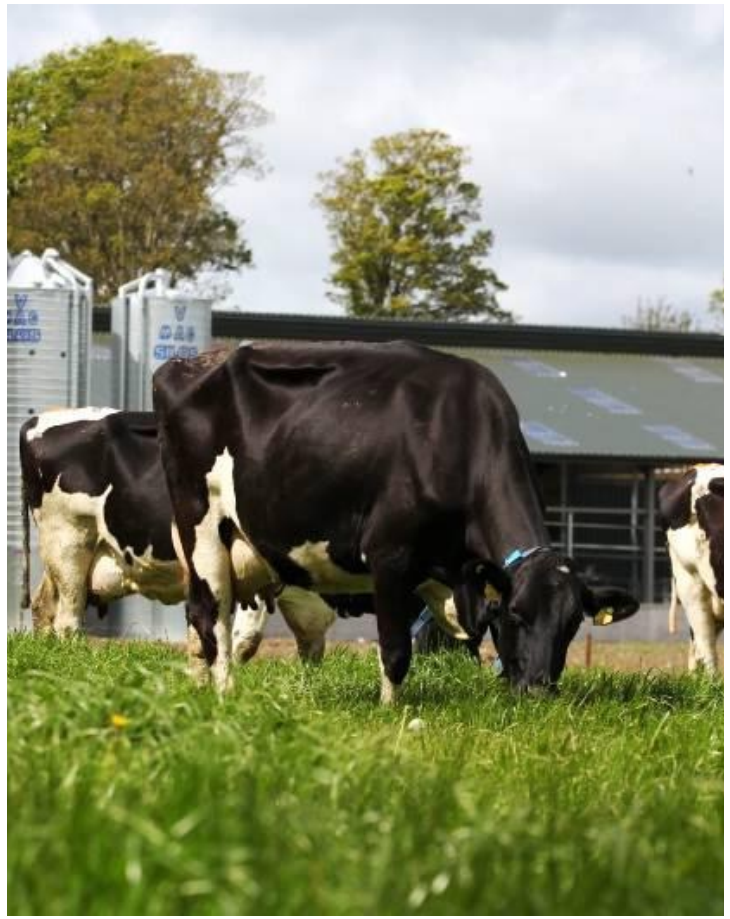
- This is 23 UFL per day (Maintenance plus 36 kg milk)

Nutritional issues for Holsteins in a high-output grazing system

- March 20th 2023

- Daily Feed budget includes 14 kg grass silage DM (11.62 UFL)
- 8 kg of concentrate

- This is 19 UFL per day (Maintenance plus 28 kg milk)



Considering minerals and trace elements

Minerals and Trace Elements FOR DAIRY COWS

- Rogers and Murphy 2000 (1700-1800 samples)
- 32% grass low or very low in P (<0.36% of DM)
- 65.4% of Irish grass low or very low in Cu (< 5 and < 10 mg/kg DM)
- 11.1% grass high or very high in Mo (> 5 mg/kg DM)
- 46.6% of grass very low in I (< 0.2 mg/kg DM)
- 71.9% of grass very low in Se (<0.08 mg/kg DM)
- 11.1% of grass low in Co (<0.1 mg/kg DM)
- 21.4% of Irish grass low in Zn (<25 mg/kg DM)

- All Island Disease Survey 2015 (Eire and NI)
- Trace Element Deficiencies in submitted samples

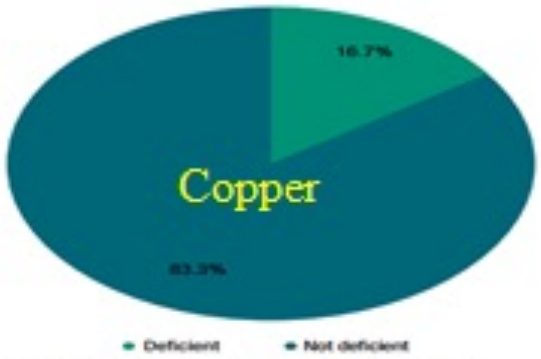


Figure 79: The number of bovine blood samples submitted to AFBI and DAFM laboratories during 2015 which were analysed for copper status and were identified as deficient or not deficient (n=11,275).

Figure 81: The number of bovine blood samples submitted to AFBI laboratories during 2015 which were analysed for inorganic iodine status and were identified as deficient or not deficient (n=3001).

