Optimising performance of beef cattle

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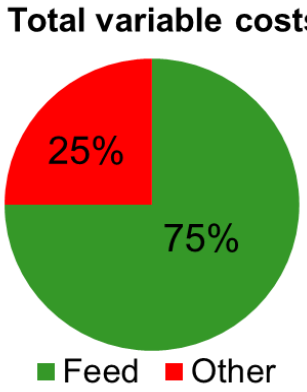
Introduction

- **Beef production:** Conversion of feed to animal product as (cost) efficiently as possible.

- **Feed provision:** Single largest variable cost in beef production

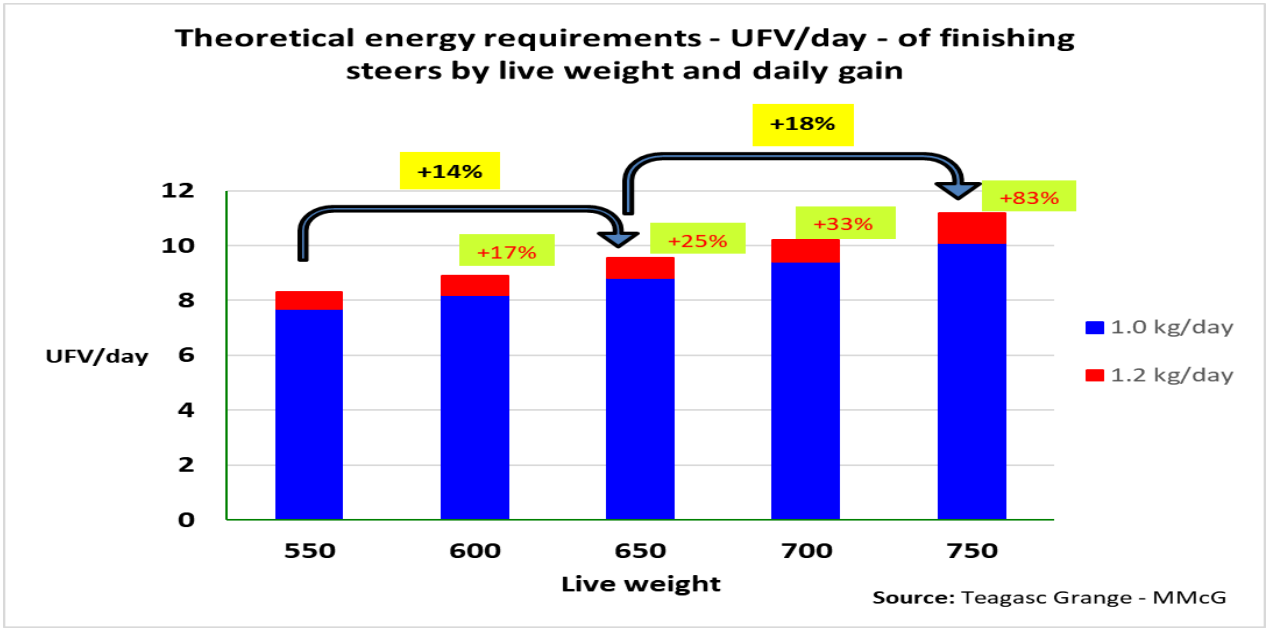


- **Feed (cost) efficiency:** Major factor determining cost competitiveness + environmental footprint & sustainability.

Animal Factors

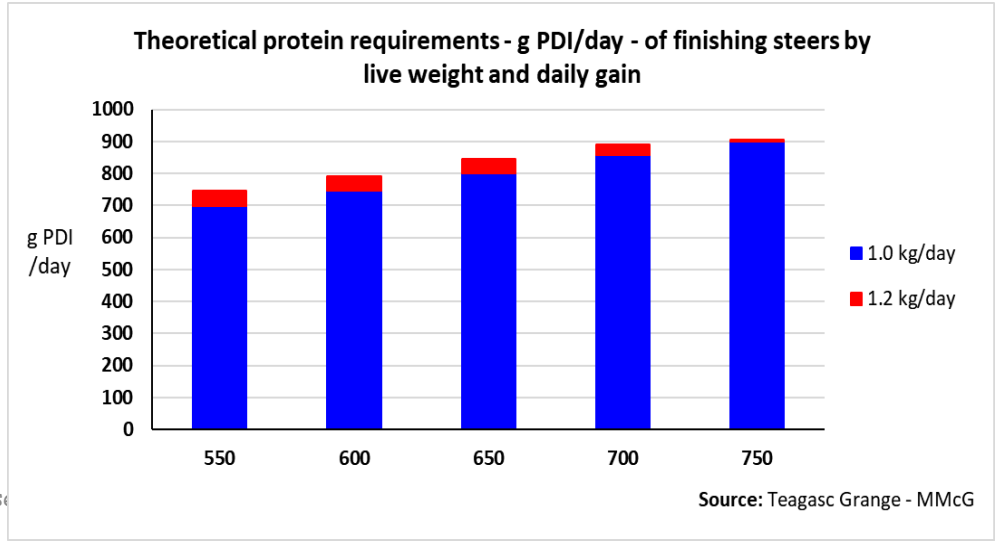
Effect of live weight & live weight gain on nutrient requirements

- **Energy**



- @Fixed rate of gain, feed requirements increase by **~15% / 100 kg increase in live weight**
- More feed required to put same increment of gain on a 'heavy' than on a 'lighter' animal
- Feed requirements are lower & efficiency is better with light, fast growing animals

- **Protein**



- **Minerals & Vitamins**
- **Water**

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BREEDS: Suckler-bred Charolais vs. Dairy-origin Holstein-Friesian steers offered a high-concentrate 'finishing' diet

	Charolais	Holstein-Friesian	Sig.	
Age, initial (days)	654	678	***	24
				% Diff
Daily DM intake (kg)	11.5	12.6	***	10
(g/kg live weight)	15.8	19.1	***	21
Daily live weight gain, ADG (kg)	1.37	1.28	P=0.07	-7
Feed conversion ratio (kg DM/kg ADG)	8.4	9.8	***	17
Live weight, mid-test (kg)	725	659	***	-9
Carcass weight (kg)	446	360	***	-19
Kill-out proportion (g/kg)	580	519	***	-11
Carcass conformation (1-15)	10.3	4.5	***	-56
Carcass fat (1-15)	10.0	9.9	NS	-1
			Source: Teagasc Grange - MMcG	

CONCLUSION: The lighter, slower-growing **Holstein-Friesian** steers consumed 10% more feed DM resulting in a **substantially inferior feed efficiency** compared to **Charolais**.

