Profitability trends of international pasture-based dairying – and what can the UK learn?

Building more profitable and resilient dairy businesses

Pasture to Profit Insight 2021

LIC
LIVESTOCK IMPROVEMENT

David Beca

January 2021

Presentation outline

- Outline dairy performance trends in a number of countries
- Identifying core group of ratios relating to profit
- Confirm definition of financial resilience
- Review impacts of changes to:
  - Pasture harvest
  - Milk production per cow
  - Production system *OR* percent of pasture in the cows diet
- Review impact of climate variability or potential warming
- Discuss background to production system trends
- Conclusions

Background to presentation

Predominantly informed from two papers that I had published in 2020

Paper #1:

Beca, D. (2020), '**Evaluating the Loss of Profitability and Declining Milk Production in the Australian Dairy Industry**', *Australasian Agribusiness Perspectives* 23, Paper 9, pp. 136-164.

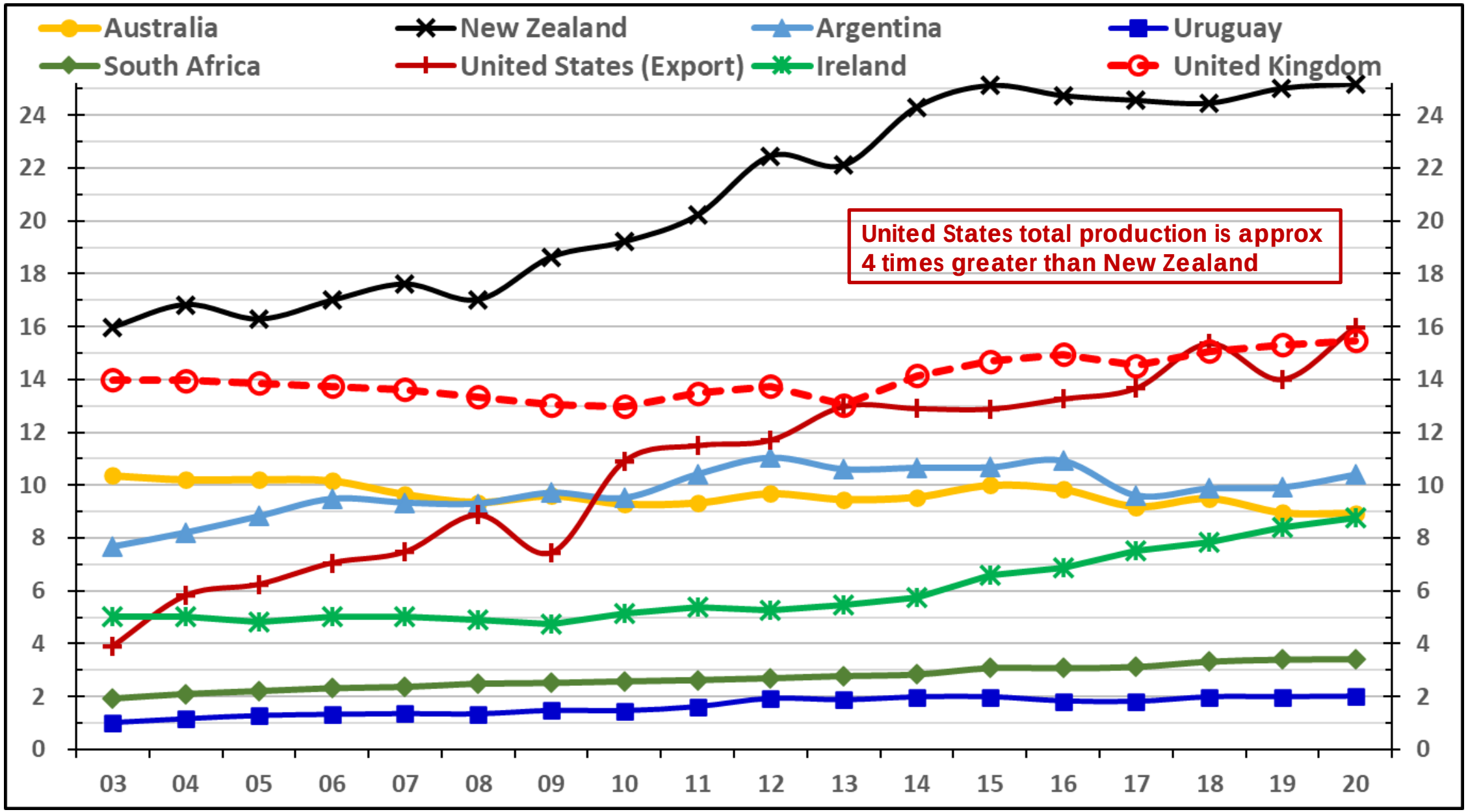
Paper #2:

Beca, D. (2020), '**Key Determinants of Profit for Pasture-based Dairy Farms**', *Australasian Agribusiness Perspectives* 23, Paper 16, pp. 247-274.

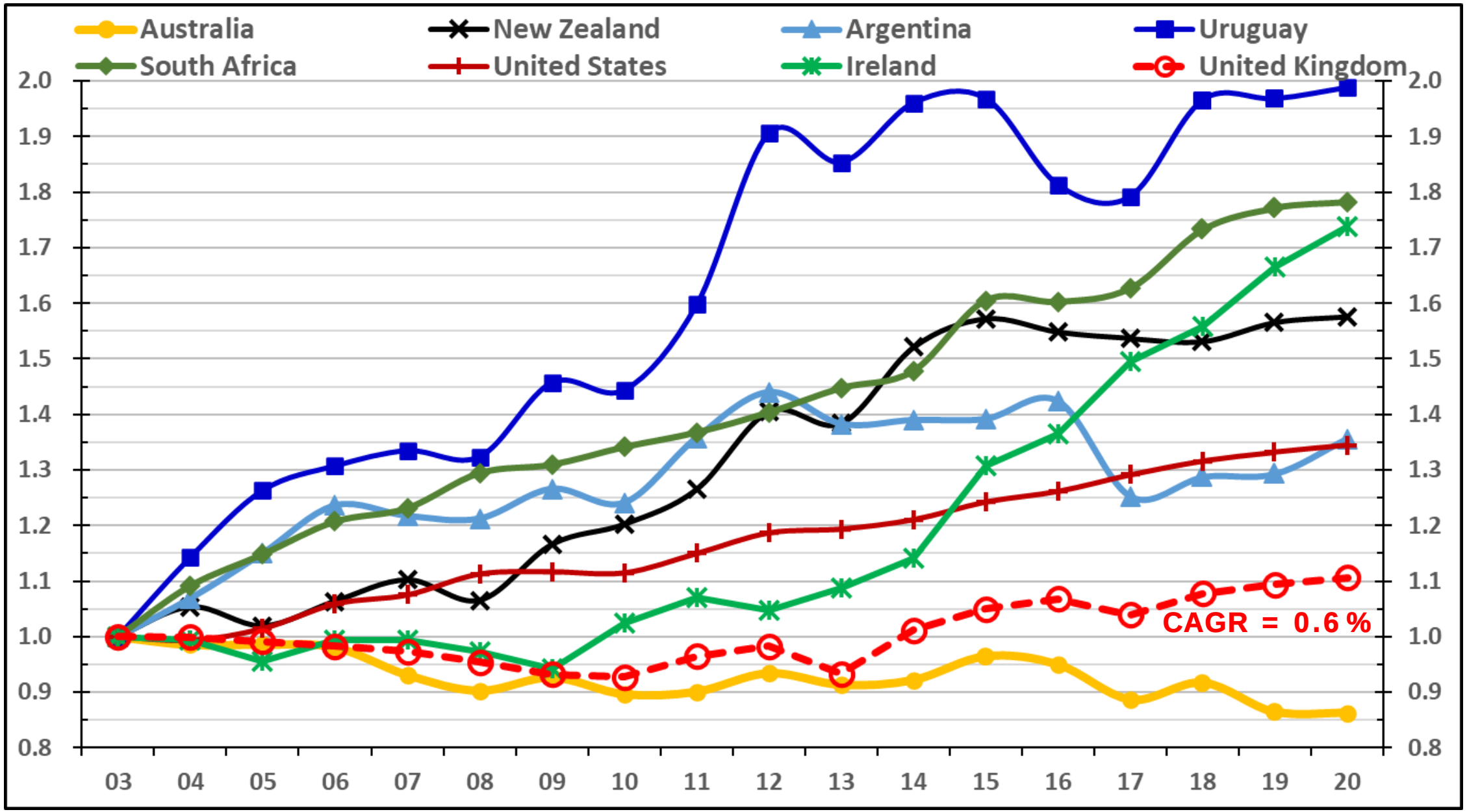
Mark Neal (DairyNZ) completed statistical analysis and provided insights

