Challenges in meeting MSA in pasture-based systems

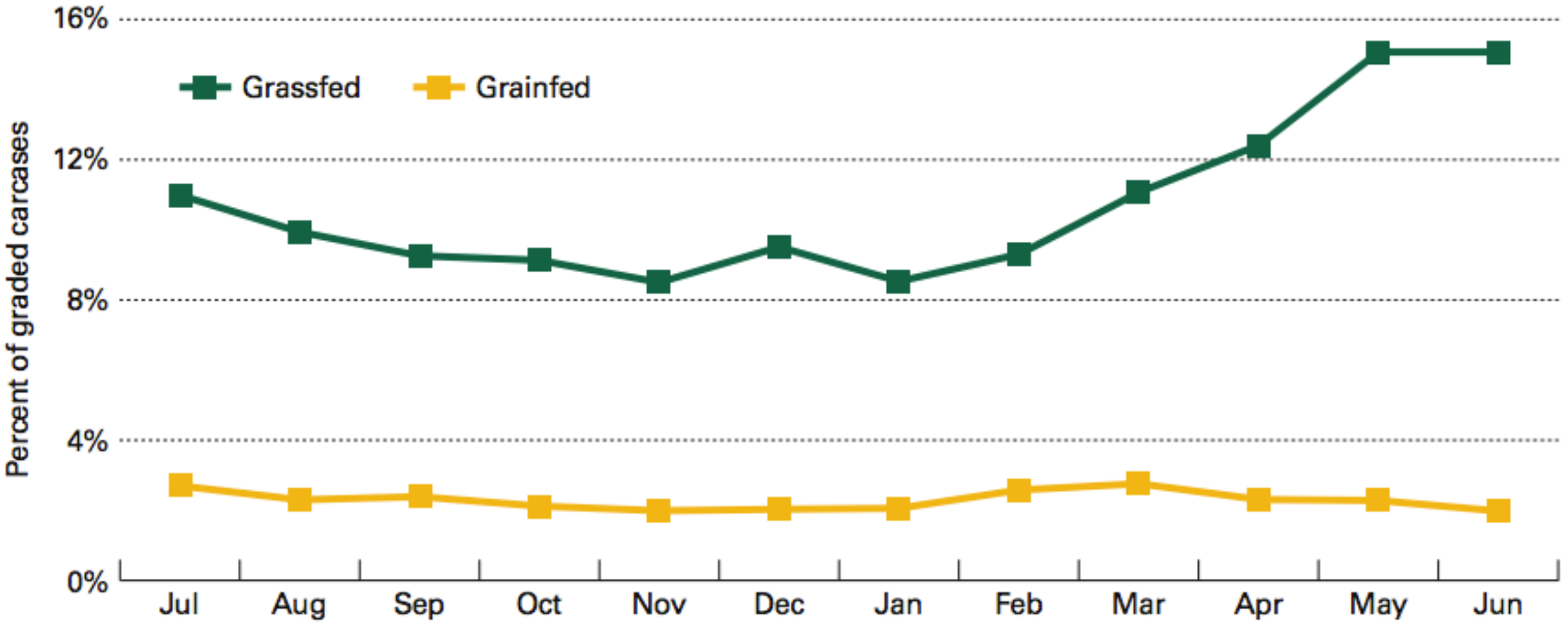
Michael Wilkes

Research Associate

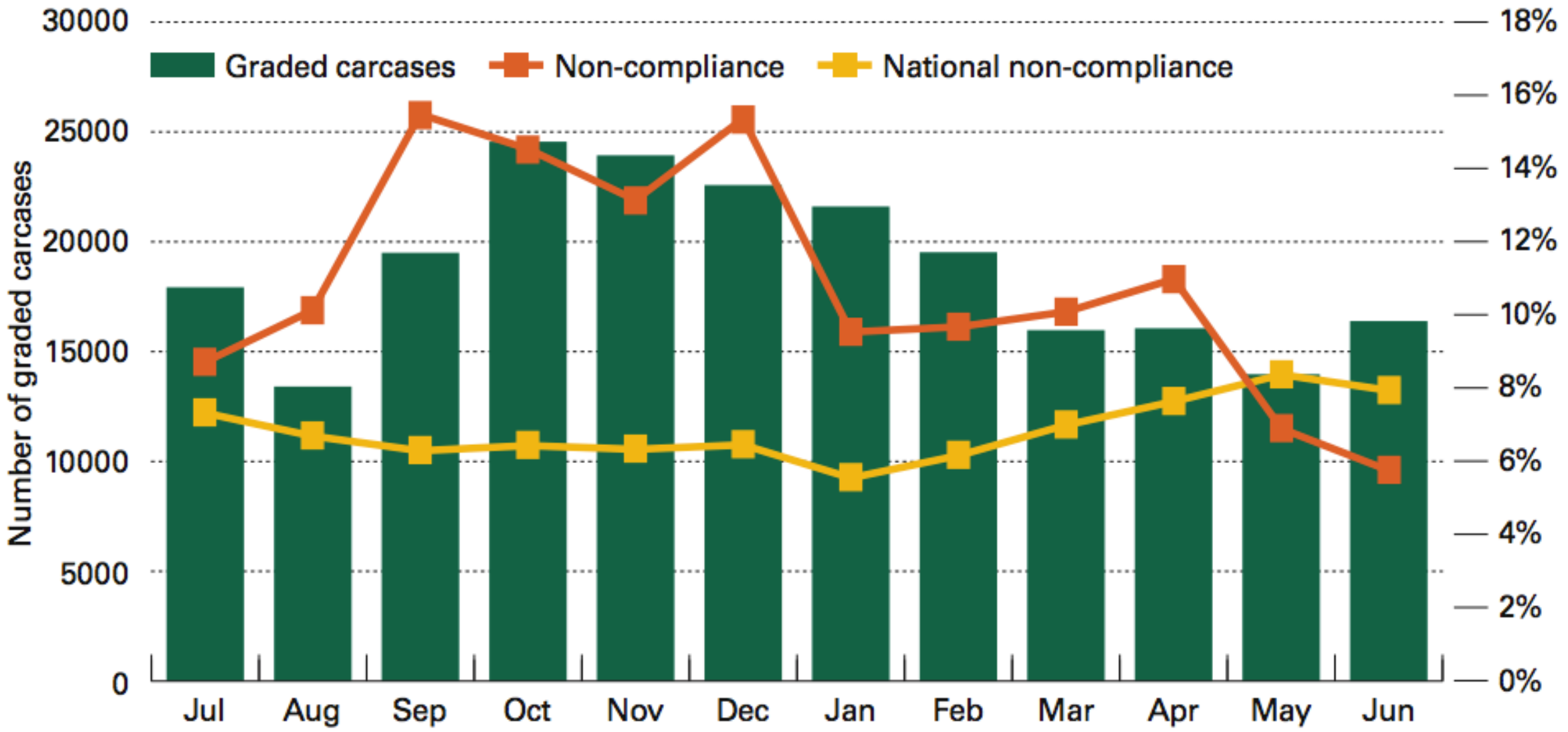
School of Animal and Veterinary Science

C/O Struan Research Centre

Struan South Australia



(MLA 2015 Australian beef eating quality audit)



(MLA 2015 Australian beef eating quality audit)

