



# Optimising performance of beef cattle



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Teagasc, AGRIC, **Grange**,  
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*“Winter Finishing Mart Event”*  
Cillin Hill, Kilkenny  
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# Introduction

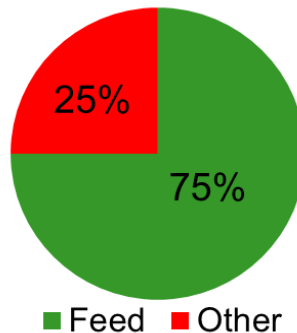
- **Beef production:** Conversion of feed to animal product as (cost) efficiently as possible.



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



Total variable costs



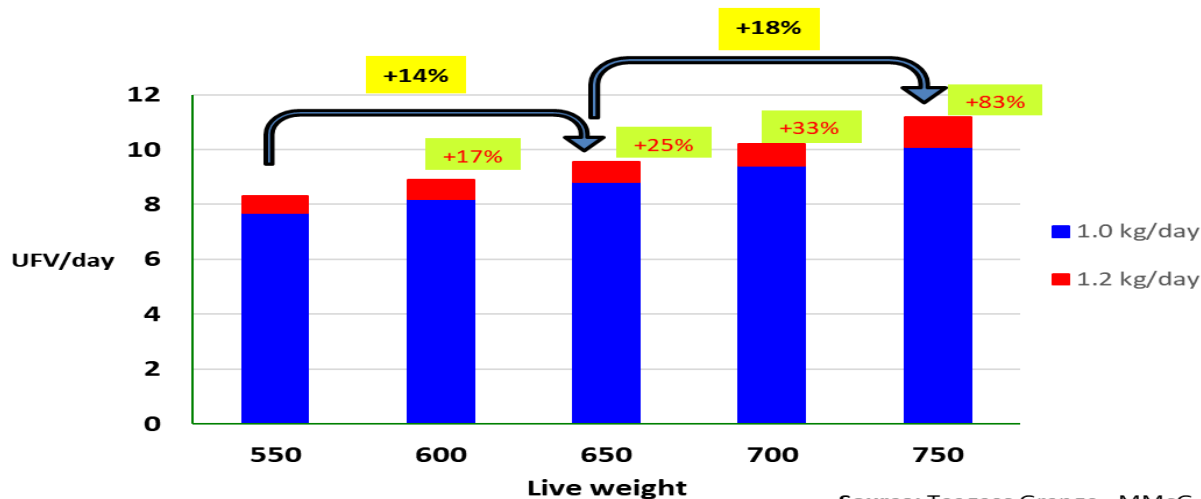
- **Feed (cost) efficiency:** Major factor determining cost competitiveness + environmental footprint & sustainability.

# Animal Factors

# Effect of live weight & live weight gain on nutrient requirements

## • Energy

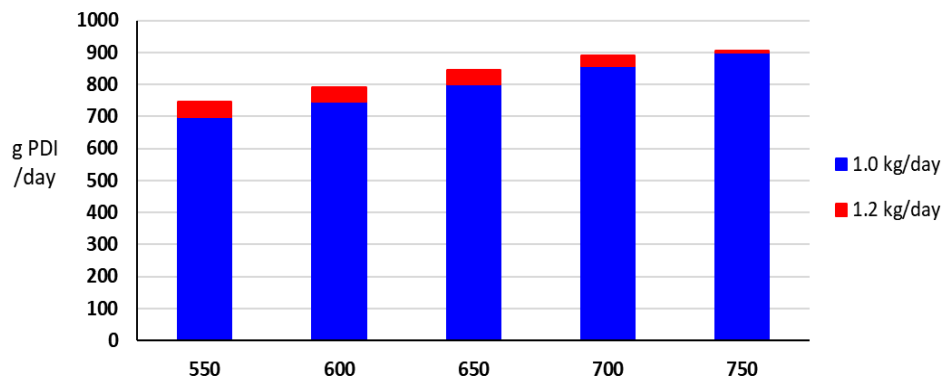
Theoretical energy requirements - UFV/day - of finishing steers by live weight and daily gain



- @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
- Minerals & Vitamins
- Water

## • Protein

Theoretical protein requirements - g PDI/day - of finishing steers by live weight and daily gain