Gonzalo Tuñon (Argentina) completed original analysis and provided insights

Total annual milk production (billion litres ECM)



Annual milk production growth (2002/03 Base = 1.0 ECM)



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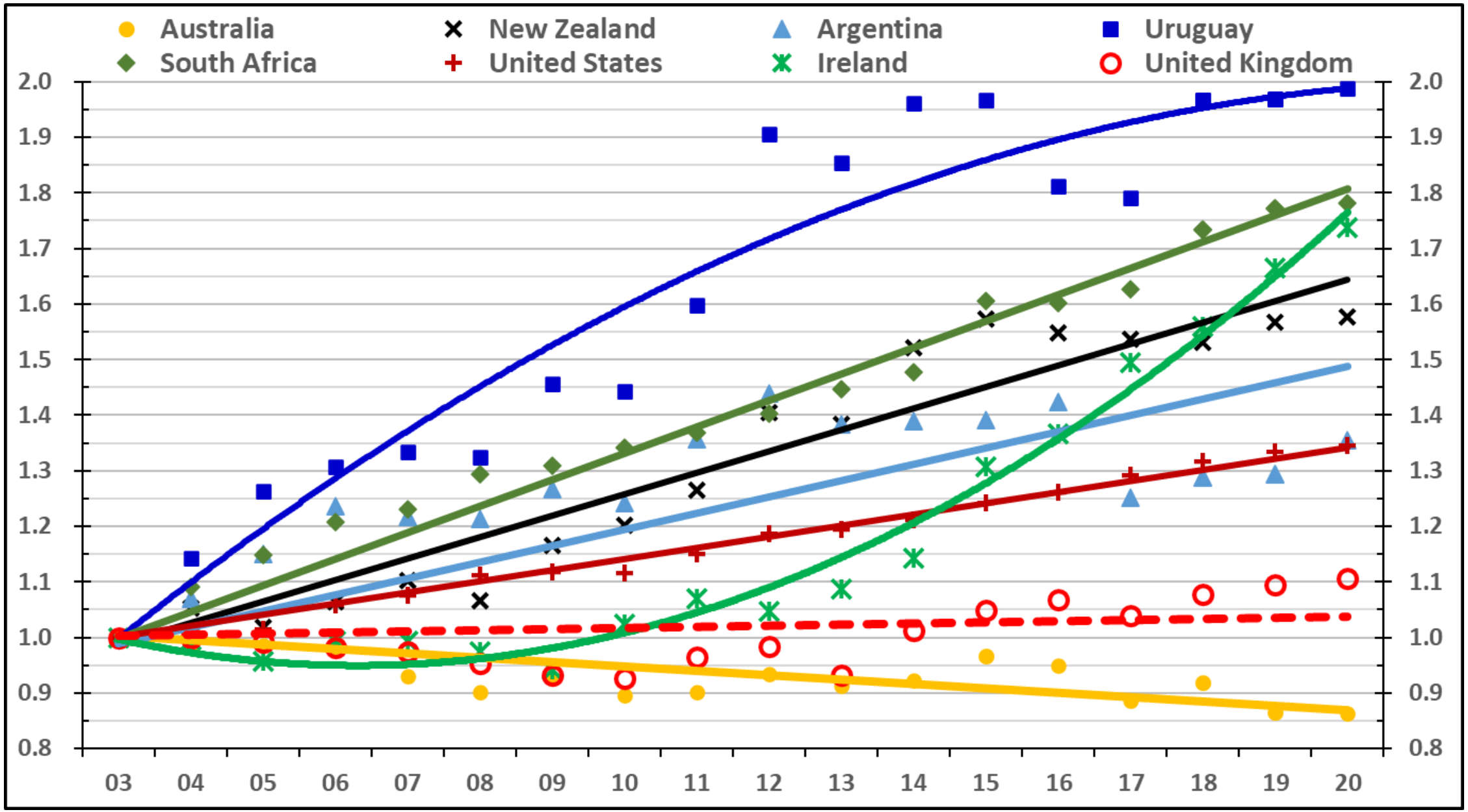
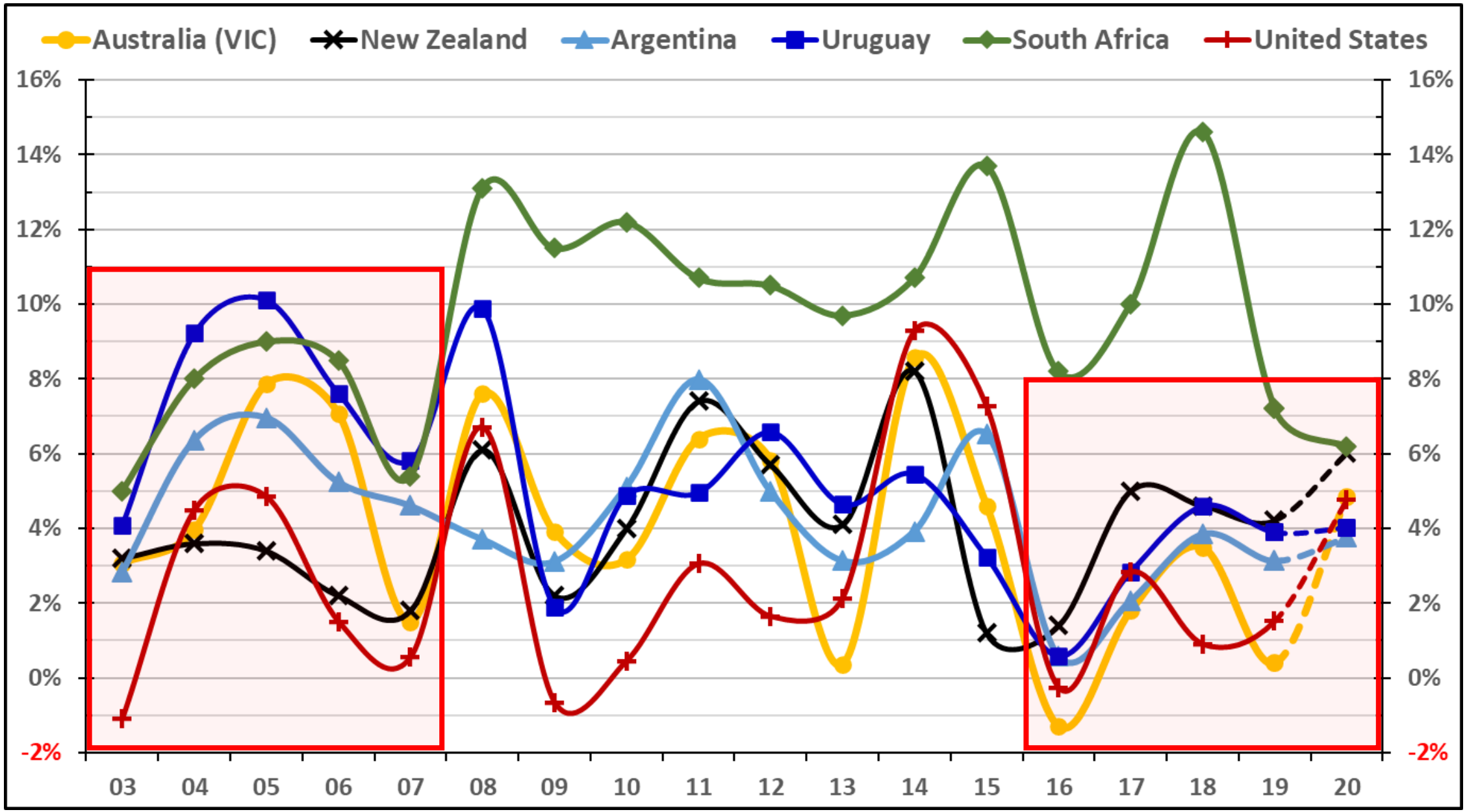