GLYCOGEN

GLUCOSE

LACTIC ACID

ATP

$-O_2$

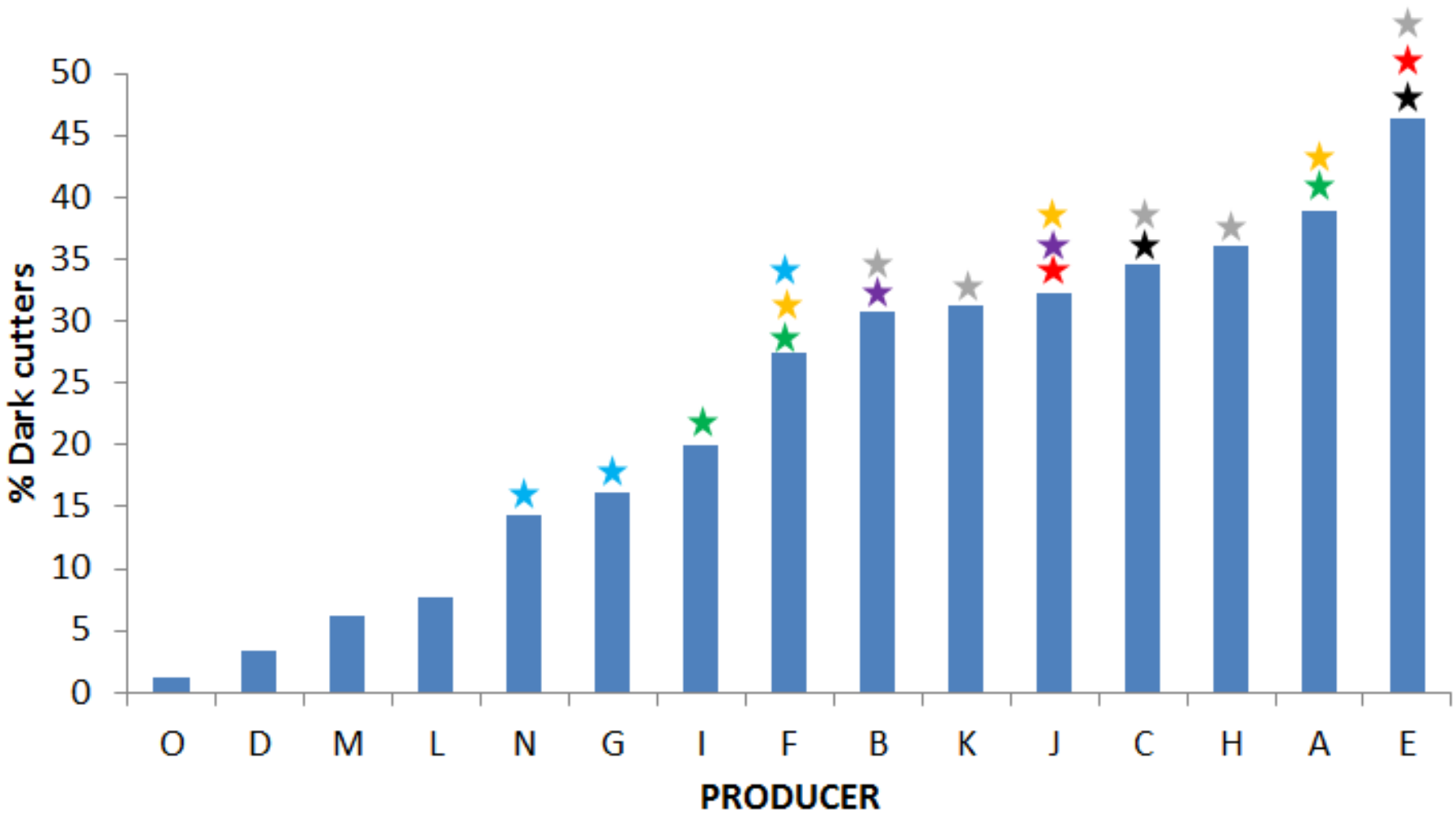
pH < 5.7

pH >5.71

Average of $0.59/kg carcass weight discount

~$3.9 million loss to both South East producers and processors

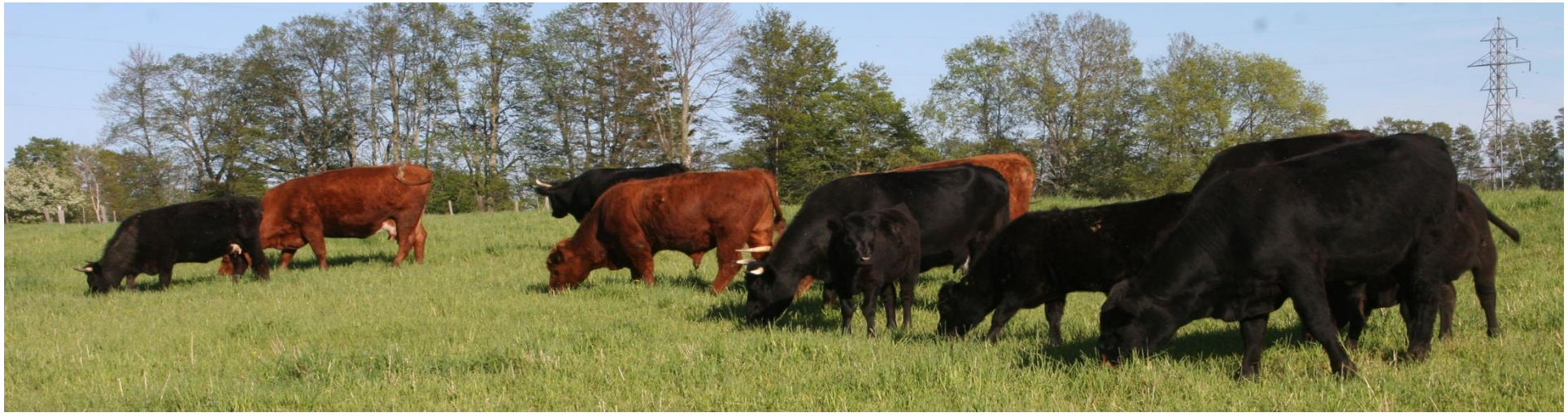
	DEPLETION	REPLETION	DEPLETION	REPLETION
Starvation	LOW	SLOW (3-6 TIMES THAN MONOGASTRICS)	LOW/NIL	LOW
Exercise	RAPID	<12 HOURS	RAPID	>12 HOURS
Stress	RAPID	<12 HOURS	RAPID	>12 HOURS