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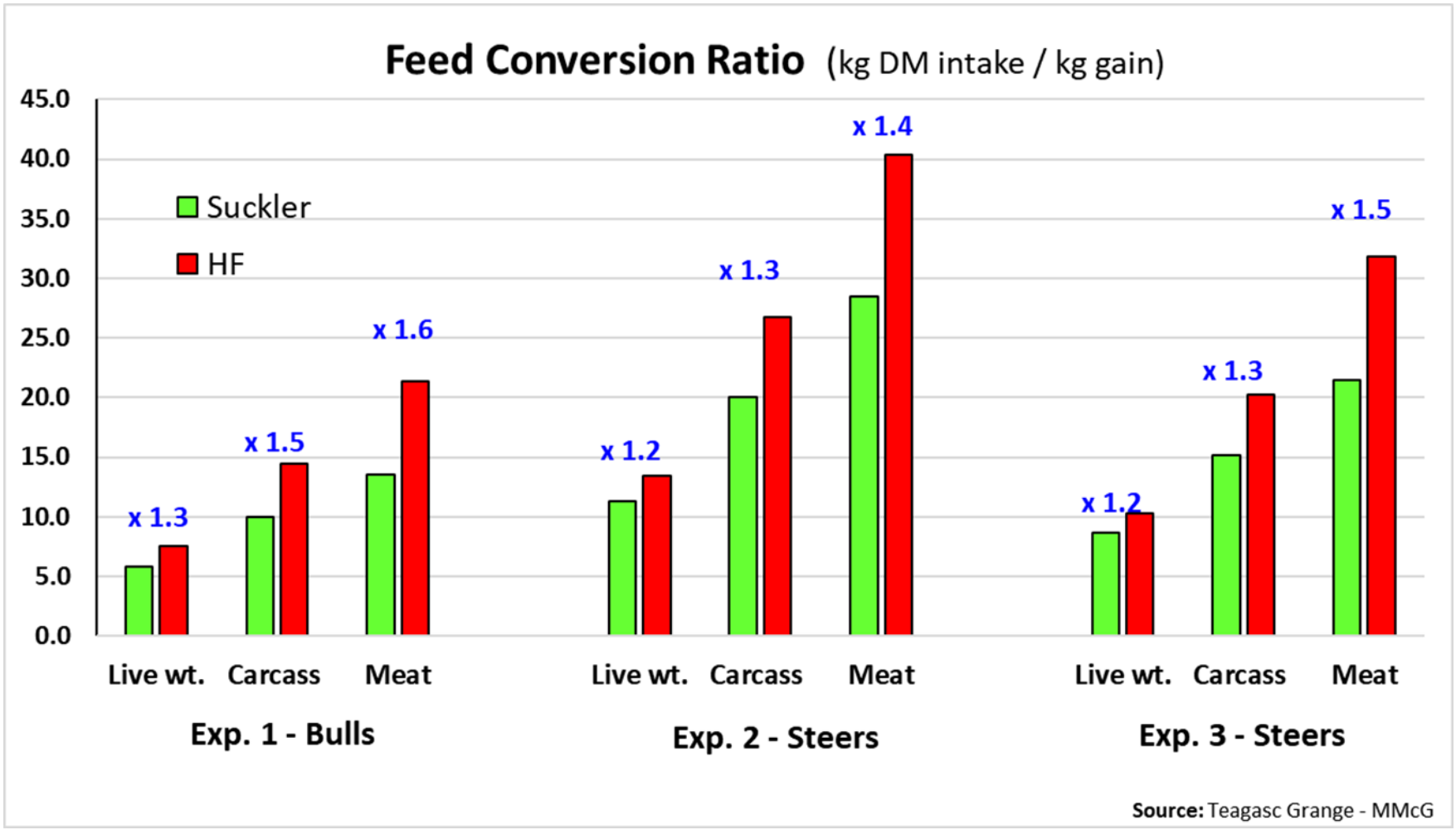
BREEDS: Late-maturing suckler-bred vs. Holstein/ Friesian cattle offered a high-concentrate finishing diet



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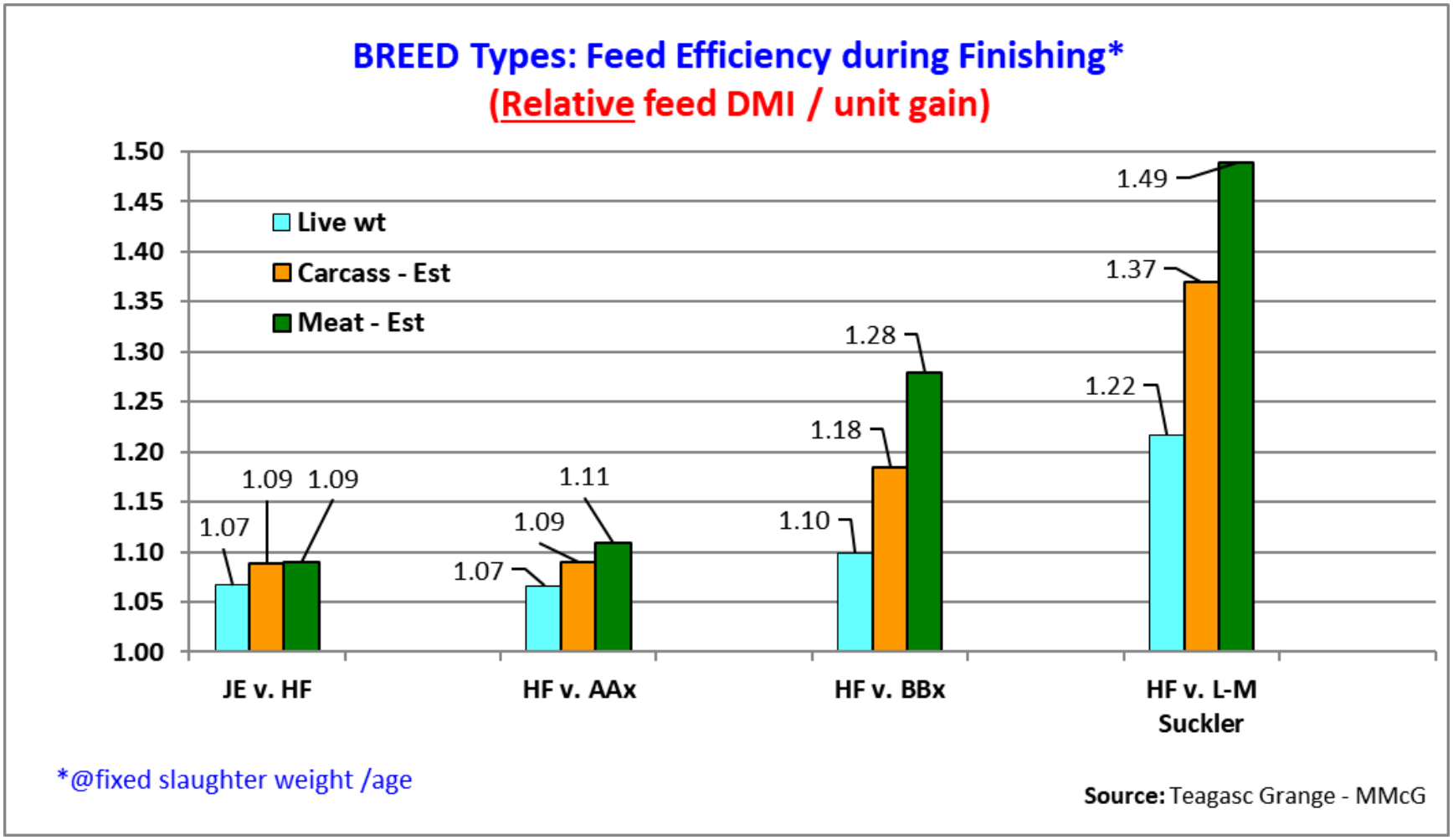
BREEDS: Feed Efficiency - Summary of Experiments