Return on capital (%)



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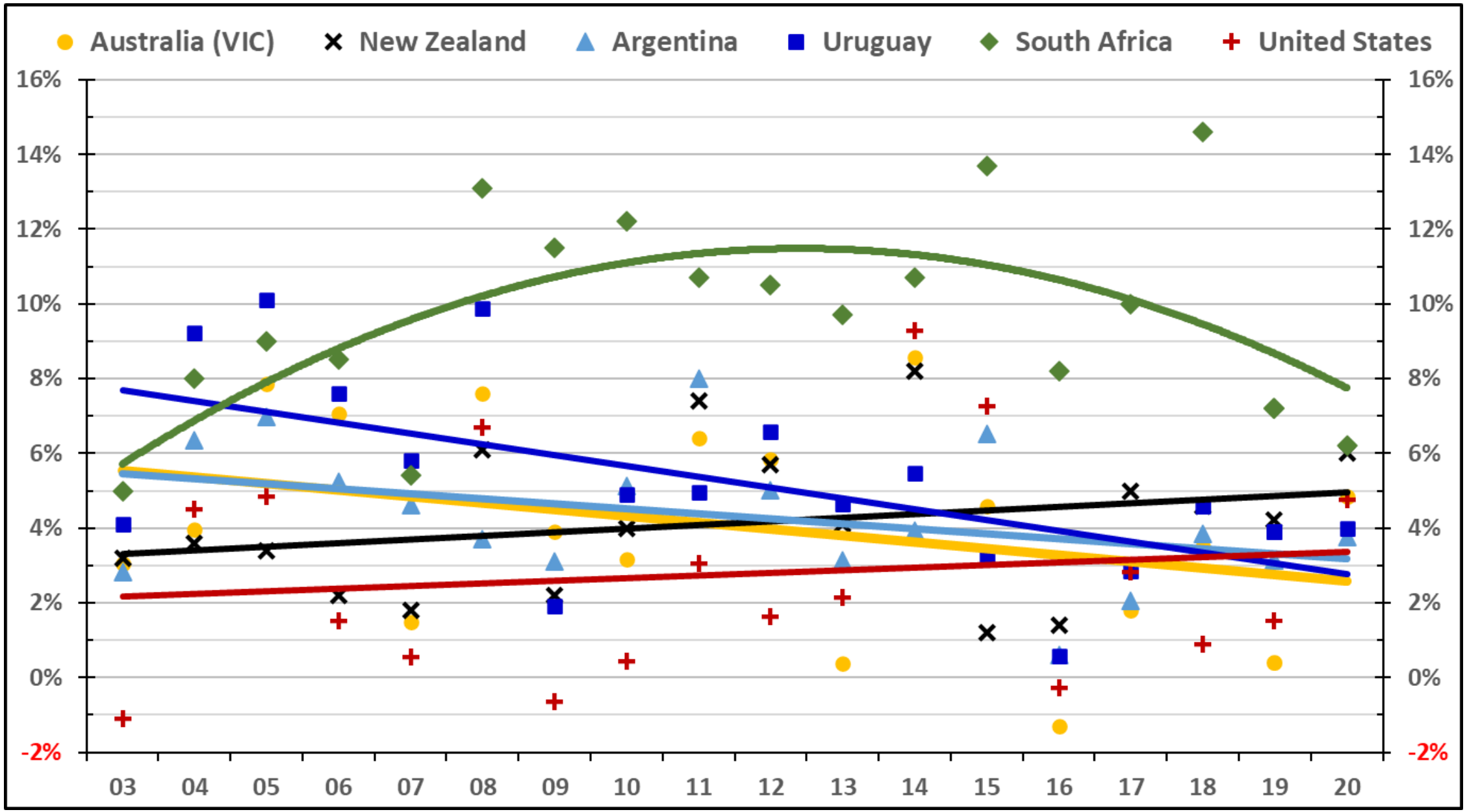
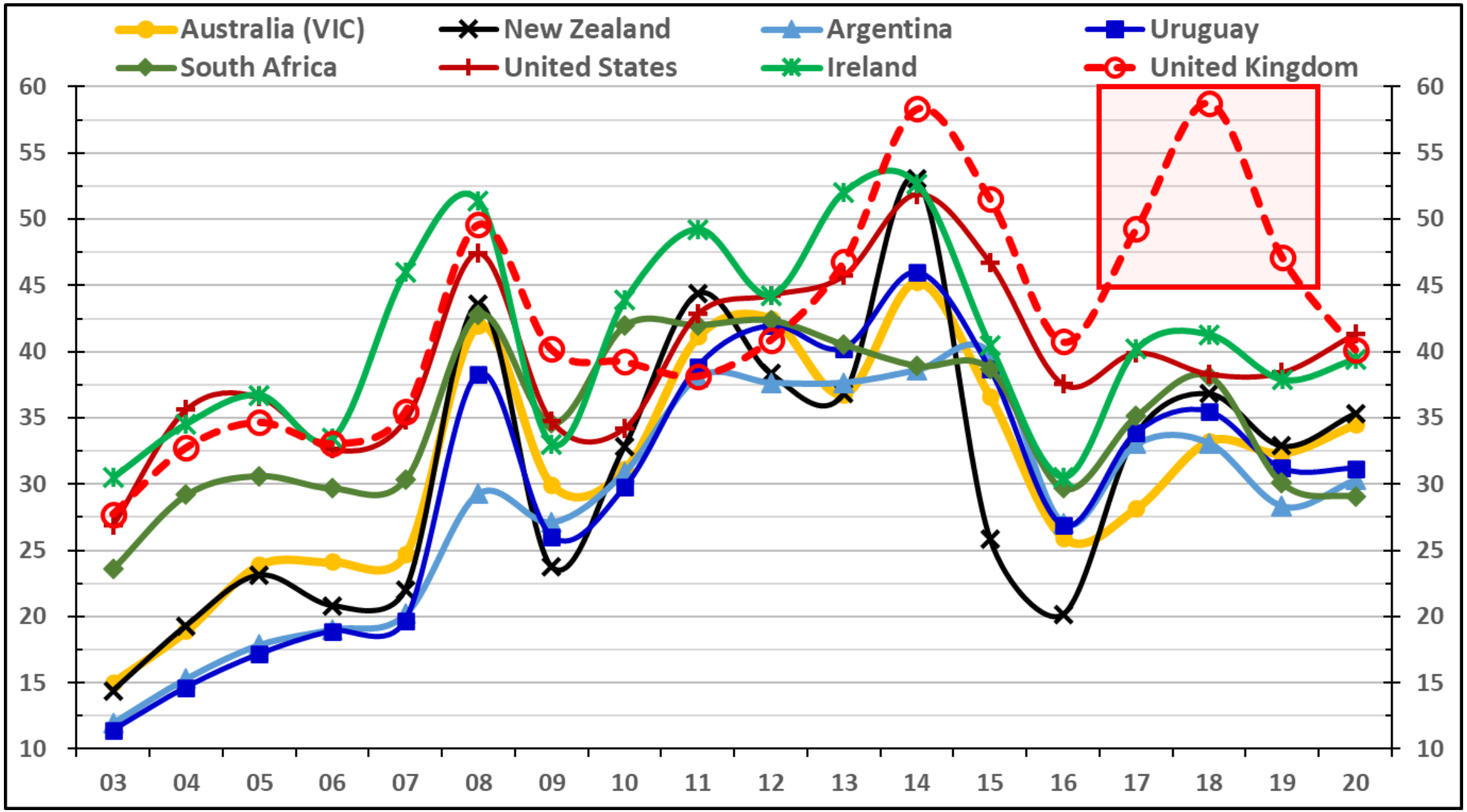


Milk price (USD c/litre ECM)