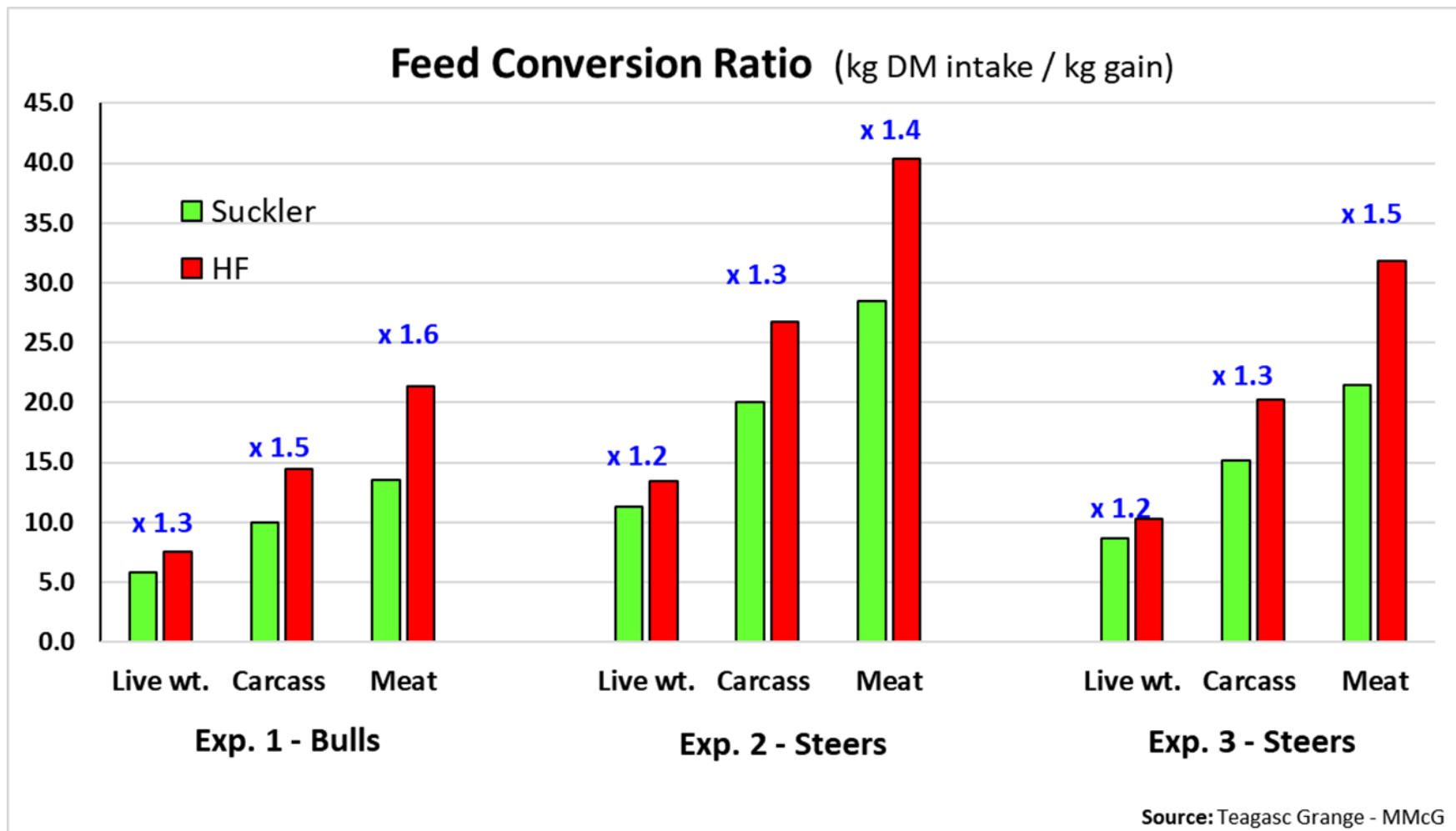
# BREEDS: Suckler-bred Charolais vs. Dairy-origin Holstein-Friesian steers offered a high-concentrate 'finishing' diet



	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

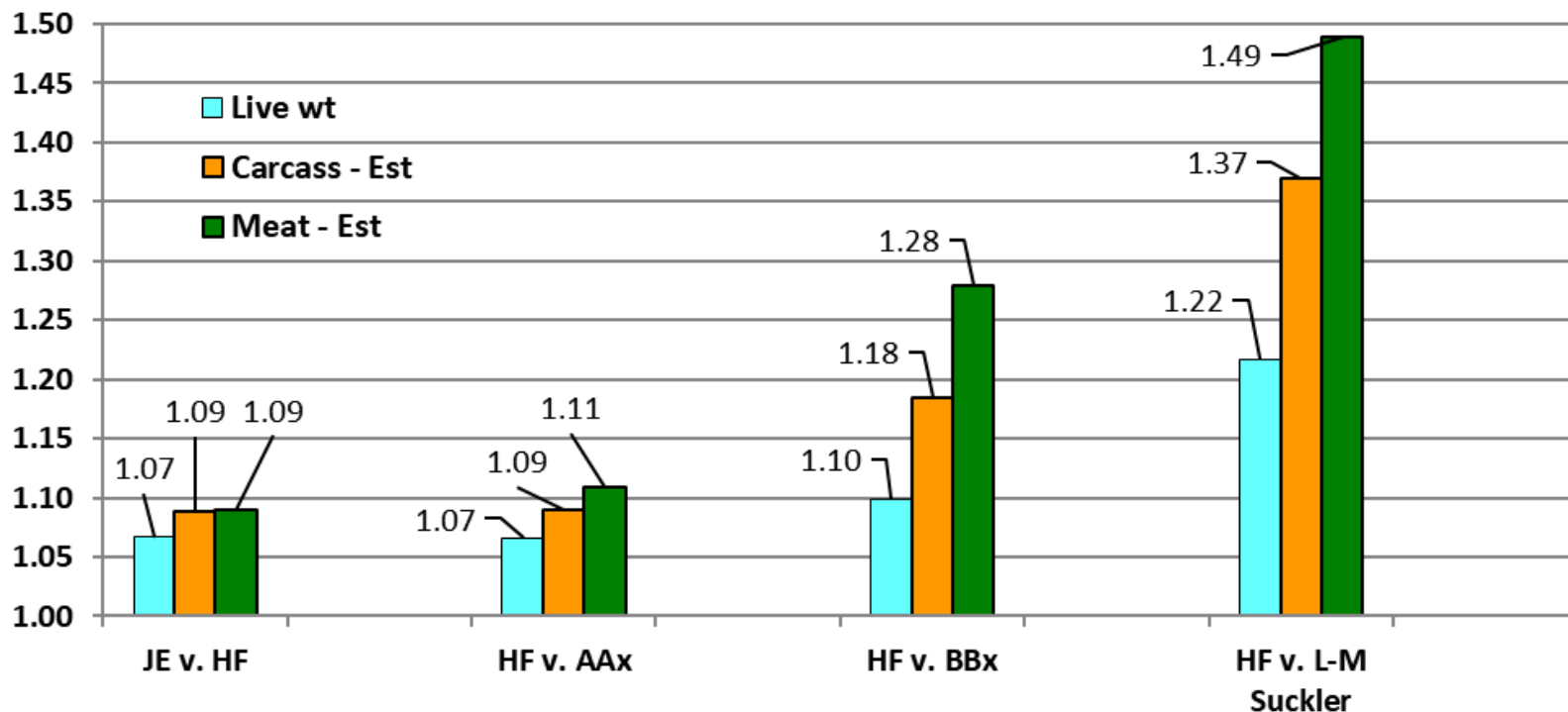
**CONCLUSION:** The lighter, slower-growing **Holstein-Friesian** steers consumed 10% more feed DM resulting in a **substantially inferior feed efficiency** compared to **Charolais**.