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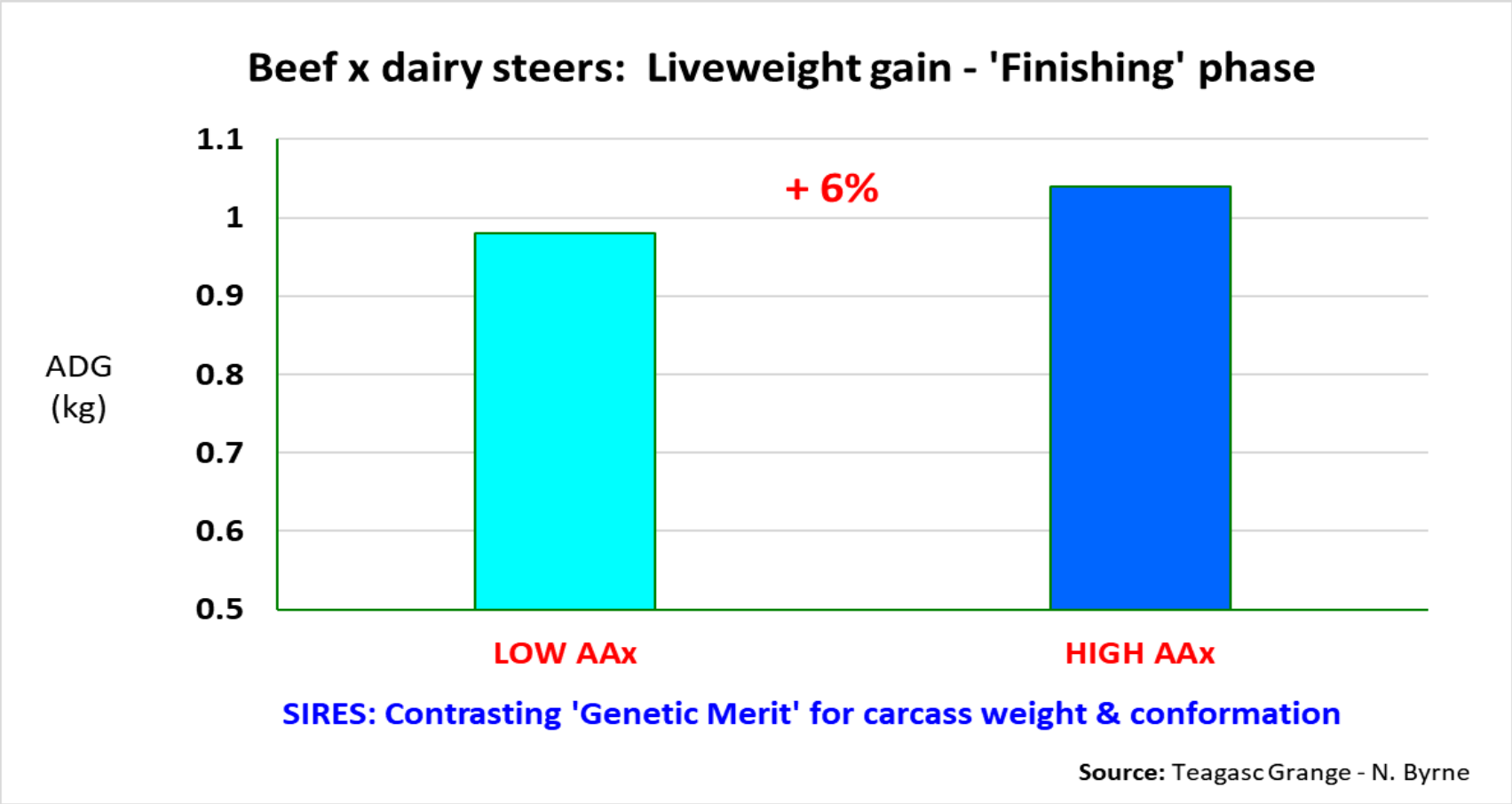
Genetic Merit



Grass silage + concentrate diet:

- Similar DM Intake between the genotypes

Bulls v. Steers

International studies

Proportional superiority of bulls over ***comparable*** steers for,

- **Live weight gain** = ~0.08-0.20
- **Carcass weight** = ~0.09-0.14
- **Lean meat yield** = ~0.20
- **Feed efficiency** = ~0.14-0.17
- **Carcass**
  - Better conformation
  - ~0.27-0.35 less fat