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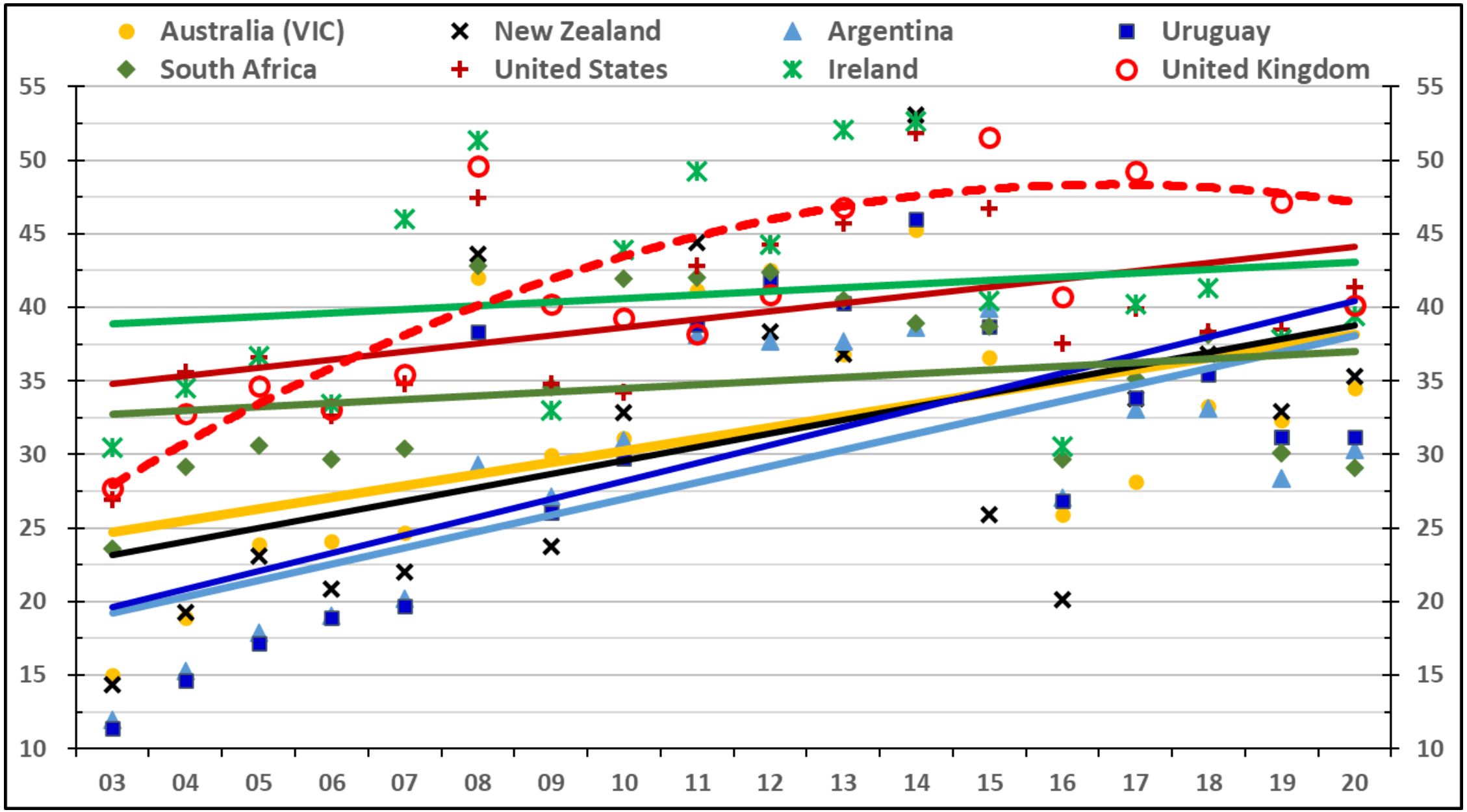
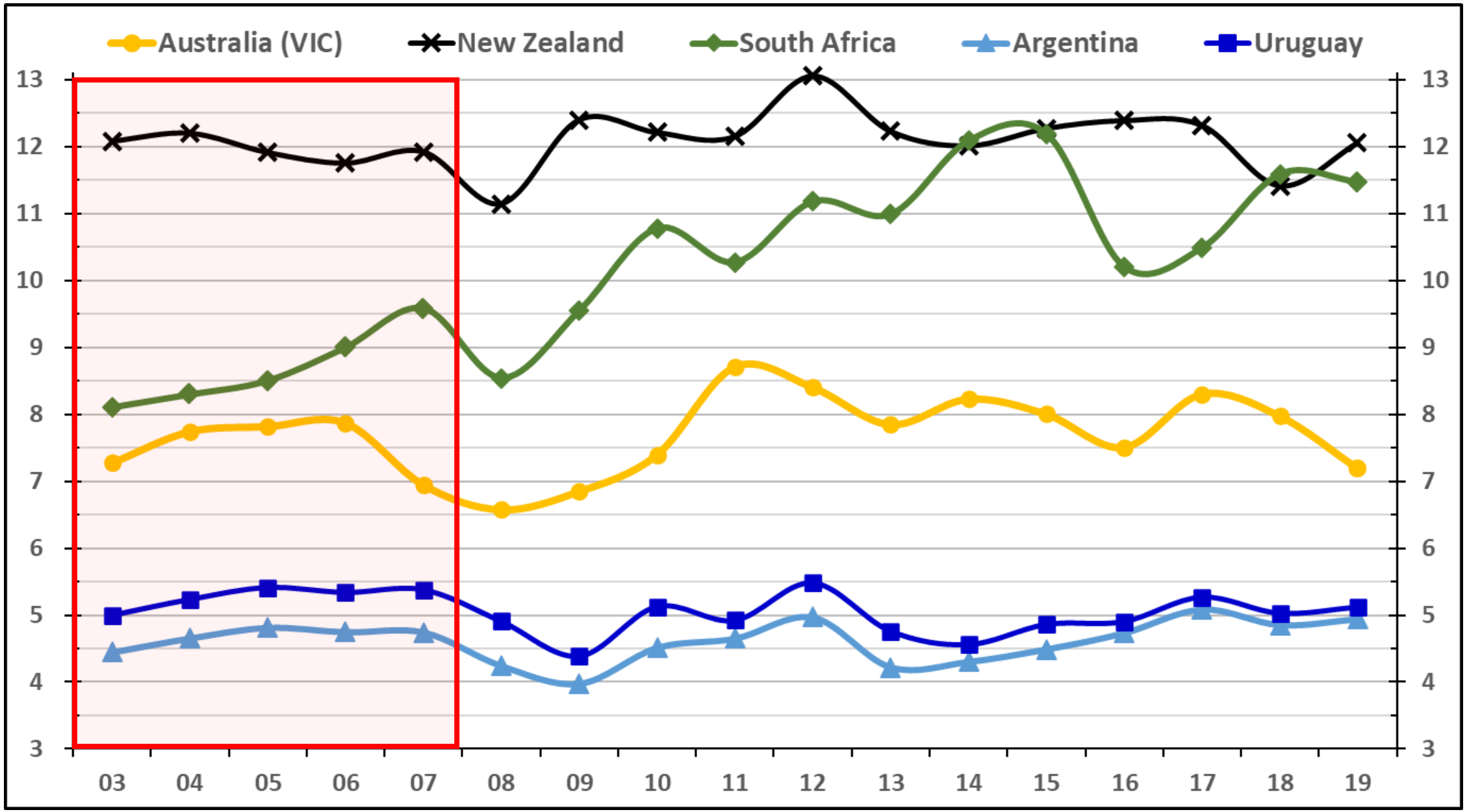


Pasture harvest (tonne dry matter per hectare per year)