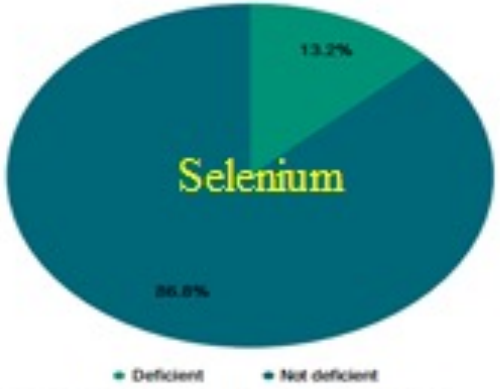


Figure 80: The number of bovine blood samples submitted to AFBI and DAFM laboratories during 2015 which were analysed for selenium status (either by blood selenium analysis or measurement of glutathione peroxidase activity) and were identified as deficient or not deficient (n=9100).

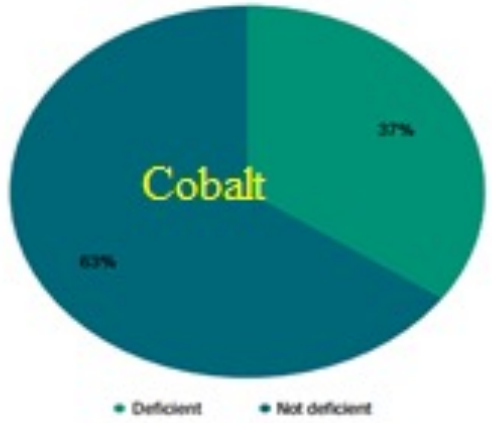


Figure 82: The total number of bovine liver samples submitted to DAFM laboratories during 2015 which were analysed for cobalt status and which were identified as deficient or not deficient (n=246).

Reducing environmental impact

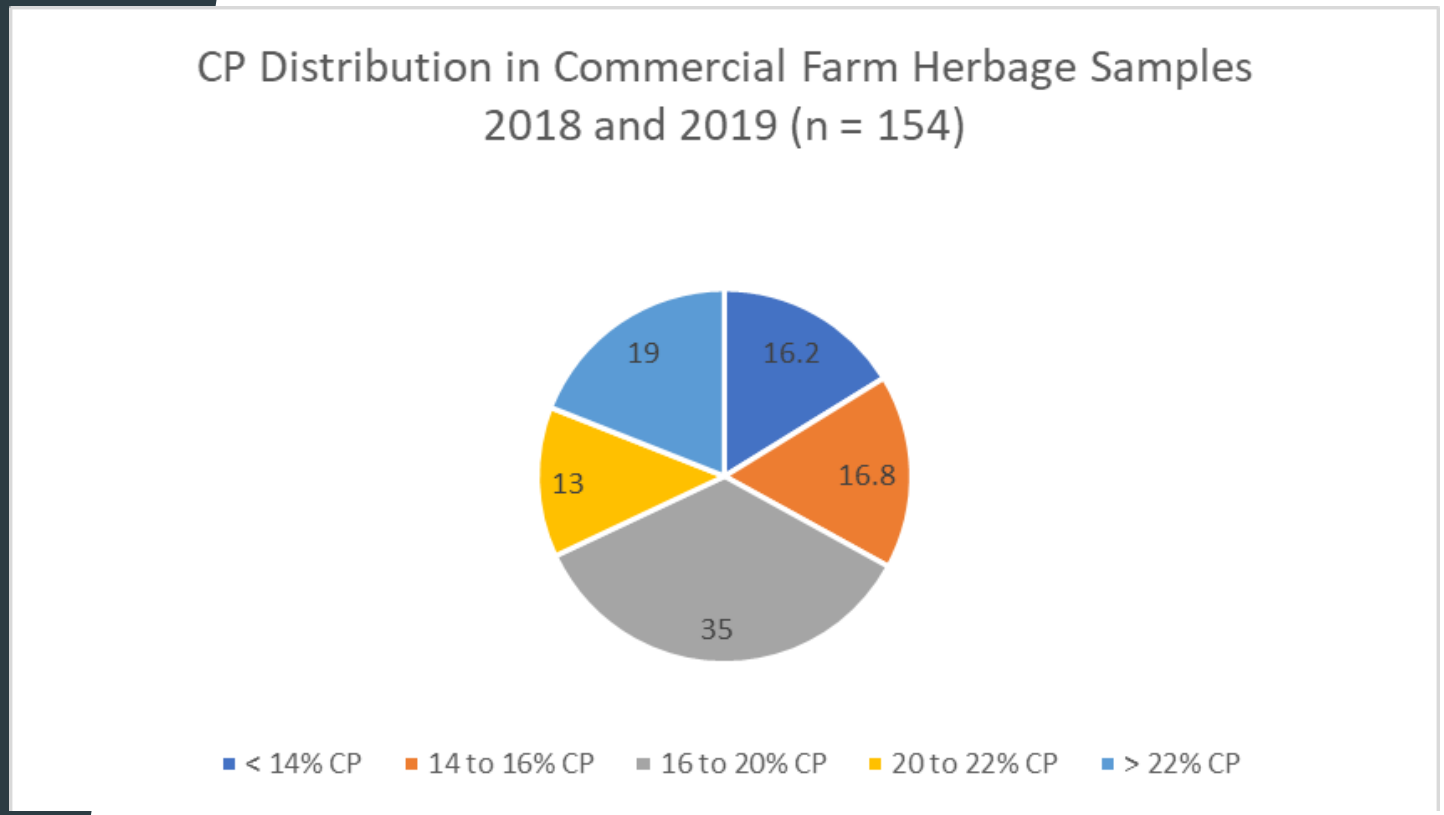
- 37% of Greenhouse gasses in Ireland from Agriculture
- Nitrous Oxide an important Green House Gas / 90% from Agriculture (23% from dung and urine on pasture)
- 85% of Nitrogen in Irish Rivers from Agriculture
- 47% of River sites in Ireland unsatisfactory Nitrate concentrations
- 98% of Ammonia emissions from Agriculture