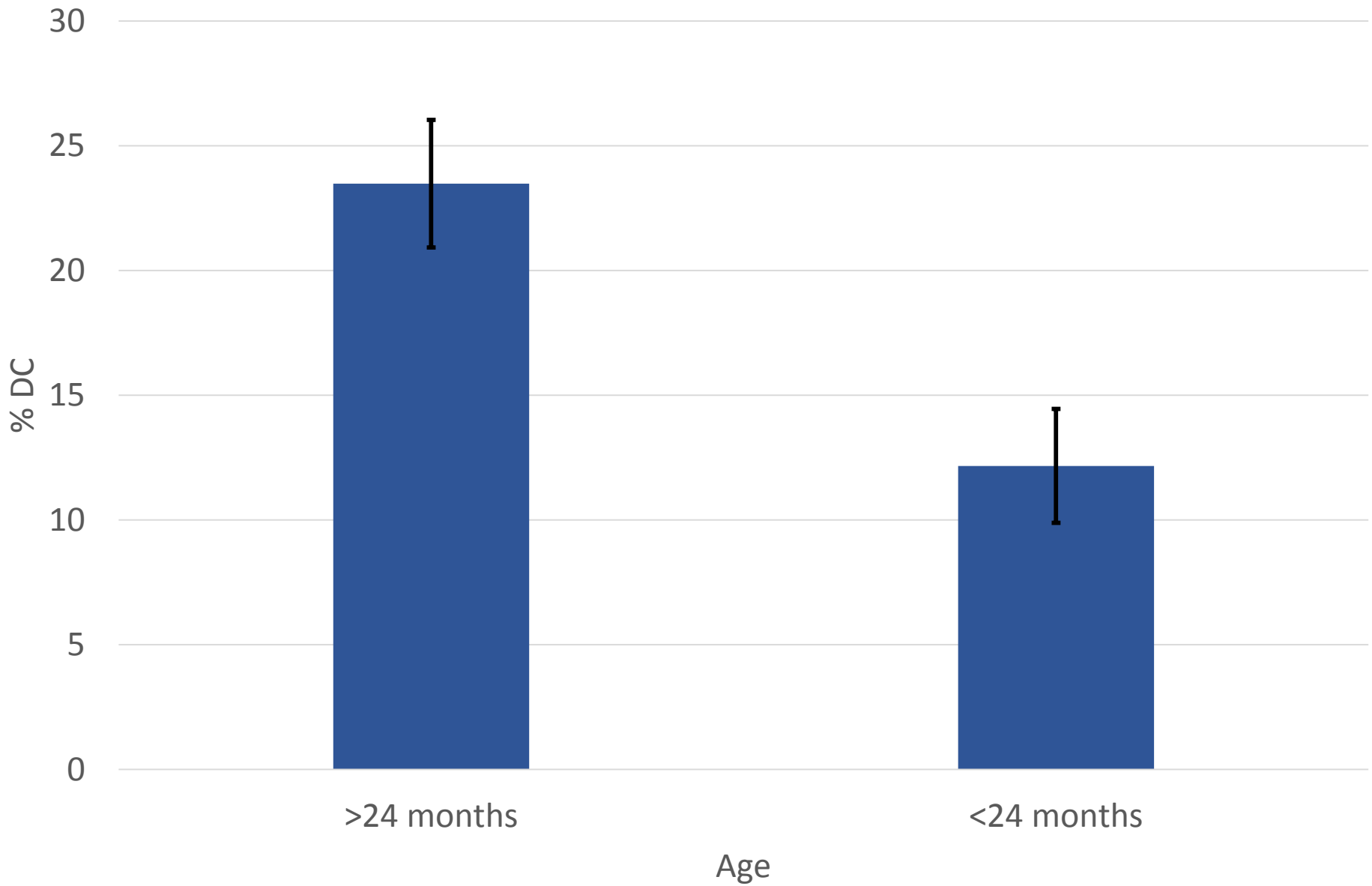


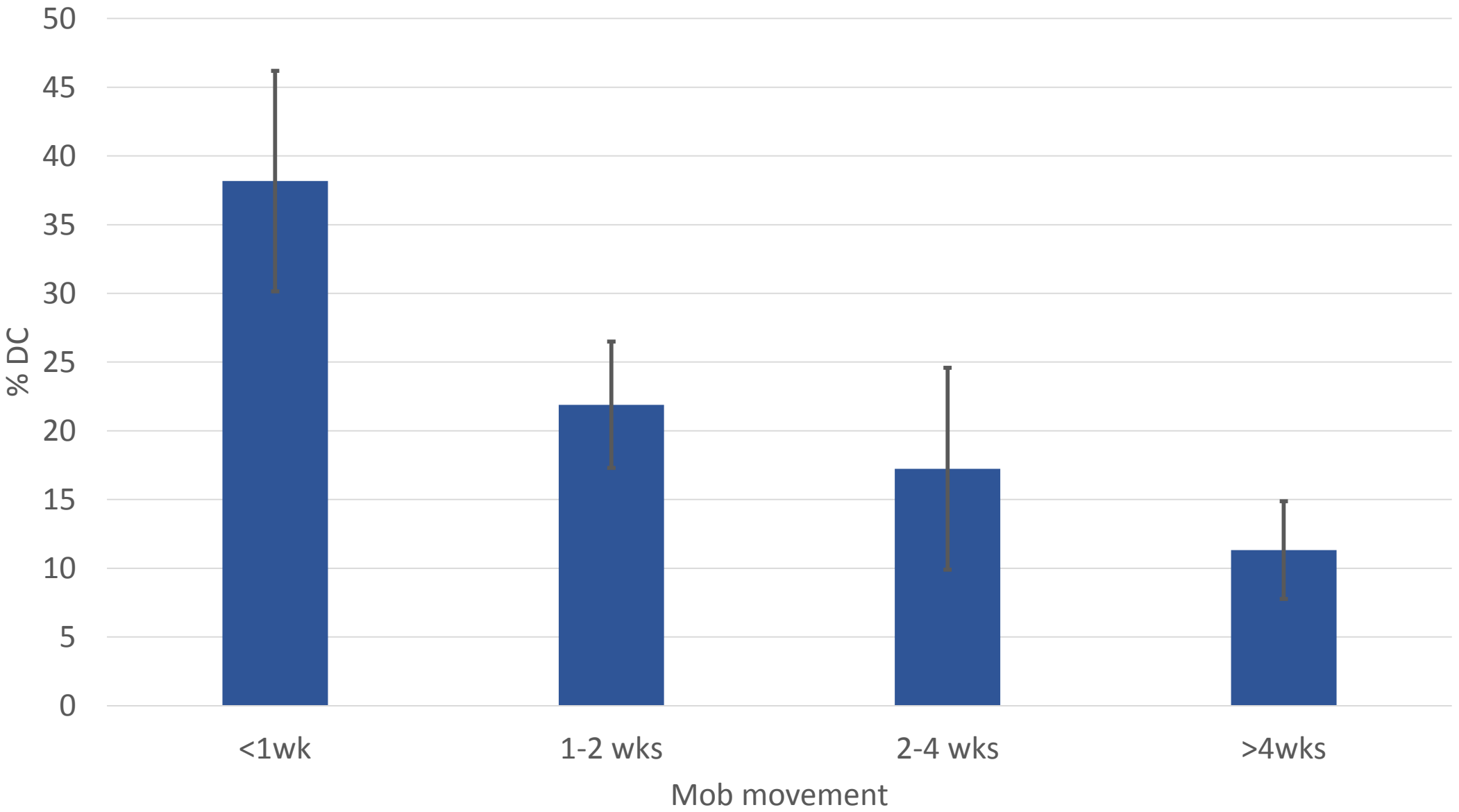
- Unimproved pasture★
- Recently mixed ★
- Recently moved★
- FOO <2000kg DM/ha ★
- Pasture mineral imbalance★
- “Tail-end” cattle ★
- Transported >100km to processor★