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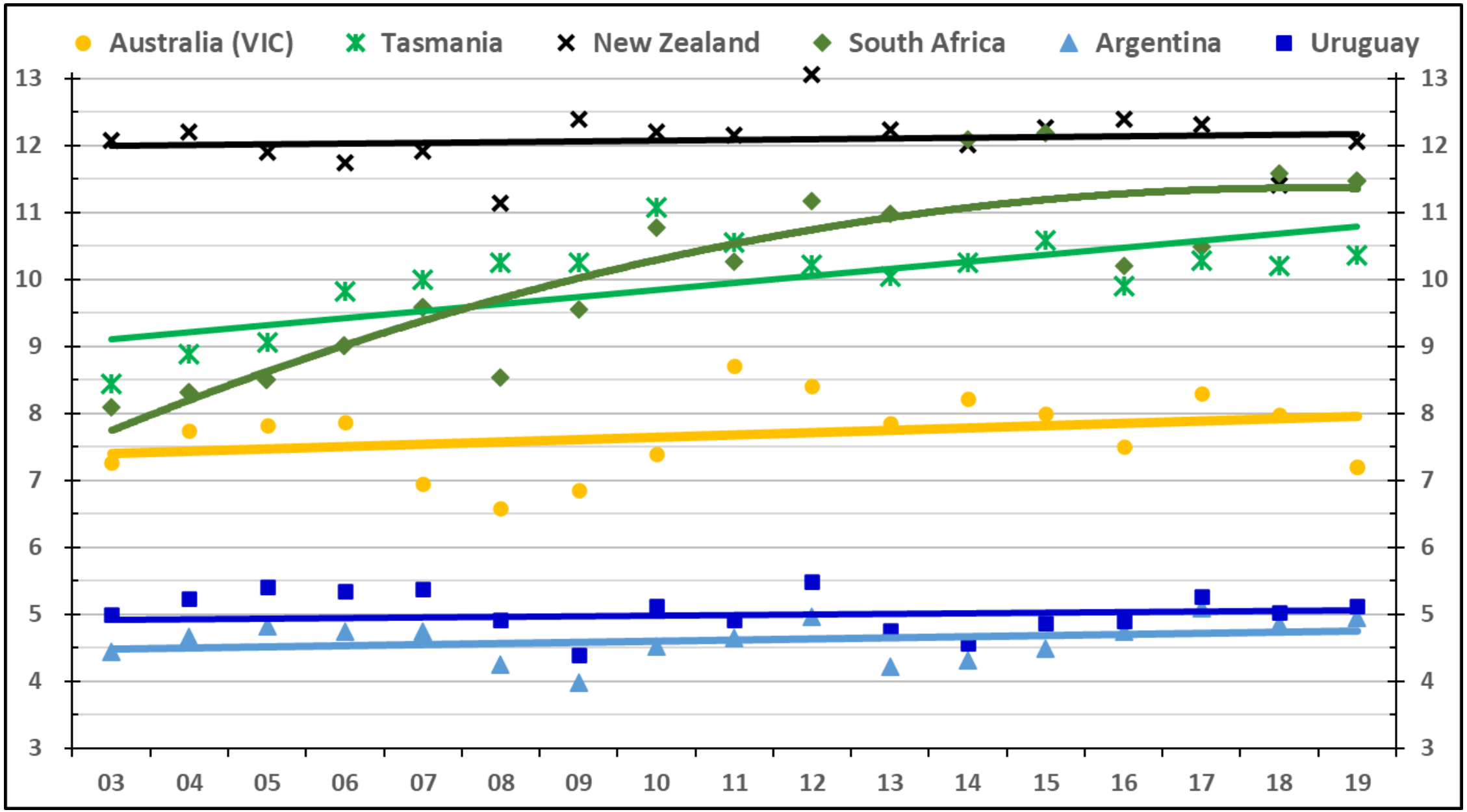
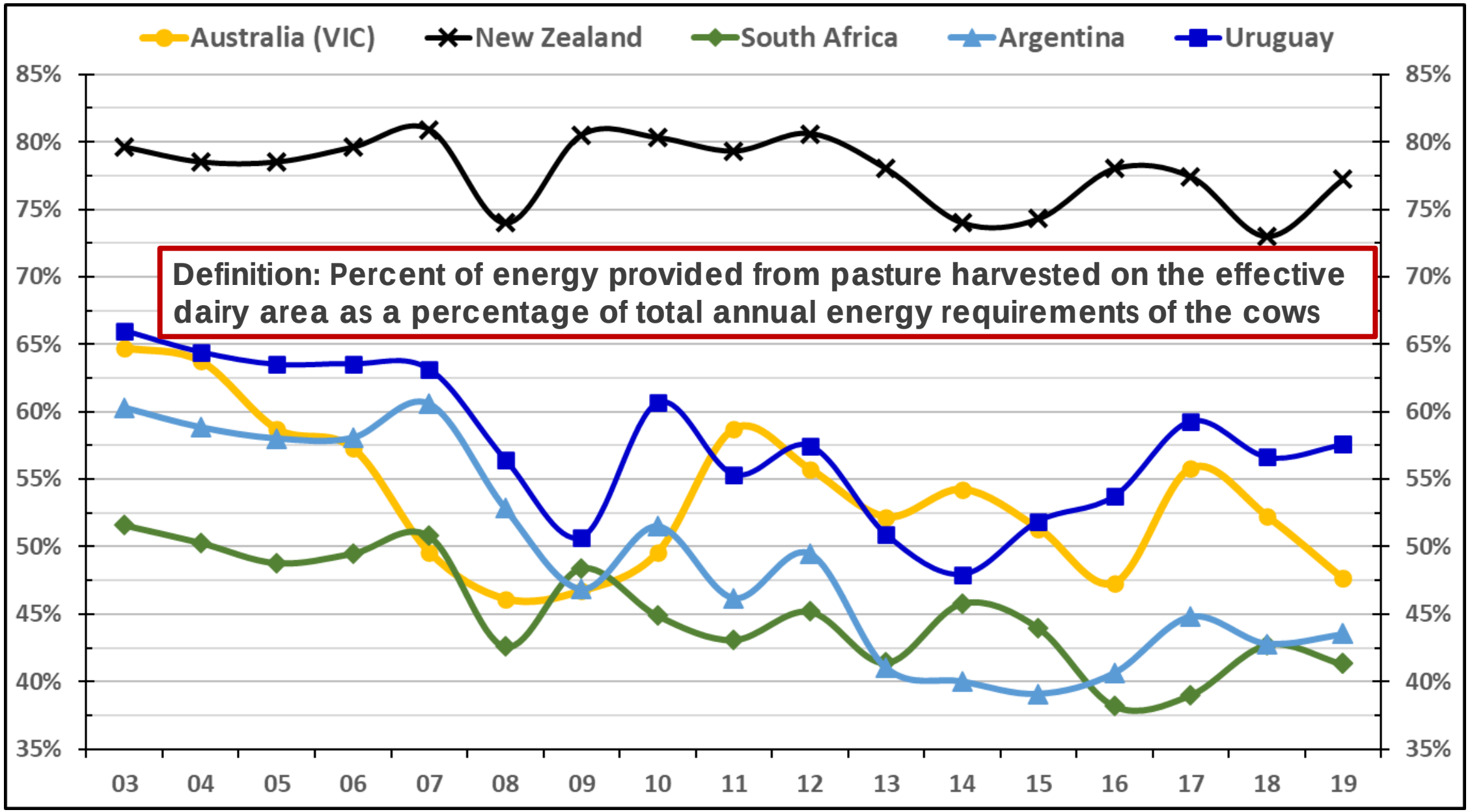


Pasture as % of cow's diet (US not on graph as 0%)