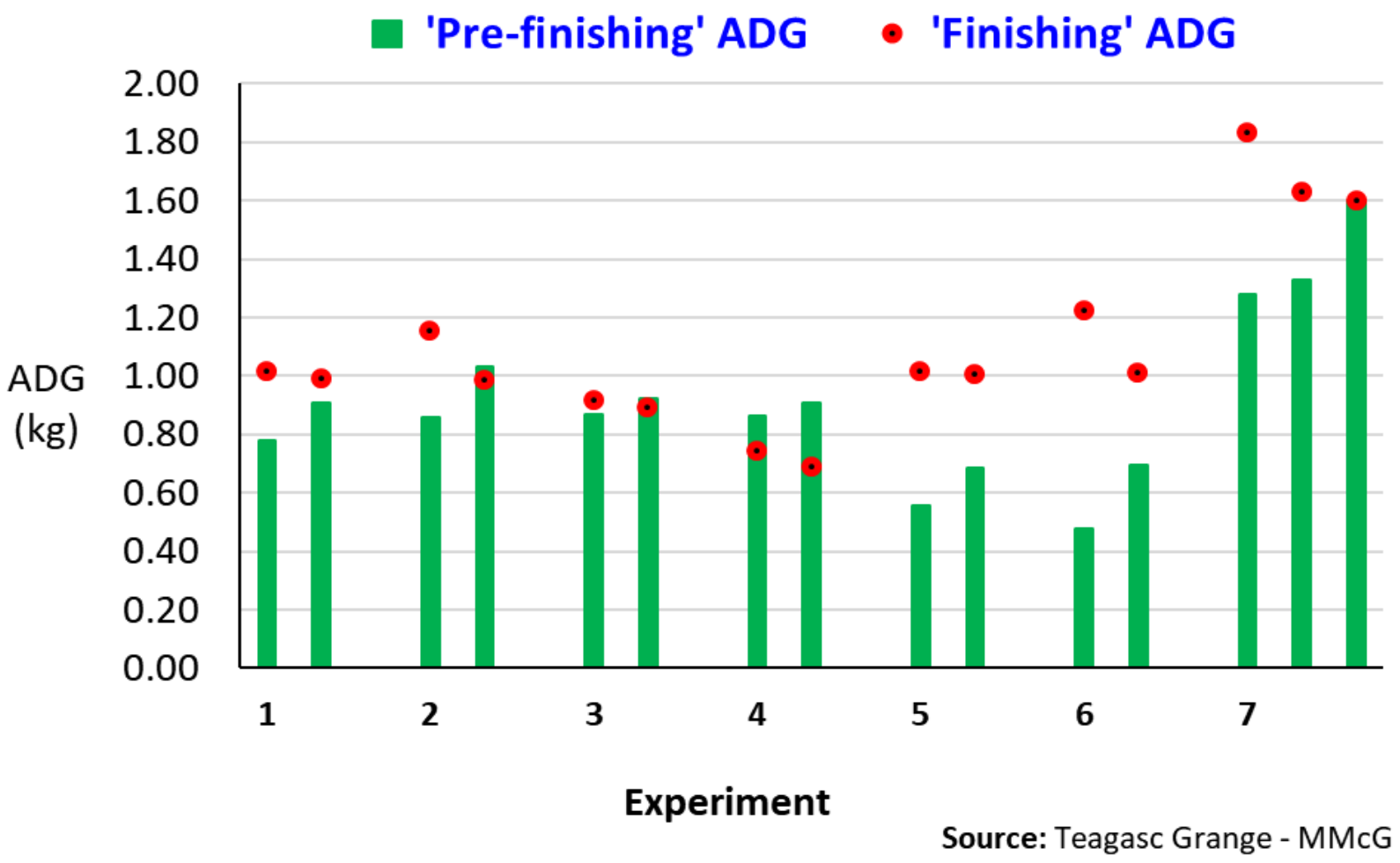
Animals: Late-maturing suckler bred
Diet: 127-day 'store' period followed by high-concentrate diet for 174 days

	STEER	BULL	% Diff
Daily DM intake (kg)	9.4	9.8	4
Daily live weight gain, ADG (kg)	1.27	1.52	20
Feed conversion ratio (kg DM/kg ADG)	7.4	6.5	-13
Slaughter weight, (kg)	683	729	7
Carcass weight (kg)	382	419	10
Kill-out proportion (g/kg)	560	575	3
Carcass conformation (1-15)	9.1	10.2	12
Carcass fat (1-15)	8.6	7.9	-8

Source: Teagasc, Grange – EO'R

Management Factors

Compensatory growth potential



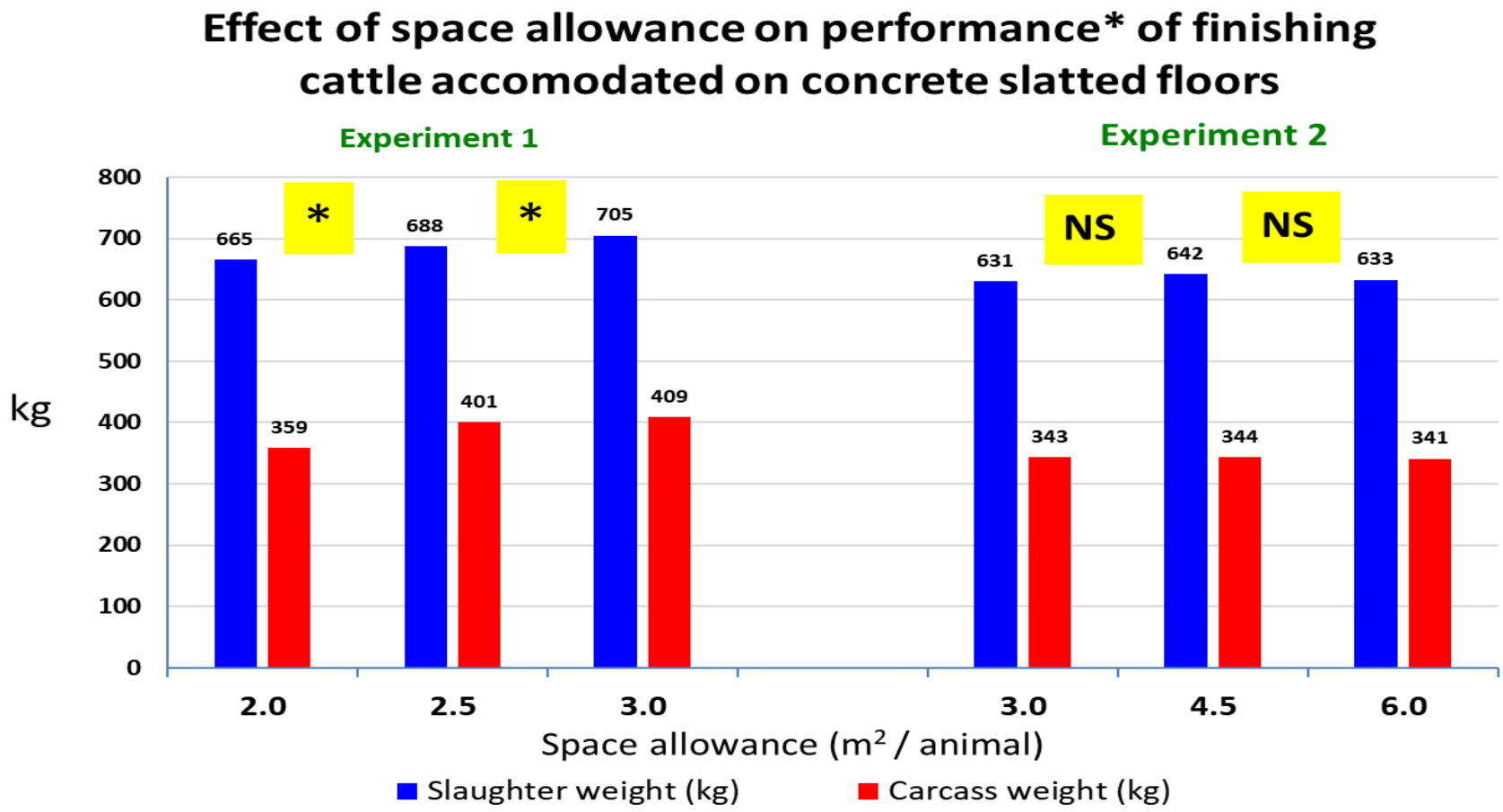
Finishing duration: Live weight gain & Feed efficiency