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



# BREEDS: Feed Efficiency - Summary of Experiments

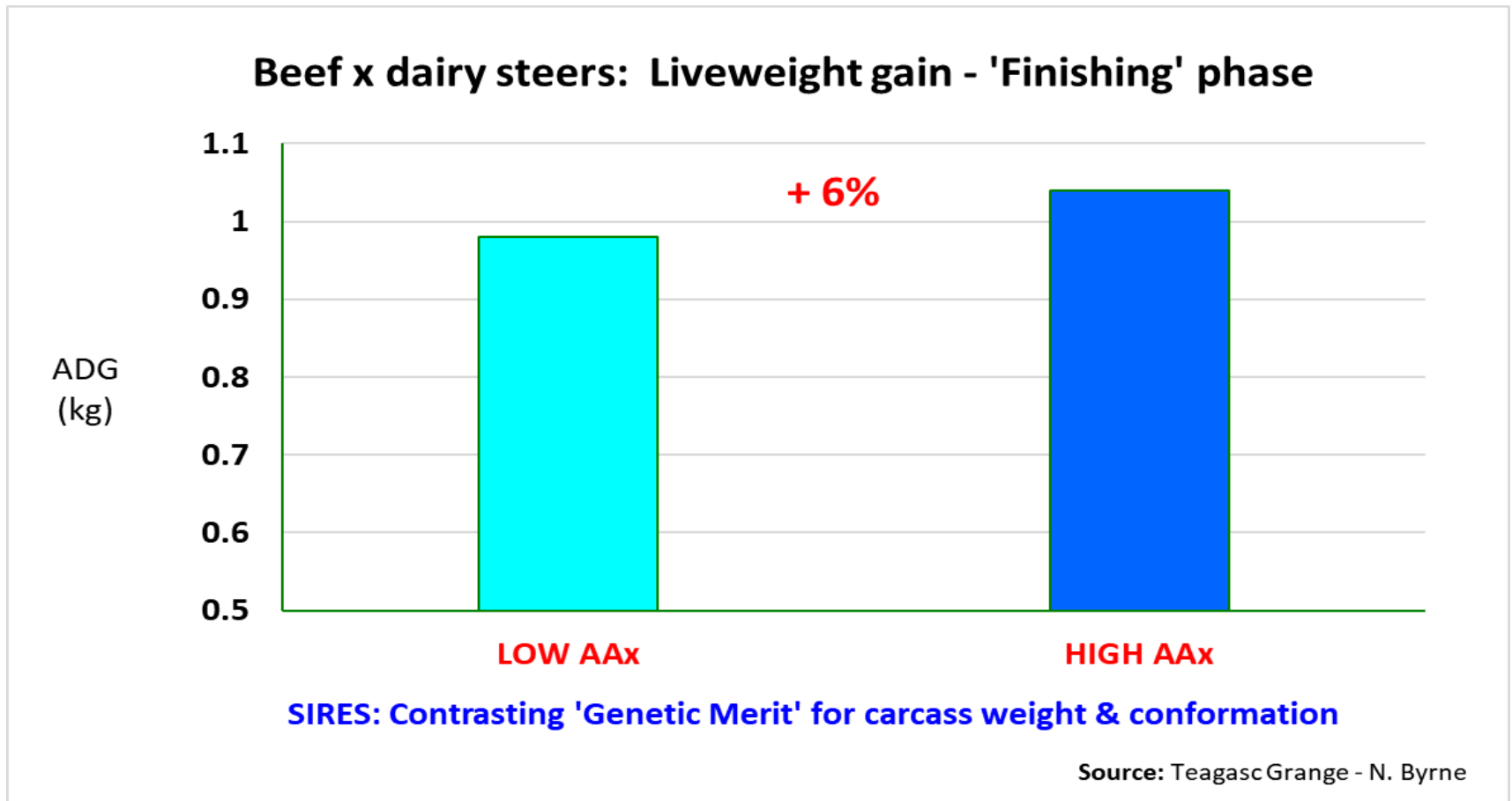
**BREED Types: Feed Efficiency during Finishing\***  
**(Relative feed DMI / unit gain)**