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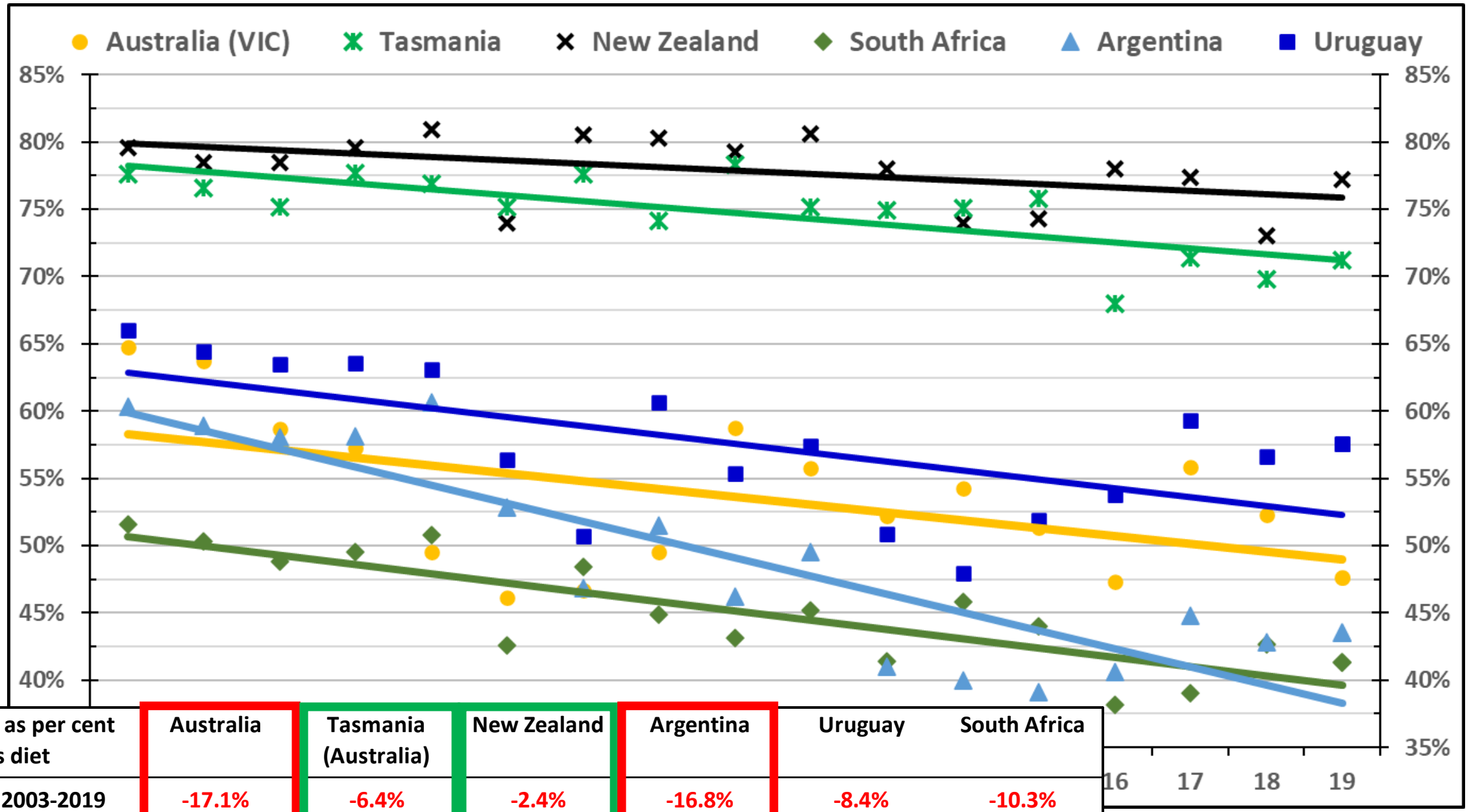
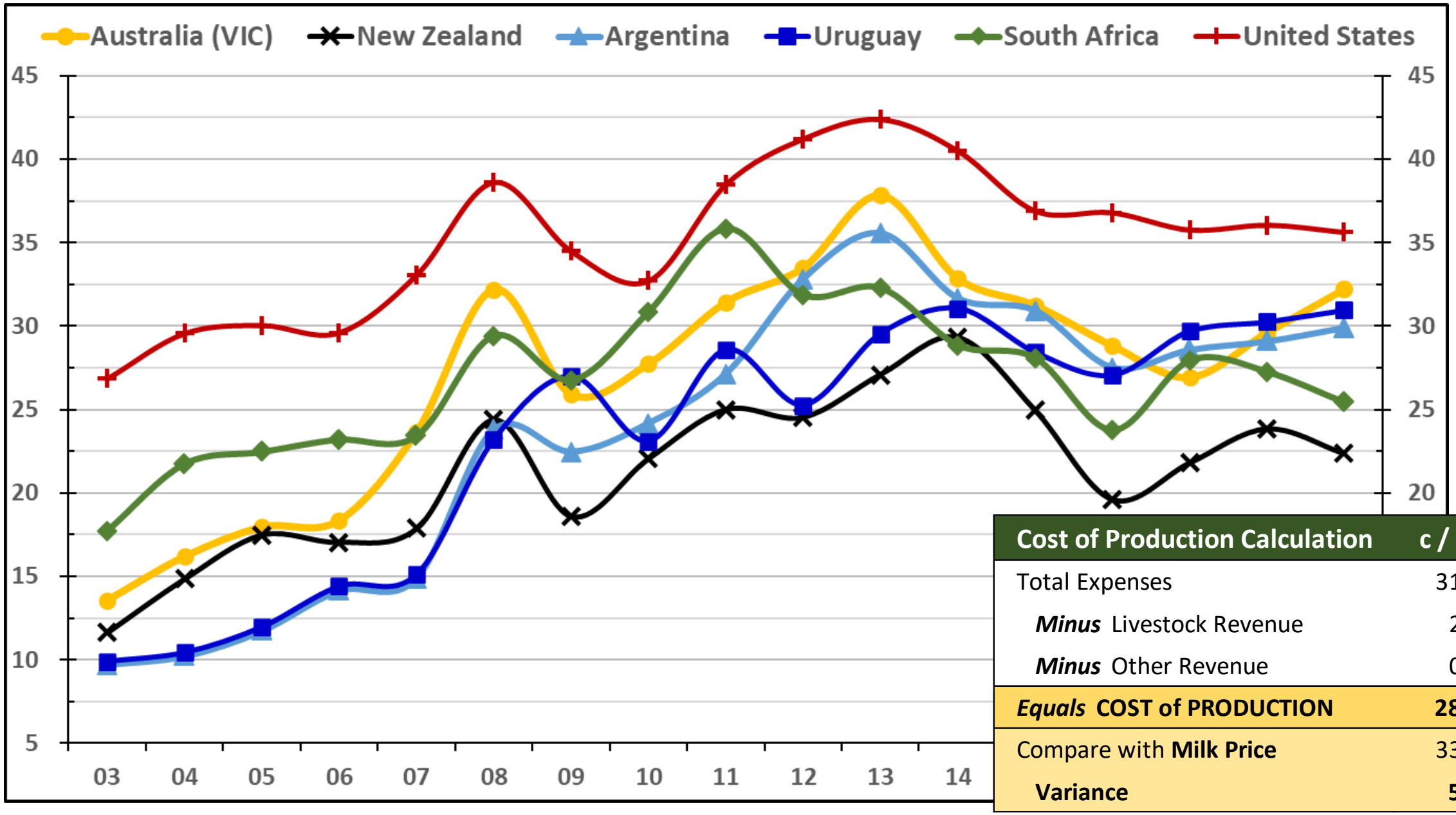