- **Animals:** Suckler-bred steers
- **Diet**
  - Grass silage *ad libitum* + 5 kg concentrate fresh weight (**Supp.**)
  - Concentrates *ad libitum* + Restricted grass silage (**Ad lib.)**

	ADG (kg)		Total DMI (kg/day)		FCR (kg DM/kg ADG)	
Diet	**Supp.**	**Ad lib.**	**Supp.**	**Ad Lib.**	**Supp.**	**Ad lib.**
Duration (days)						
Overall: 0-132	**0.94**	**1.17**	**10.1**	**10.7**	**10.7**	**9.2**
1st 'half': 0-62	*1.13*	*1.38*	*9.9*	*11.0*	*8.8*	*8.0*
2nd 'half' 63-132	*0.77*	*0.98*	*10.3*	*10.5*	*13.4*	*10.6*
1st vs. 2nd 'half' % Difference	***-32***	***-29***	***+4***	***-5***	***+52***	***+34***

Source: Teagasc, Grange - MMcG

Space allowance



*No difference in feed DM Intake

Source: Teagasc Grange - B. Earley

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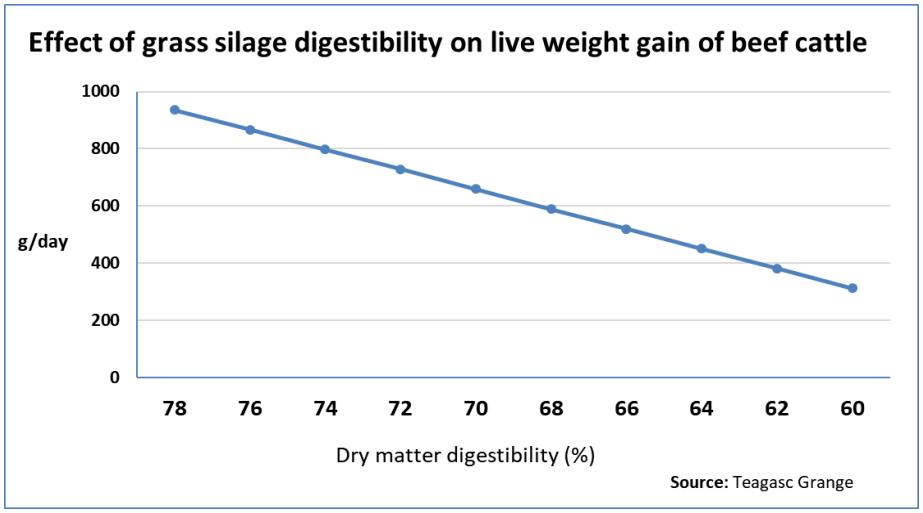
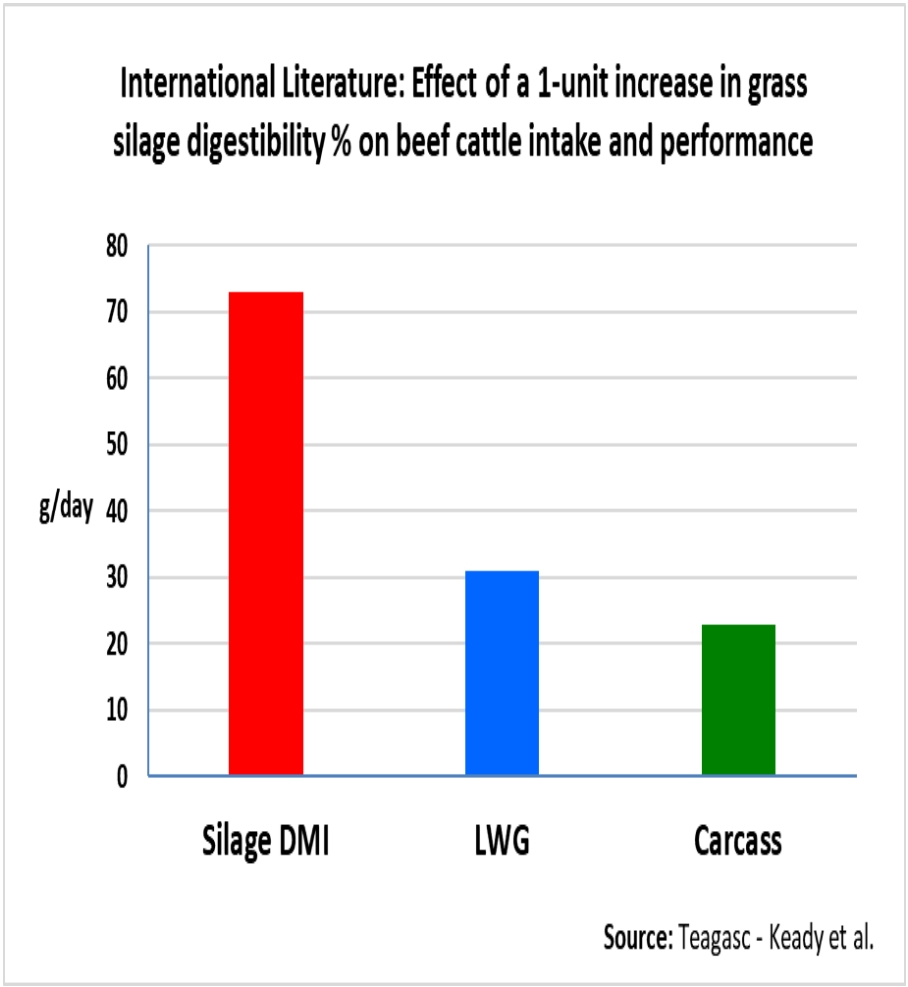
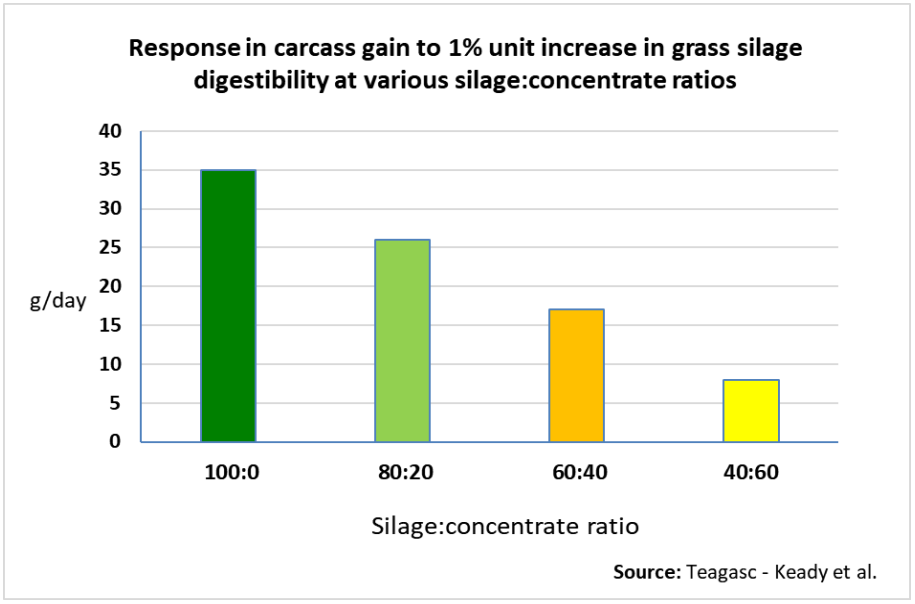
Feed Factors