\*@fixed slaughter weight /age

Source: Teagasc Grange - MMcG

# 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

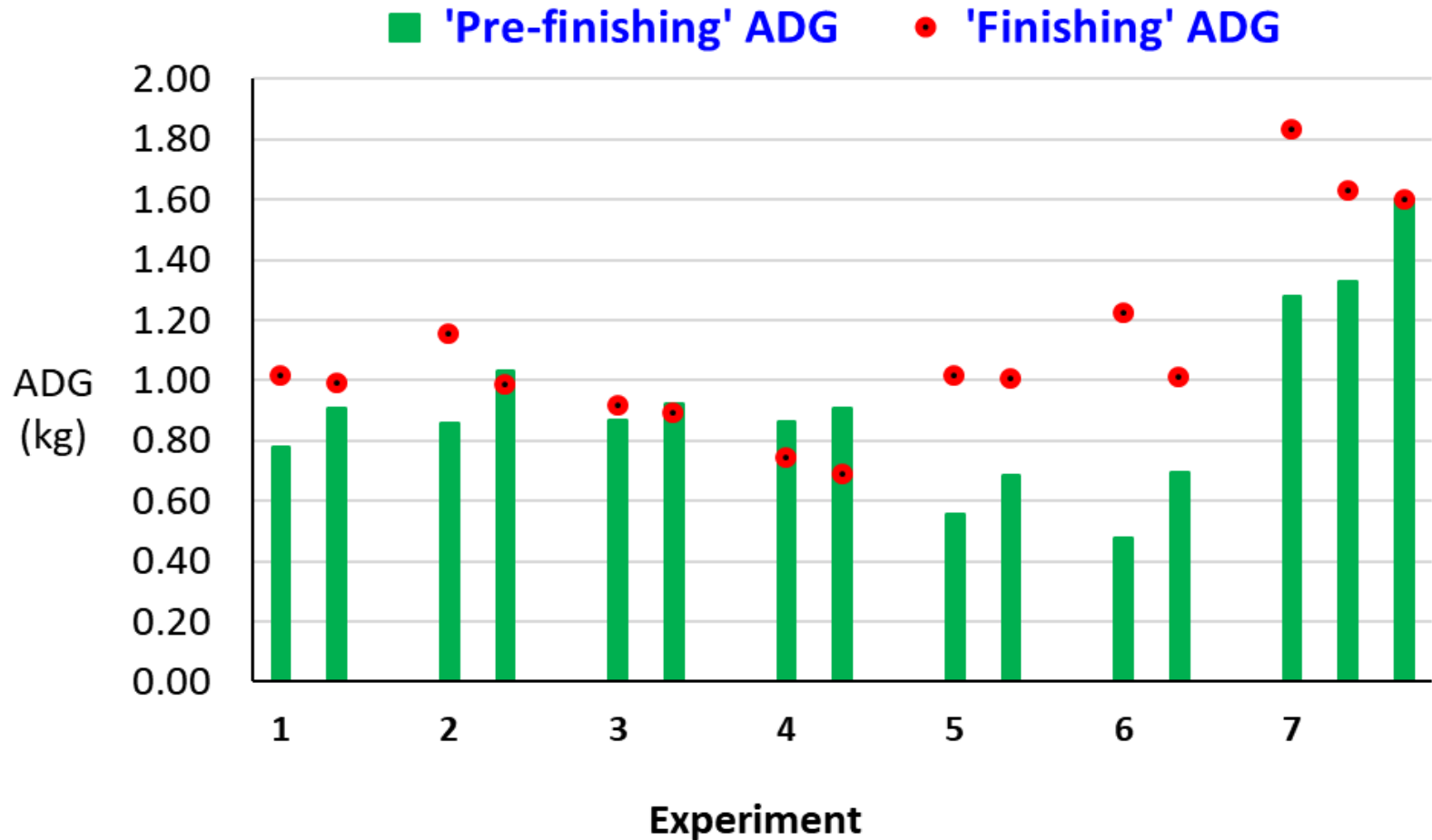
**Diet:** 127-day 'store' period followed by high-concentrate diet for 174 days