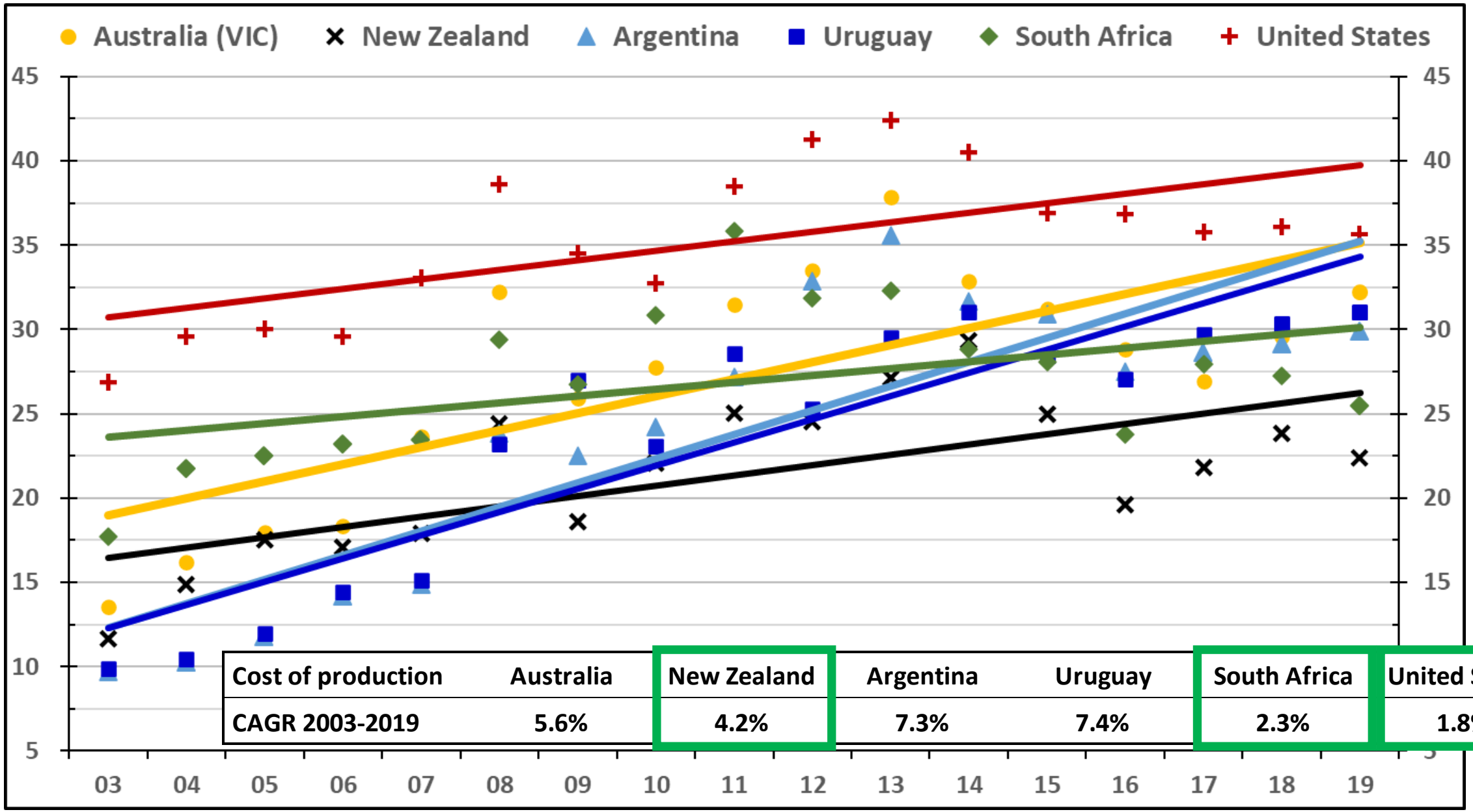
Pasture as per cent of cow's diet	Australia	Tasmania (Australia)	New Zealand	Argentina	Uruguay	South Africa
Change 2003-2019	-17.1%	-6.4%	-2.4%	-16.8%	-8.4%	-10.3%

Cost of production (USD c/litre ECM)



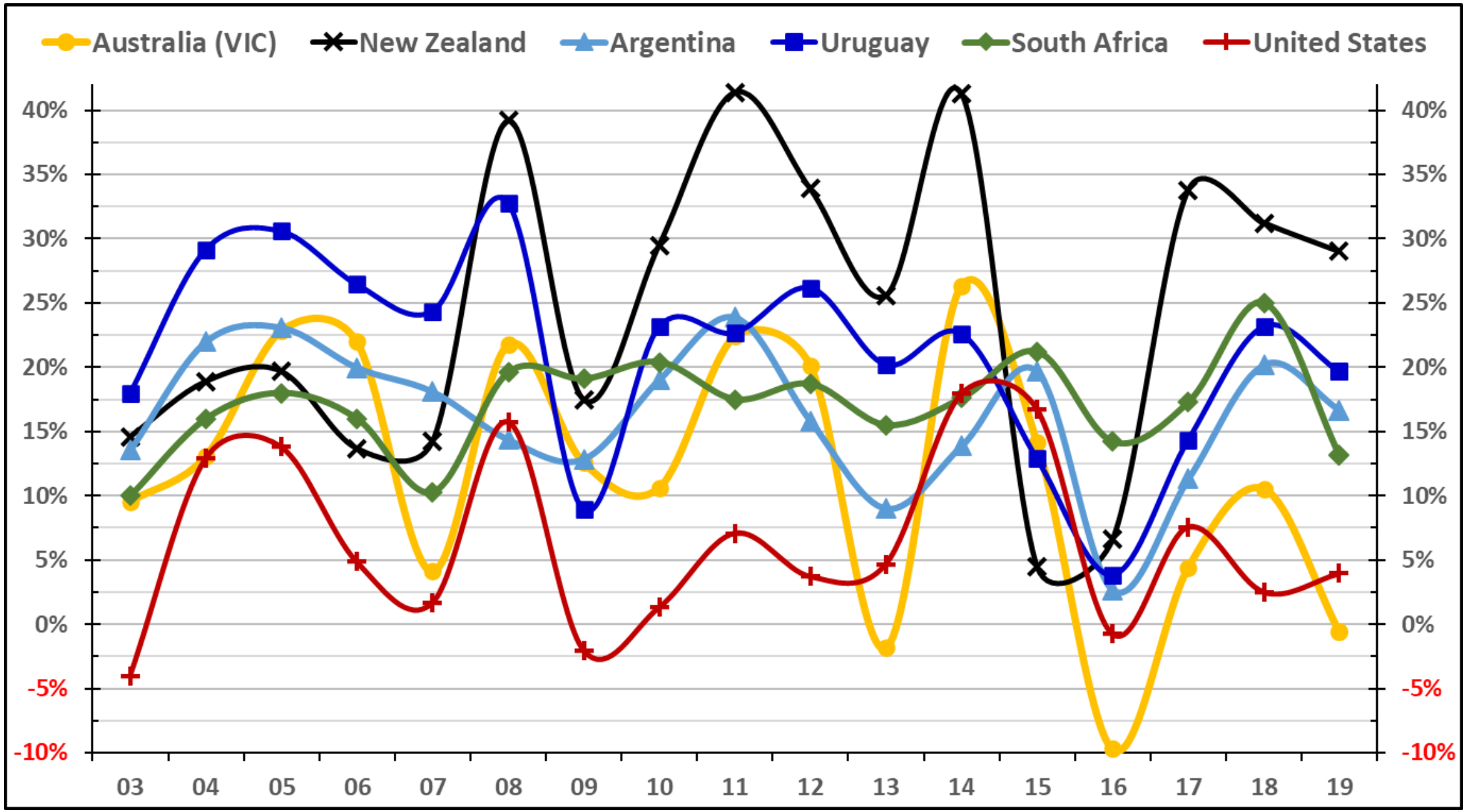
Cost of Production Calculation	c / litre
Total Expenses	31.0
Minus Livestock Revenue	2.7
Minus Other Revenue	0.3
Equals **COST of PRODUCTION**	**28.0**
Compare with **Milk Price**	33.0
Variance	**5.0**

Cost of production (USD c/litre ECM)



Cost of production	Australia	New Zealand	Argentina	Uruguay	South Africa	United States
CAGR 2003-2019	5.6%	4.2%	7.3%	7.4%	2.3%	1.8%

Operating profit margin (%)