Grass silage digestibility







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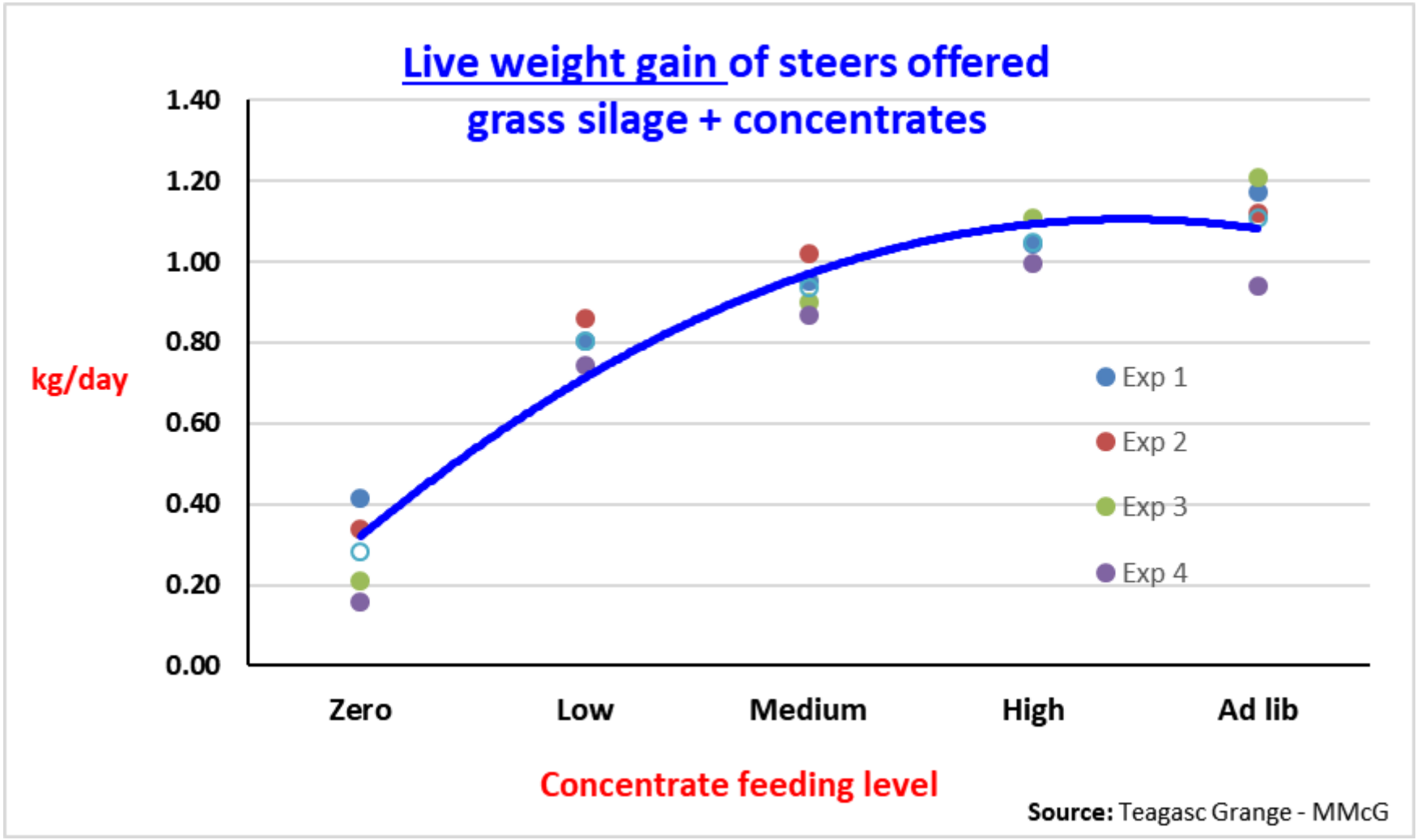
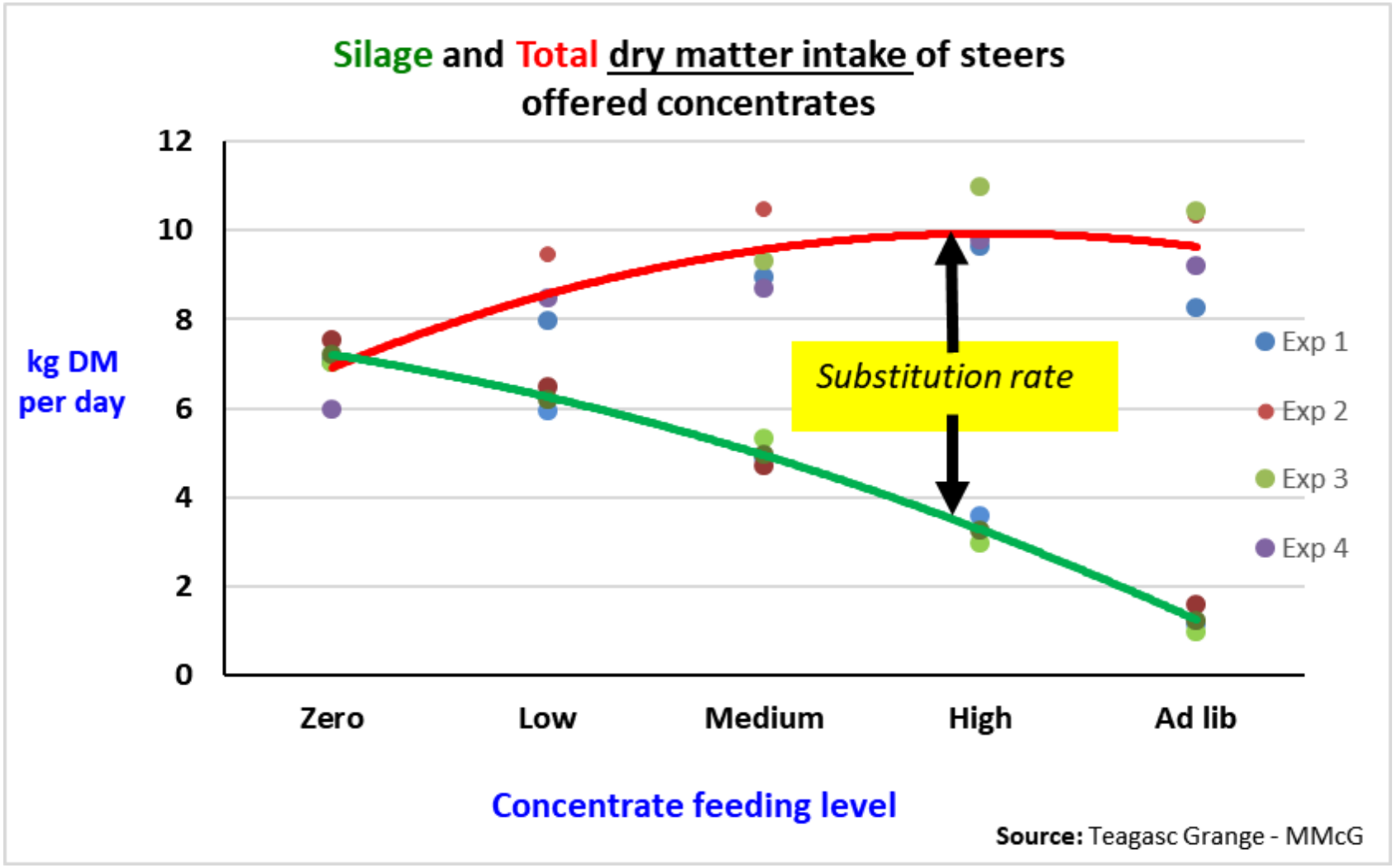
Grass silage + concentrates: ‘Growth’ response