Scoping research 2014-15

- 5800 pasture finished MSA-eligible cattle
- Pasture sample and estimate of FOO
- Pasture History
- Animal History
- Management History
- Blood and Liver sample at slaughter

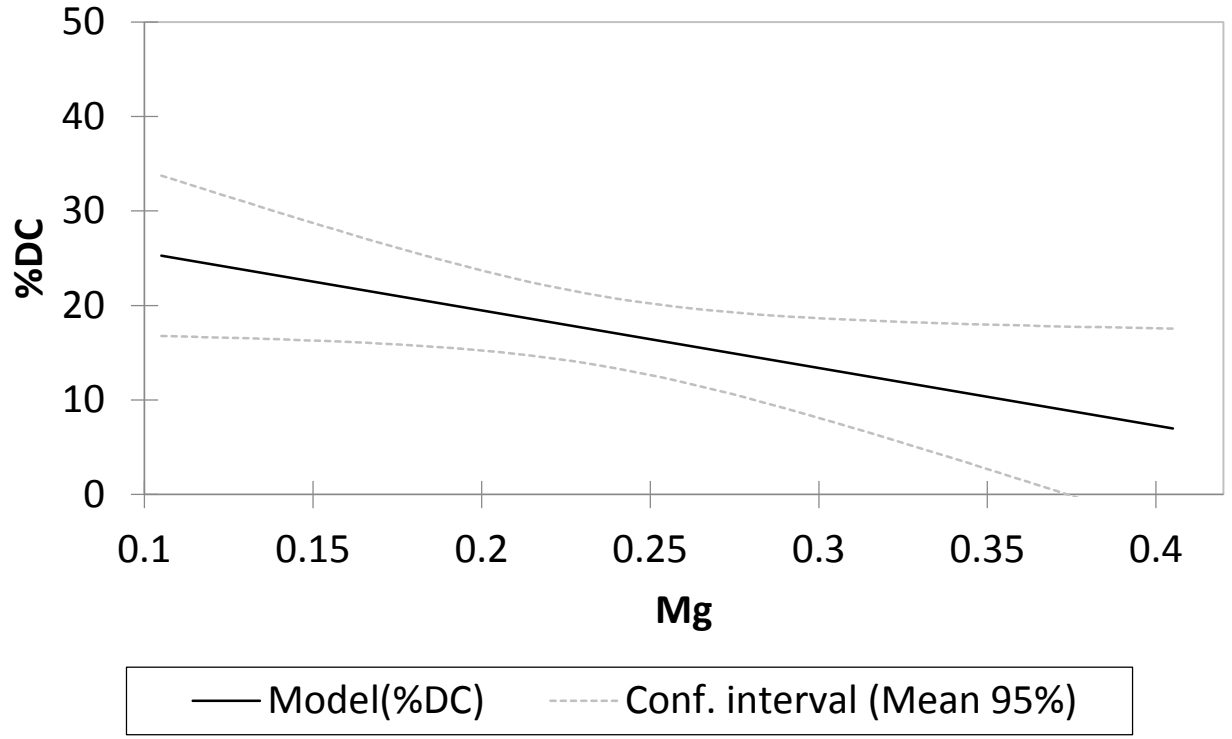



30
25
20
15
10
5
0
% DC
>24 months
<24 months
Age


50
45
40
35
30
25
20
15
10
5
0
% DC
<1wk
1-2 wks
2-4 wks
>4wks
Mob movement

Pasture composition

- Magnesium
  - Pasture level significantly related to mob incidence of DC
  - 0.18-0.32% DM range measured
  - 0.1% increase in Mg results in 6% decrease in mean mob DC %



ROLE OF MAGNESIUM

- Enzyme co-factor and activator of over 300 enzymes
  - Energy metabolism and protein synthesis
  - Neurotransmitter function
  - Cell growth
  - Reproduction
  - DNA synthesis

- Rumen epithelium is the primary site of absorption

SUPPLEMENTING MAGNESIUM

- Not stored, need continual dietary source
- Max tolerable 0.4-0.5% DM Mg^{2+}
- 4g Mg/d per 1% increase in K^{+} (Schonewille *et al.* 2008)
- Efficiency of absorption:

Chelated Mg=MgO > $MgCO_3$ > $MgSO_4$

Delivery Options

- Bolus
- Loose lick
- Block Lick
- Water supplementation
- Pasture supplementation- Fertiliser or Spray

Animal Mineral status

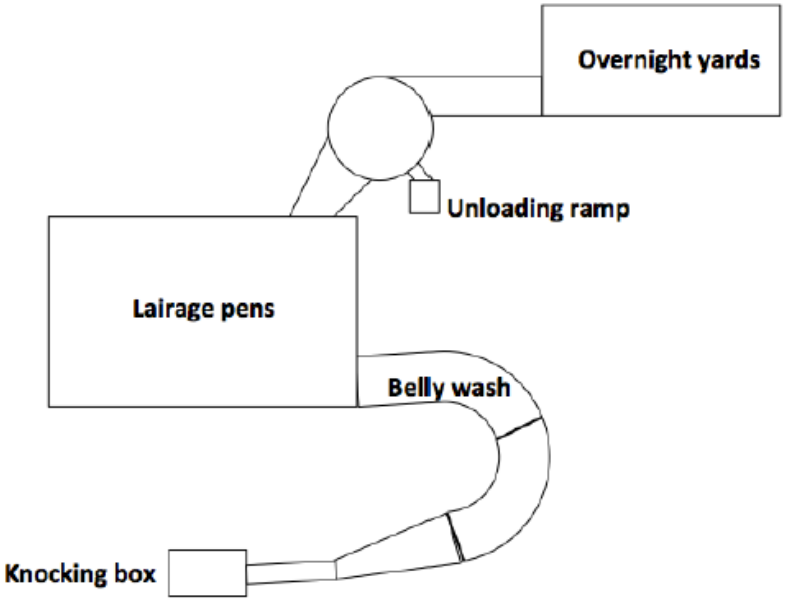
- Copper
- 99% deficient

- Zinc
- 94% deficient

- No direct correlation with mob %DC
- Both significantly correlated with both MSA marble score and rib fat depth
- Higher energy status= greater fat deposition

What About Factors off-farm?

- Observational Cohort Study
- 2881 animals
  - 63 mobs, 163 wash groups
- Measurements
  - Unloading
  - Lairage behaviour (Day before and of slaughter)
  - Washing frequency and duration



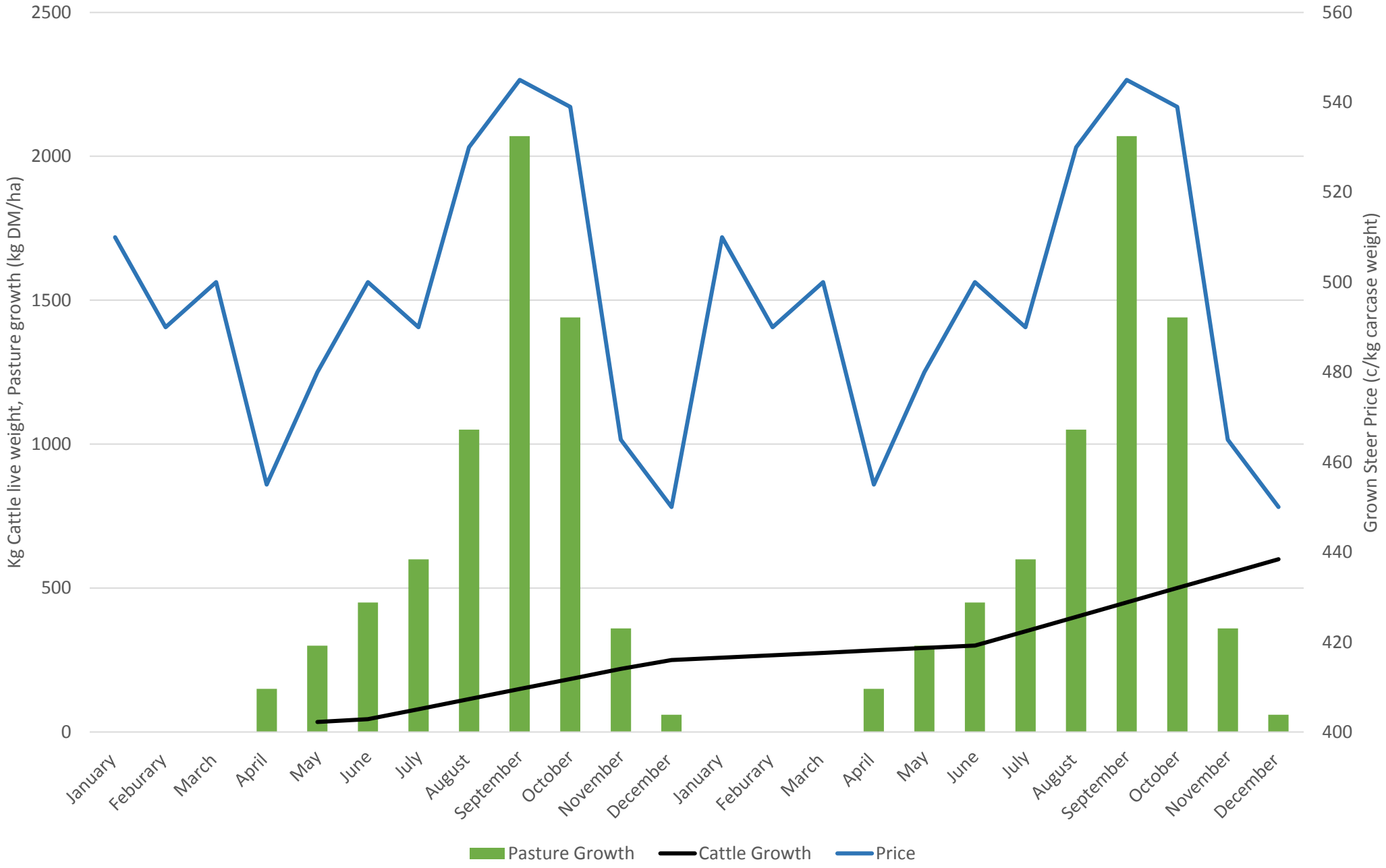
	Pasture	Grain	Total
Number of animals	1,437 50%	1,447 50%	2,884 100%
Dark cutting incidence	24%	2%	13%
Total number of carcasses classified dark cutters	342 92%	31 8%	373 100%
Carcasses with pH > 5.7	333 92%	28 8%	361 100%
Carcasses with meat colour > 3	342 92%	31 8%	373 100%