Background - Dairy

- Irish dairy production is based on efficient and maximum use of grazed grass
- Perennial Ryegrass requires high levels of Nitrogen input to grow at maximum output
- When grazed at the highest levels of quality is often high in protein causing inefficient Nitrogen use in grazing cattle

- UCD Study Commercial Farms
- Neville (2023)
- In press IVJ

- 32% > 20% Protein



Nutritional issues for Holsteins in a high-output grazing system

- Improving Farm-gate Nitrogen Use Efficiency
- Reduce Chemical N
- Use Protected Urea
- Improve soil fertility
- Use low N requiring forages
  - White clover
  - Multispecies swards

Source Henessy, Teagasc 2021, Irish Dairying

Table 2. Average animal and sward production on grass-only swards receiving 250 kg N/ha and grass-white clover swards receiving 150 kg N/ha from 2013–2020.

	Grass-only 250 kg N/ha	Grass-white clover 150 kg N/ha	Difference
Stocking rate (cows/ha)	2.74	2.74	-
Annual herbage prod. (t DM/ha)	13.5	13.4	-0.1
Silage conserved (t DM/cow)	1.00	0.98	-0.02
Silage fed during lactation (kg DM/cow)	259	333	+74
Average sward clover content (%)	-	22.0	-
Milk yield per cow (kg)	6,068	6,331	+243
Milk solids yield per cow (kg)	490	510	+20
Concentrate fed (kg/cow)	438	438	-
Nitrogen use efficiency (%) (2013–2016)	40	58	+18
Net profit (€/ha) (2013–2016)	1,974	2,082	+108


Grazing forages with legumes and herbs
Lower Nitrogen Input
Perennial ryegrass and white clover Multispecies swards
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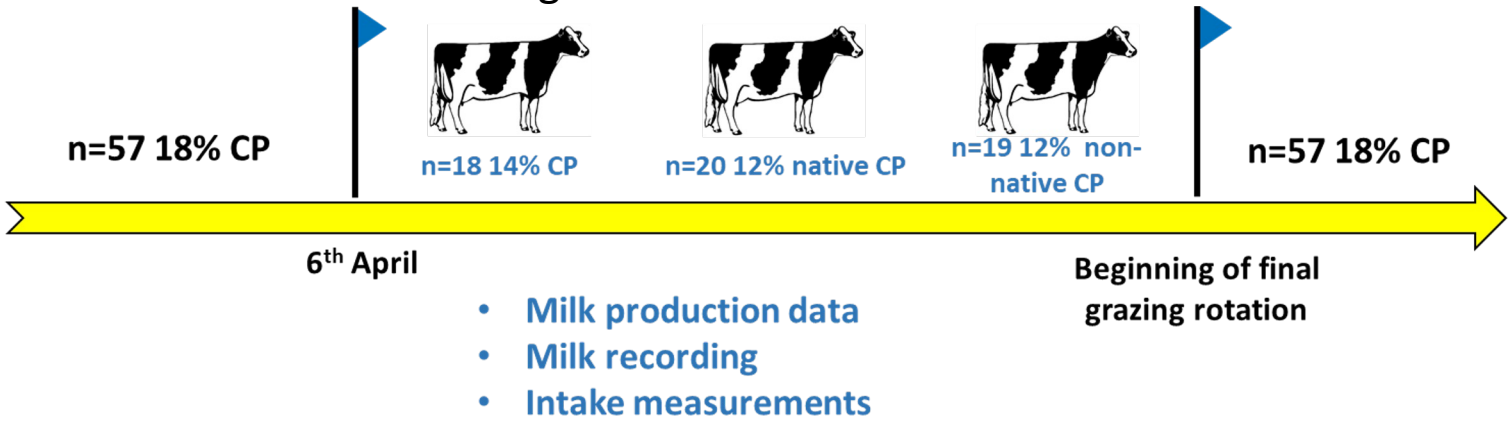
Feed Origin Important for Sustainability