	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



Source: Teagasc Grange - MMcG

# Finishing duration: Live weight gain & Feed efficiency

- **Animals:** Suckler-bred steers

- **Diet**

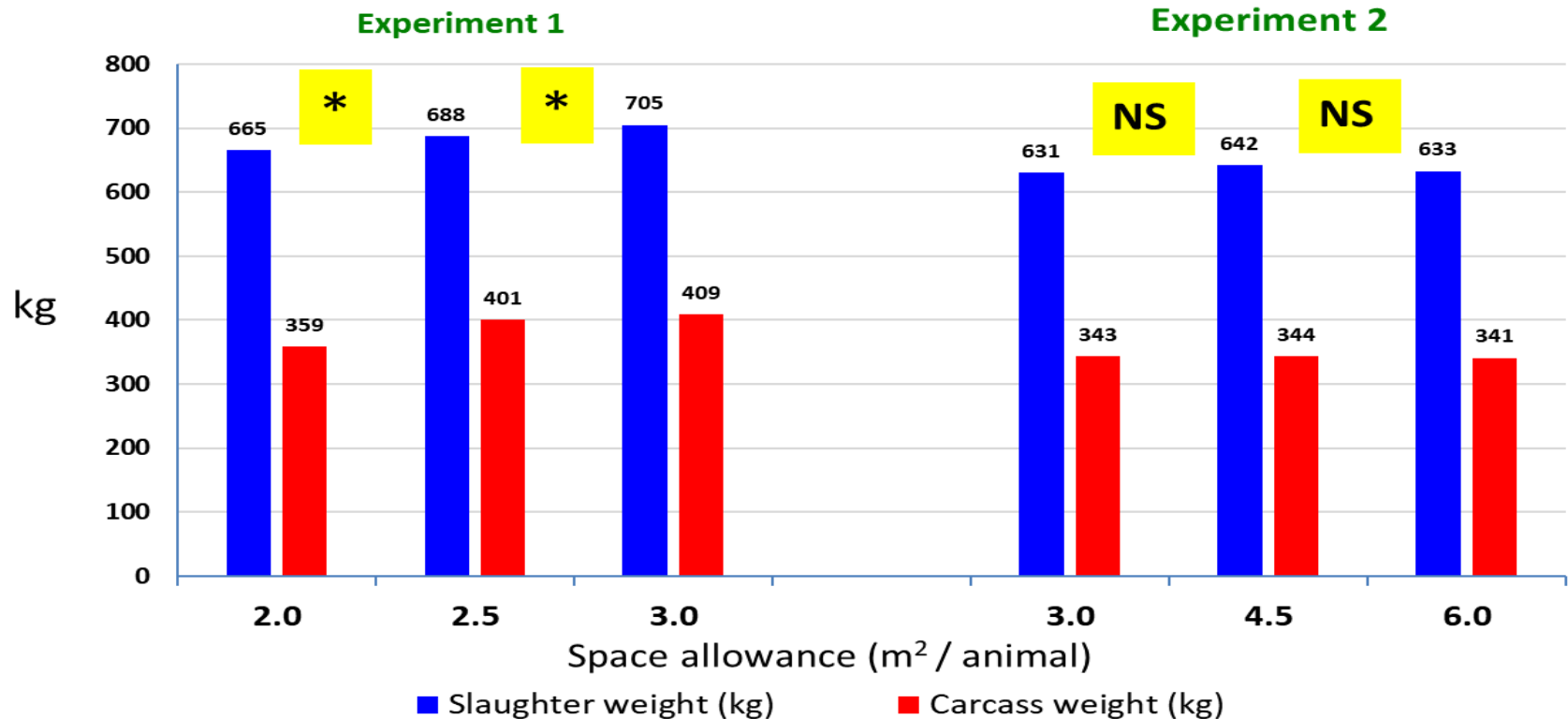
- Grass silage *ad libitum* + 5 kg concentrate fresh weight (**Supp.**)
- Concentrates *ad libitum* + Restricted grass silage (**Ad lib.**)

	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
1 <sup>st</sup> 'half': 0-62	1.13	1.38	9.9	11.0	8.8	8.0
2 <sup>nd</sup> 'half' 63-132	0.77	0.98	10.3	10.5	13.4	10.6
1 <sup>st</sup> vs. 2 <sup>nd</sup> 'half'						
% Difference	-32	-29	+4	-5	+52	+34