	F probability	Effect on %DC
# Lairage washes	<0.001	0.8
Wash duration	0.091	0
Falls during unloading	<0.001	6.8
Jumping during unloading	<0.001	4.6
Group movement (morning)	0.01	3.8

- Avoid ‘carry over’ stock
  - Quit early
  - Grow faster
- Minimise movement of stock within 2 weeks of slaughter
  - Definitely not within 1 week!
- Understand pasture composition AND animal status’
  - Mg, K+
  - Copper and Zinc
- Tailor supplementation based on the individual system
- Employ strategies to reduce reactivity to transport and lairage conditions
  - Regular handling
  - Yard weaning
  - Clean cattle minimise washing stress

Fodder beet grazing systems

Opportunities for the Southern Australian Beef Systems


2500
2000
1500
1000
500
0
Kg Cattle live weight, Pasture growth (kg DM/ha)
560
540
520
500
480
460
440
420
400
Grown Steer Price (c/kg carcase weight)
January
Feburary
March
April
May
June
July
August
September
October
November
December
January
Feburary
March
April
May
June
July
August
September
October
November
December
Pasture Growth
Cattle Growth
Price

Fodder Beet

- *Beta vulgaris spp.*
- *Family includes spinach, chard, beetroot*

- Mangelwurzel and sugar beet
- Large, tankard bulb (high energy)
- Spinach-type leaves (high protein)

- Long history as stockfeed
- NZ commenced work optimising grazing *in situ* approx. 10 years ago

The research project

- PIRSA Advanced Food Manufacturing grant

"Innovative management practices to achieve year round supply of premium pasture finished cattle in the Limestone Coast region"

- Collaborative project

- MLA Donor company support for year 2 (2016-17)

Trial Outline

- 7 sites in total over 2 years
  - 2015-2016- 26ha
  - 2016-2017-32ha

- Fodder beet vs. control (conventional pasture and/or other forage crops)

- Steer Entry weight 350-450kg

- Animal measurements
  - Growth Rate
  - Muscle glycogen concentration
  - MSA grading performance

- Crop measurements
  - Growth rate and Yield
  - Crop utilisation
  - Feed quality and mineral composition

ECONOMICS

2015-16

- Crops sown early-late October
- Pivot irrigation (though flood will work)
- Specific horticultural chemical
- Induction feeding commenced late Feb-early March