- Soya hulls: Argentina
- Palm kernel expeller: Indonesia, Malaysia
- Barley: Irish!!
- Oats: Irish!!

UCD 2020 Supplement Trial for Grazing Cows

- 3 Dairy nuts
  - 14% Protein
  - 12% Protein with non-native ingredients
  - 12% Protein with native ingredients



- Compare three diets to evaluate
  - Milk production and composition

14% Protein Nut Lyons 2020

14 Protein Nut 20 Cows systems Apr 1 to Oct 1	
Rolled barley	22.7
Ground maize	22.5
Maize distillers grains	7.5
Unmolassed beet pulp	12.2
Soya hulls	13.1
Soyabean meal 48	10.7
Molasses	4.5
Fat added	1.5
Acid buff	1
Limestone	0.8
Milling salt	0.9
Mono dicalcium phosphate	0.8
Cal Mag	0.75
Trace element /additive pack	1.05

DM (%)	:	87.0
UFL (UFL)	:	0.97
UFV (UFV)	:	0.94
PDIN (g)	:	97
PDIE (g)	:	104
SFU (SFU)	:	0.00
LFU (LFU)	:	0.00
CFU (CFU)	:	0.00
OM (g)	:	786
OMD (%)	:	81.2
CP (g)	:	140

PDIA (g)	:	52
LysDI (% PDIE	:	6.33
MetDI (% PDIE	:	1.71
CF (g)	:	95
P (g)	:	5.1
Pabs (g)	:	3.9
Ca (g)	:	11.8

2020 Trial: Composition of Concentrates

12% Protein Native Nut

Native Nut 20 cows systems Apr 1 to Oct 15	
Rolled oats	32
Rolled barley	33.7
Pollard (wheat feed)	5
Rolled beans	18
Molasses	4.5
Fat added	1.5
Acid buff	1
Limestone	0.8
Milling salt	0.9
Mono dicalcium phosphate	0.8
Cal Mag	0.75
Trace element /additive pack	1.05