Source: Teagasc, Grange - MMcG

# Space allowance

## Effect of space allowance on performance\* of finishing cattle accommodated on concrete slatted floors



\*No difference in feed DM Intake

Source: Teagasc Grange - B. Earley

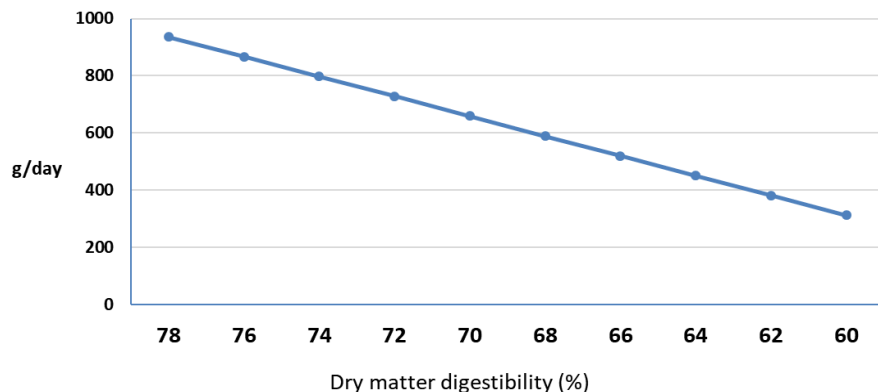
# Feed Factors



# Grass silage digestibility

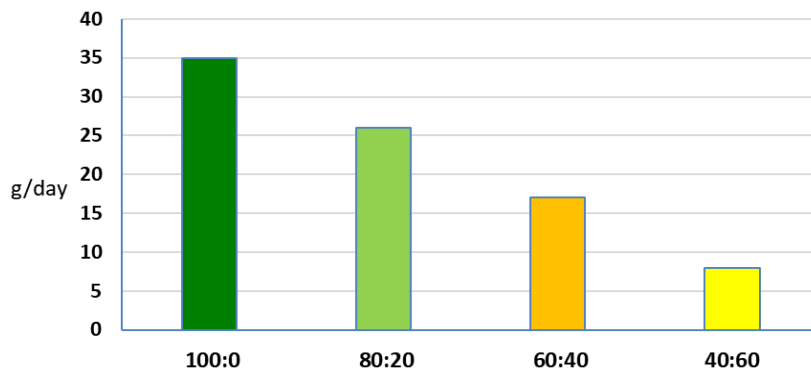


**Effect of grass silage digestibility on live weight gain of beef cattle**



Source: Teagasc Grange

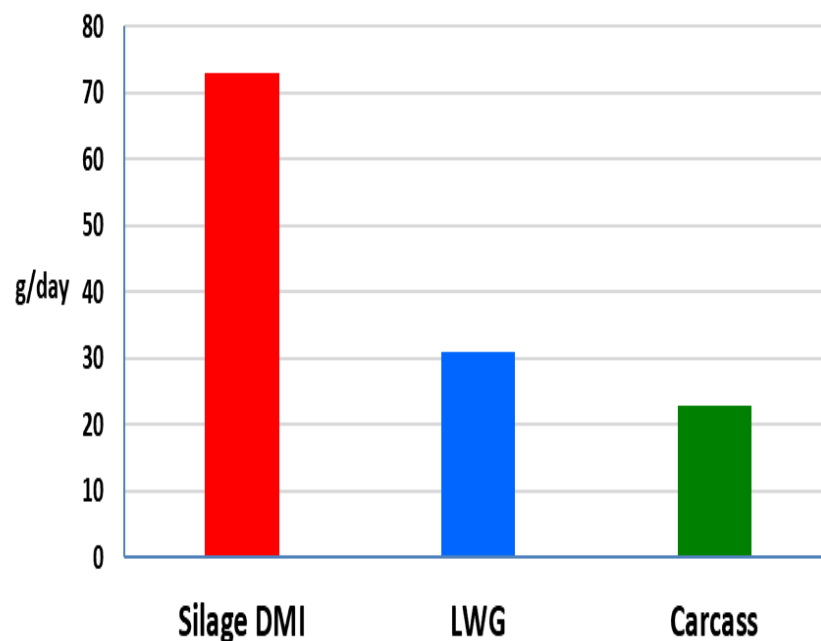
**Response in carcass gain to 1% unit increase in grass silage digestibility at various silage:concentrate ratios**



Silage:concentrate ratio

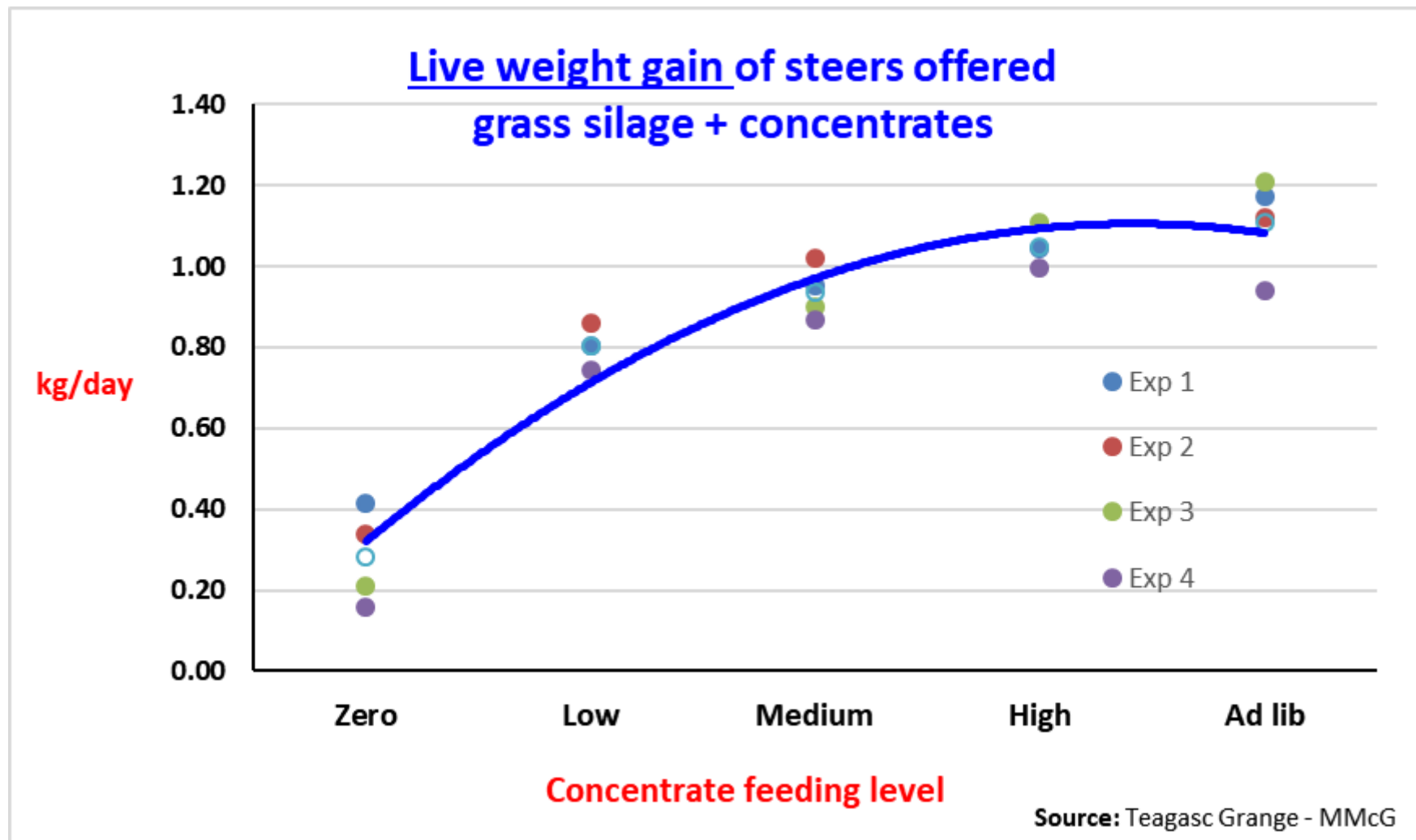
Source: Teagasc - Keady et al.