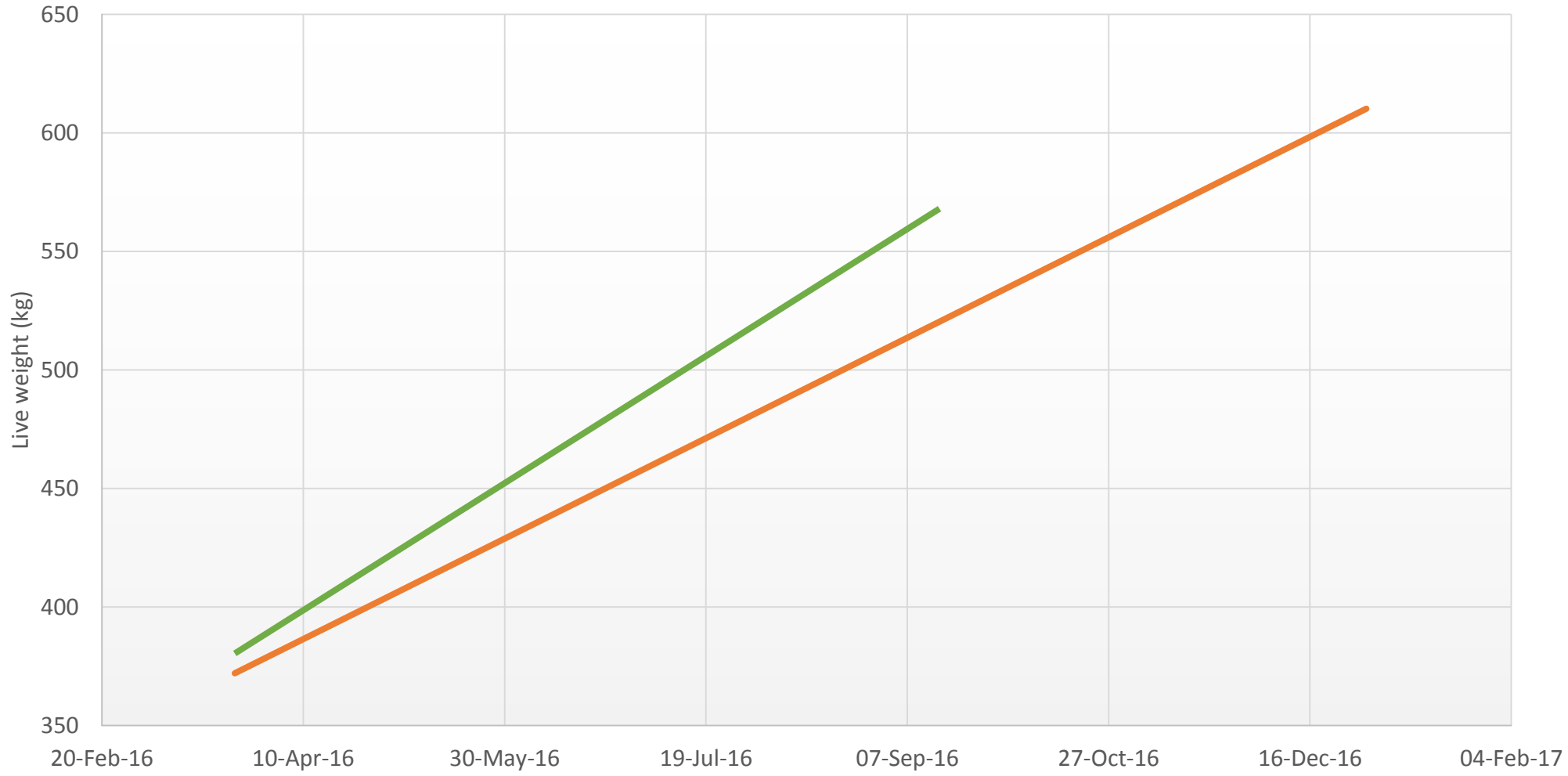
Cultivation	Seed + Seeding	Spray	Fertiliser	Irrigation	Total/ha
$61	$659	$1411	$985	$422	$3538

2015-16 Crop Performance

Average Yield (tonnes DM/ha)	% Utilisation	Harvested Yield Cost ($/ tonne DM)
26	92	152

Crude Protein (%)	Metabolisable Energy (MJ/kg DM)	Neutral Detergent Fibre (%)
13	11	19

2015-16 Animal Performance



Trait	Beet	Control	SEM	F Pr.
Slaughter Date	18/08/2016	11/11/2016	21	<0.001
Ossification	129.1	146.1	2.05	<0.001
EMA	75.08	70.82	1.01	<0.001
Rump Fat	10.37	10.41	1.39	0.802
Rib Fat	5.897	6.883	0.404	<0.001
MSAMB	413.1	404.8	19.17	0.431
pH	5.58	5.62	0.007	<0.001
MSA INDEX	62.33	61.33	0.453	<0.001
$/KG	6.36	5.76	0.099	<0.001
TOTAL VALUE	2013	1850	6.73	<0.001

	Kg Live weight/ha	Cost/ha	Cost/kg LW gain	$/kg LW gain	Net income $/ha	Gross Margin $/ha
Beet	1468.2	4280.5	3.03	3.5	5138.7	858.2
Control	99.7	128.69	3.16	3.3	326.24	197.55

Transition to grazing

- High Water Soluble Carbohydrate content
- Transition feeding period paramount
  - “Makes-or-breaks” the system
  - Start at 1kg DM/hd/day
- Strip grazing to control intake
  - Good power source required
- Clostridial vaccinations up to date

Nutritional concerns

- Acidosis/SARA

- Polioencephalomalacia
  - High sugar, low roughage induced thiamine deficiency
  - Exacerbated by high Sulfur diets

- Trace mineral nutrition
  - Particularly requiring:
    - Magnesium (Due to high K levels)
    - Phosphorous (Low levels in beets)

Phosphorous

- 0.18-0.24% Dry matter
  - 8kg DM intake of beets= 19grams P/day
  - 20g P/kg liveweight gain required.

- Crucial for bone development, energy metabolism

- Deficiencies result in depressed feed intake, low growth rates and eventual ataxia.

Hot tips

- Sufficient Grazing face
  - 1.5m plus/hd
- Roughage allocation
  - Level of restriction dependant on quality
- **Consistency** is the key
  - Make life boring for them

- High Yielding
- Facilitate faster turn-off
- Higher eating quality product

- Optimisation of feeding systems
- Sheep applications
- Whole farm system economic benefits

michael.wilkes@adelaide.edu.au

0407712180

Murdoch UNIVERSITY

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mla MEAT & LIVESTOCK AUSTRALIA