‘High’ DMD grass silage

Grass silage + concentrates: Intake response



'High' DMD grass silage

Grass silage 'digestibility': Supplementation

Effect of Silage Digestibility ?

Research: each 1 unit decline in DMD of grass silage requires an additional **~0.33 kg** concentrate daily to sustain performance in finishing cattle.

	Concentrate level - kg/day			
Grass Silage DMD - %	**60**	**65**	**70**	**75**
Finishing steer* (1.0 kg ADG)	-	7.0-8.0	5.5-6.5	4.0-5.0

Corresponding "optimum" daily concentrate supplementation rates for

- **Finishing Heifers** (lower growth potential) reduced by ~1.5 to 2.0 kg.

*[**Finishing Bulls** (higher growth potential) increased by ~1.5 to 2.0 kg]*

Source: Teagasc, Grange

Maize meal vs. Rolled Barley

- Suckler-bred steers
- Grass silage ad libitum + 4 kg concentrate DM daily
- Coarse rations

	Cereal type		Sig.
	Rolled Barley	Maize Meal	
Silage DM intake (kg/day)	6.5	6.4	NS
Total DM intake (kg/day)	10.5	10.4	NS
Daily live weight gain (kg)	0.98	0.99	NS
FCE (g live weight gain/kg DM intake)	93	95	NS
Slaughter weight (kg)	680	681	NS
Carcass weight (kg)	388	385	NS
Kill-out proportion (g/kg)	570	565	NS
Carcass conformation score (1-15)	8.5	8.2	NS
Carcass fat score (1-15)	6.4	6.9	NS

Source: Teagasc Grange - MMcG

FOUR previous Teagasc studies comparing Maize meal vs. rolled Barley-based rations

- ~Replacing 50% rolled barley with maize meal (+ soyabean meal)
- Concentrate offered to **young bulls *ad libitum*** (3 x dairy-bred / 1 x suckler-bred)
- No difference in animal performance **except** 1 study, in favour of Maize meal
- **No difference in carcass fatness** in any of the studies

‘Native’ cereals: Barley vs. Oats

Experiment 1

- Suckler-bred steers
- Grass silage ad libitum + 4 kg concentrate DM daily
- Coarse rations

	Rolled Barley	Rolled Oats	Sig.
Silage DM intake (kg/day)	5.9	5.8	NS
Total DM intake (kg/day)	9.9	9.8	NS
Final live weight (kg)	697	697	NS
Carcass weight (kg)	402	405	NS
Conformation score (1-15)	9.0	9.5	NS
Fat score (1-15)	7.9	7.8	NS