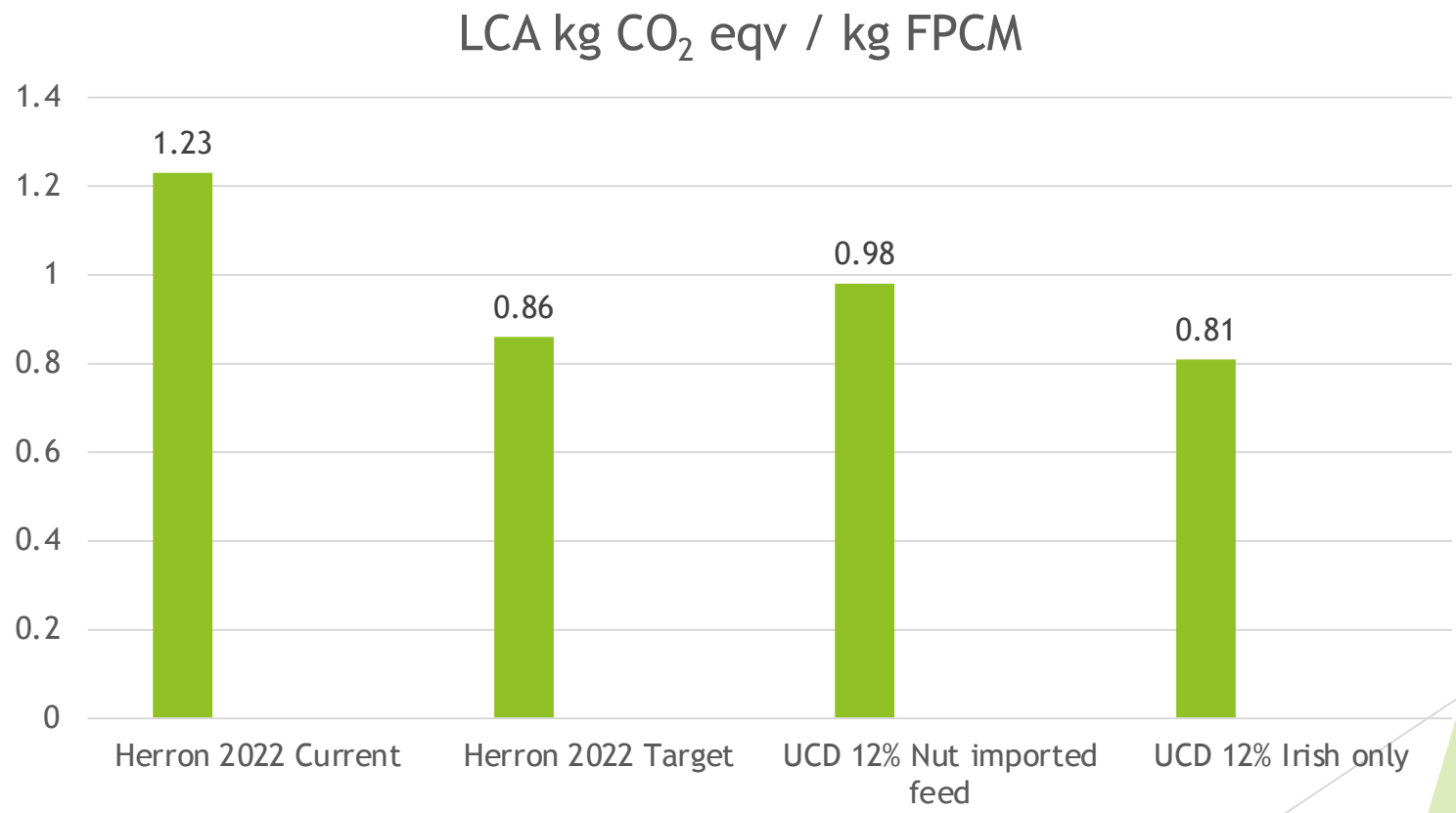
Nutrient values of the mixtur

DM (%)	:	86.8	PDIA (g)	:	21
UFL (UFL)	:	0.91	LysDI (% PDIE	:	6.57
UFV (UFV)	:	0.89	MetDI (% PDIE	:	1.77
PDIN (g)	:	75	CF (g)	:	75
PDIE (g)	:	75	P (g)	:	6.7
SFU (SFU)	:	0.00	Pabs (g)	:	5.1
LFU (LFU)	:	0.00	Ca (g)	:	11.2
CFU (CFU)	:	0.00			
OM (g)	:	791			
OMD (%)	:	76.6			
CP (g)	:	119			

2020 Dairy Nut Trial: Results

	14%	12% Imported	12% Irish	P
Milk yield (kg)	26.7 ±0.63	26.2 ±0.64	25.3 ±0.63	0.31
Fat (%)	4.42 ±0.09	4.29 ±0.08	4.42 ±0.09	0.43
Protein (%)	3.61 ±0.04	3.65 ±0.04	3.65 ±0.04	0.65
F+P (kg)	2.09 ±0.04	2.03 ±0.04	2.03 ±0.04	0.58
SCC (,000)	74.0 ±12.9	72.2 ±12.8	78.1 ±12.7	0.58

Green house gas emissions for dairy production systems modelled using LCA approach (provisional data)



Nutritional issues for Holsteins in a high-output grazing system

- Protein concentrations as low as 12% in the supplementary dairy nut can sustain milk production levels for high-output grazing cows
- Supplementary dairy nuts based on a high usage of native feed ingredients can result in similar performance to that of dairy cows fed supplements based on imported ingredients
- Provisional LCA analysis
- Significant advantage of using Irish sourced feeds

Thank you for listening!!

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