**International Literature: Effect of a 1-unit increase in grass silage digestibility % on beef cattle intake and performance**



Source: Teagasc - Keady et al.

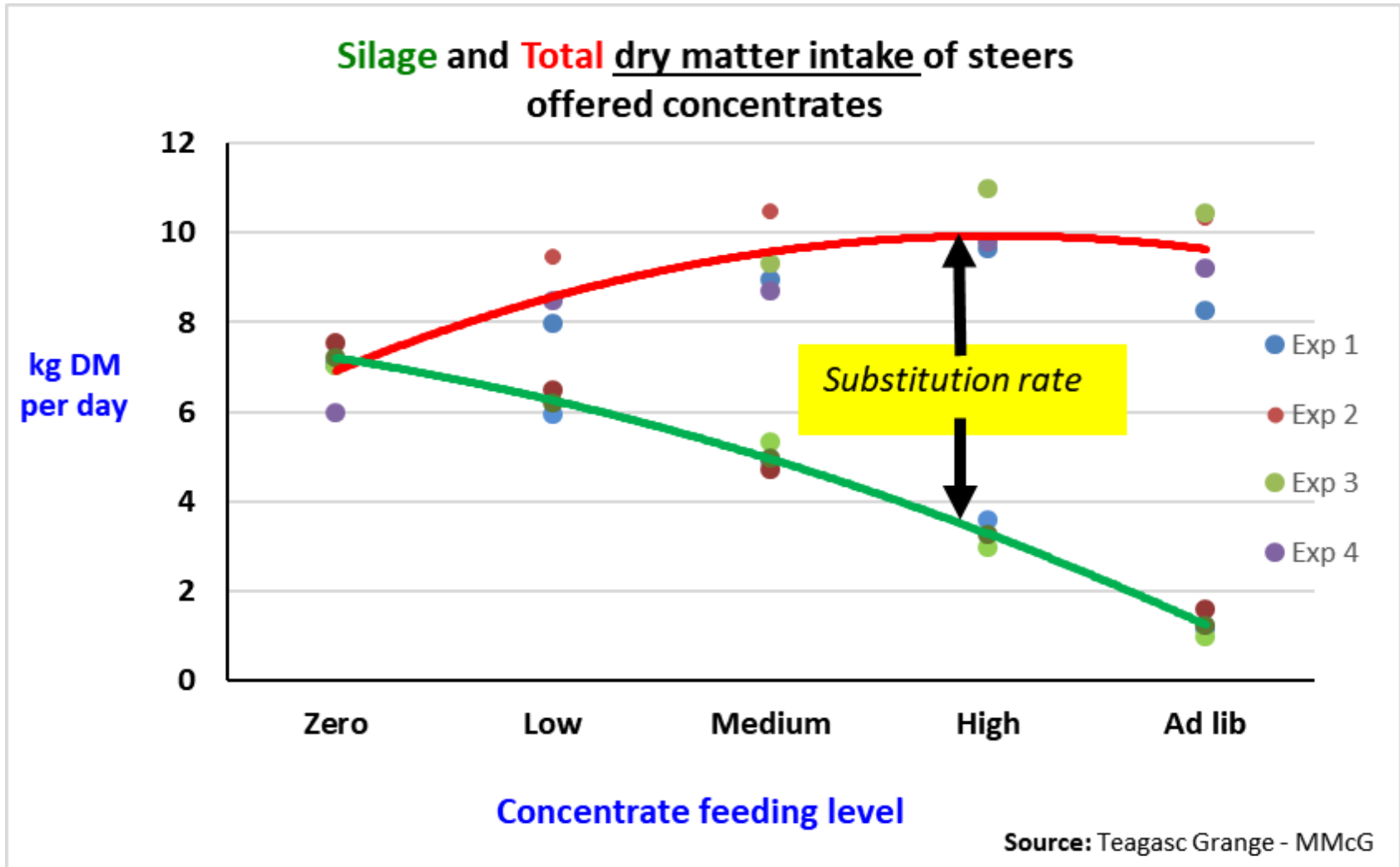
# Grass silage + concentrates: 'Growth' response