Experiment 2

	Rolled Barley	Rolled Oats	Sig.
Silage DM intake (kg/day)	5.1	5.4	NS
Total DM intake (kg/day)	9.1	9.4	NS
Daily live weight gain - ADG (kg)	1.03	1.03	NS
Feed conversion ratio (kg DM/ kg ADG)	8.9	9.2	NS
Slaughter weight (kg)	570	571	NS
Carcass weight (kg)	328	325	NS
Kill-out proportion (g/kg)	564	560	NS
Carcass conformation score (1-15)	9.1	8.6	NS
Carcass fat score (1-15)	7.6	7.3	NS

Source: Teagasc Grange - MMcG

Legumes: Beans & Peas

- Suckler-bred steers
- Grass silage ad libitum + 4 kg concentrate DM daily
- Isonitrogenous coarse rations

Experiment 1

	Protein-energy source		
	Flaked Beans	Flaked Peas	Sig.
Silage DM intake (kg/day)	5.8	5.8	NS
Total DM intake (kg/day)	9.8	9.8	NS
Final live weight (kg)	701	688	0.08
Carcass weight (kg)	405	396	0.05
Conformation score (1-15)	9.7	8.7	0.07
Fat score (1-15)	7.9	7.8	NS

Experiment 2

	Protein-energy source				
	Flaked Beans	Flaked peas	Maize Gluten	Corn Distillers	Sig.
Silage DM intake (kg/day)	6.4	6.2	6.5	6.5	NS
Total DM intake (kg/day)	10.4	10.2	10.5	10.5	NS
Daily live weight gain (kg)	0.96	0.96	1.02	0.99	NS
FCE (g live weight gain/kg DM intake)	91.4	93.9	97.3	93.3	NS
Slaughter weight (kg)	678	678	685	681	NS
Carcass weight (kg)	383	390	387	384	NS
Kill-out proportion (g/kg)	566	576	565	564	NS
Carcass conformation score (1-15)	8.2	8.8	8.1	8.3	NS
Carcass fat score (1-15)	6.8	6.4	7.0	6.3	NS

Source: Teagasc Grange - MMcG

Response to protein in Finishing Cattle

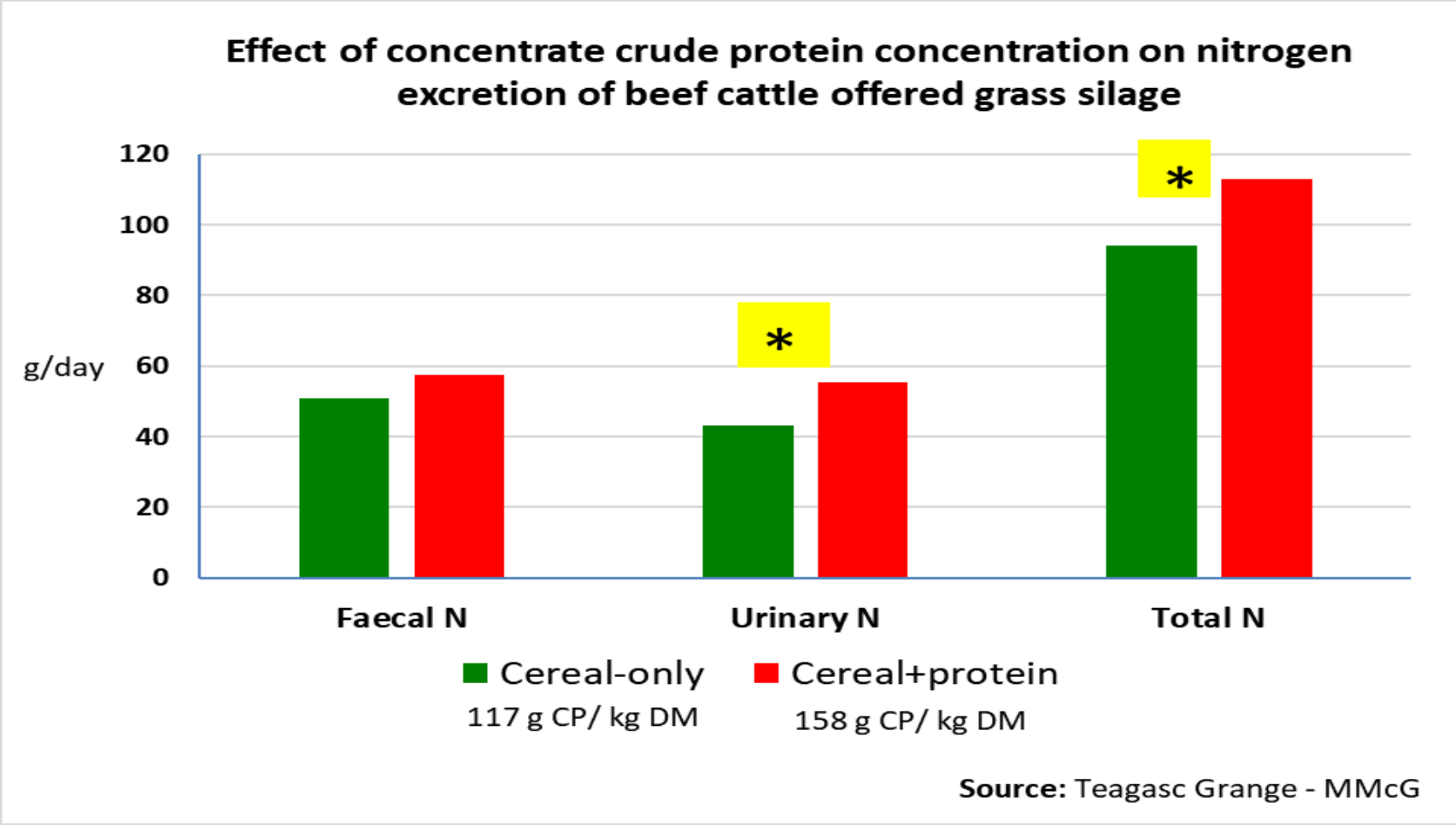
- Grass silage + concentrates
- Finishing steers / heifers / bulls
  - Barley-based concentrate + Protein supplement:
    - » High DMD silage = X
    - » Low DMD silage = ✓
  - Low crude protein grass silage = ✓

% CP in Dietary DM	
Heifers/Steers	~11-12
Bulls: growing	~13-15
Bulls: finishing	~12-13

Implications

- With low DMD & low CP grass silage
  - » Higher CP % required in concentrate

Effect of reducing concentrate crude protein concentration on nitrogen excretion



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