'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			
<u>Grass Silage DMD - %</u>	<u>60</u>	<u>65</u>	<u>70</u>	<u>75</u>
<u>Finishing steer*</u> (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



	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

## 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

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

## 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 = ✓

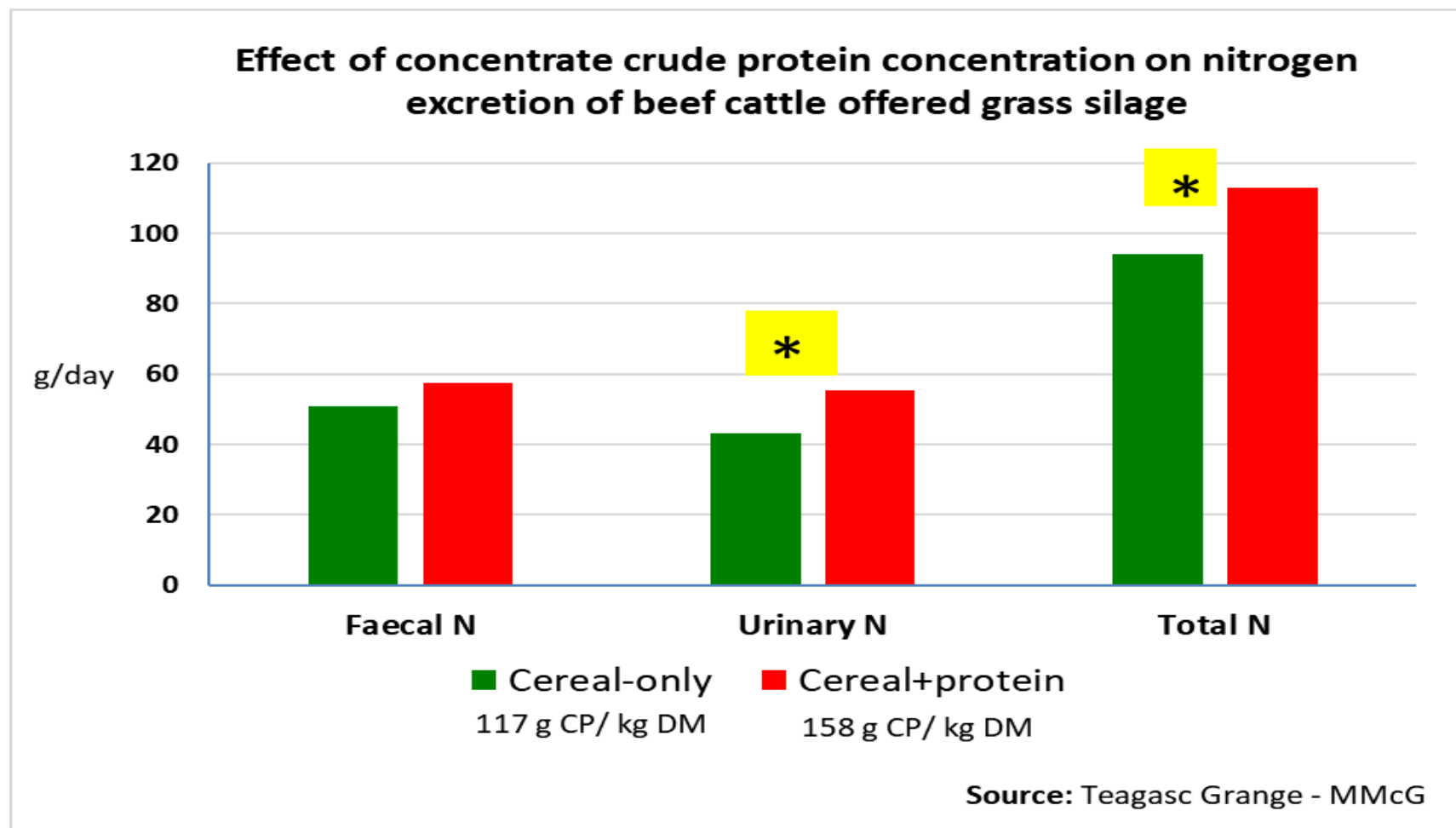
## % CP in Dietary DM

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





A photograph of three cows standing in a lush green field under a blue sky with scattered white clouds. The cow on the left is reddish-brown, the middle one is black, and the one on the right is light tan. All three have yellow ear tags. The text "Thank you for your attention" is overlaid in yellow on the black cow.

Thank you  
for your  
attention