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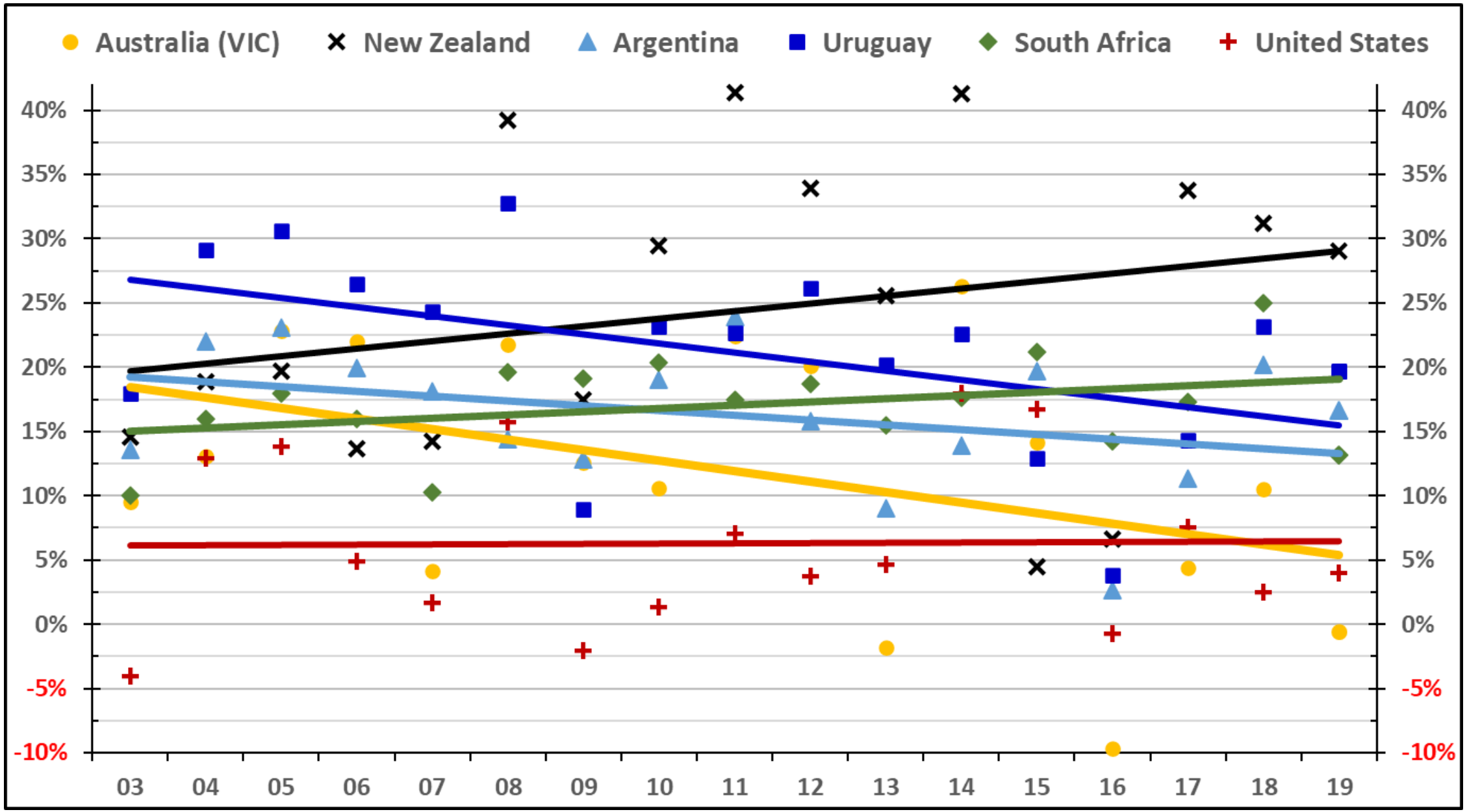
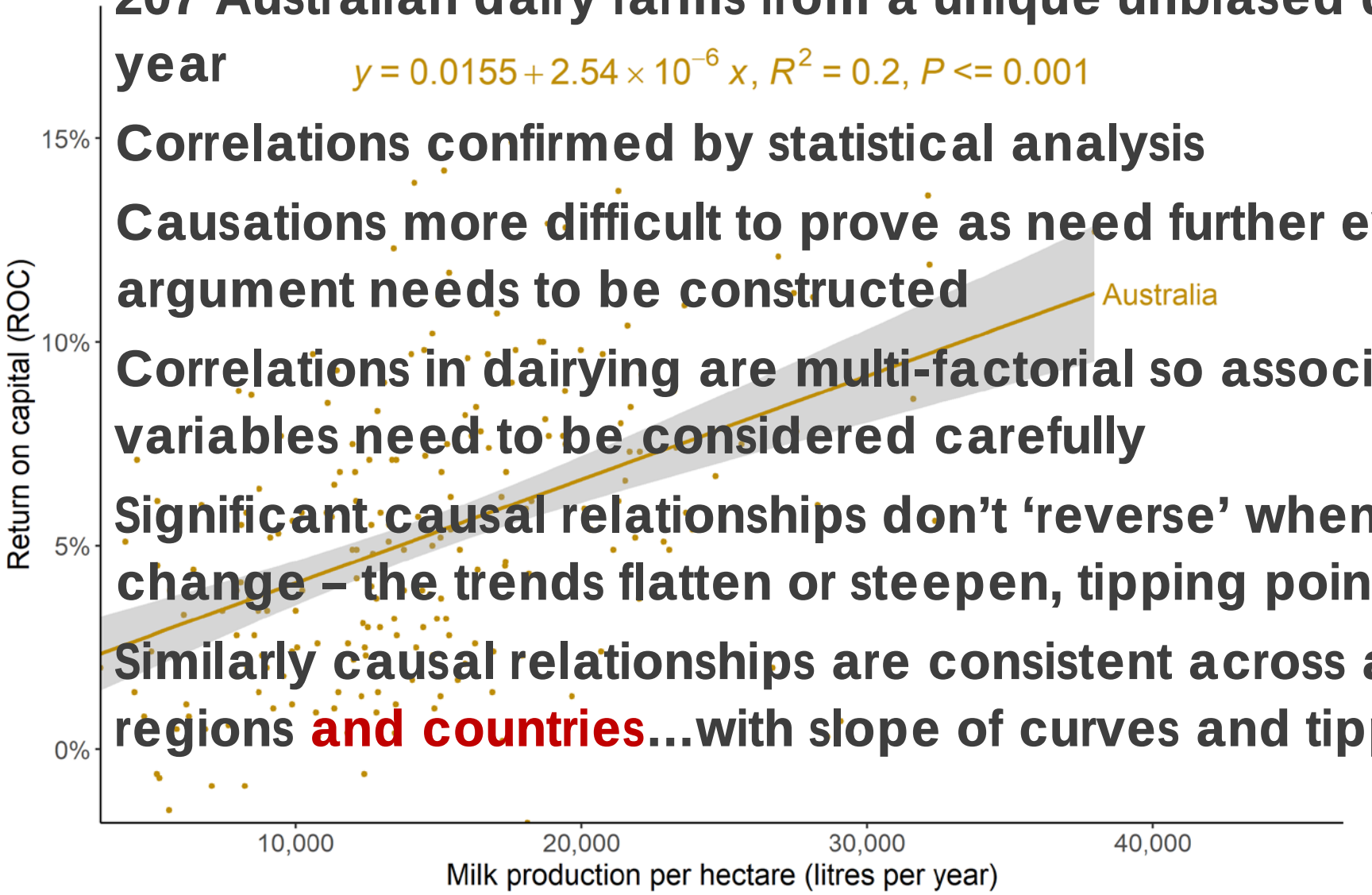


Source of data…and correlations and causations

207 Australian dairy farms from a unique unbiased dataset of a single year



Correlations confirmed by statistical analysis

Causations more difficult to prove as need further evidence – an argument needs to be constructed

Correlations in dairying are multi-factorial so associations between two variables need to be considered carefully

Significant causal relationships don't 'reverse' when trading conditions change – the trends flatten or steepen, tipping points move…

Similarly causal relationships are consistent across all pasture-based regions and countries…with slope of curves and tipping points moving

Prioritised list of key ratios

Primary ratio	R^2	P	Secondary ratio or proxy	R^2	P
Return on total capital (ROC) [defines profit]	**Comparator for other ratios**		Profit per hectare	0.79	<= 0.001
			Profit per cow	0.73	<= 0.001
Operating profit margin	0.75	<= 0.001	Profit per litre	0.76	<= 0.001
Cost of production per litre	0.44	<= 0.001	Total expenses per litre	0.51	<= 0.001
Pasture harvest	0.41	<= 0.001			
Pasture cost per tonne dry matter	0.23	<= 0.001			
Milk price	0.20	<= 0.001			
Milk production per hectare	0.20	<= 0.001	Stocking rate	0.25	<= 0.001
Supplement cost per litre	0.20	<= 0.001	Total feed cost per litre	0.21	<= 0.001
Core per cow cost	0.20	<= 0.001			
Labour cost per cow	0.18	<= 0.001	Cows per full-time staff equivalent	0.13	<= 0.001
			Labour cost per litre	0.17	<= 0.001
			Litres per full-time staff equivalent	0.11	<= 0.001
Core per hectare cost per tonne dry matter of pasture harvest	0.17	<= 0.001			
Pasture as per cent of diet	0.08	<= 0.001	Pasture consumed per cow	0.07	0.001

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Costs incl. in Core per Cow Costs	Percent
Animal Health	100%
Breeding	100%
Dairy Shed Expenses	100%
Electricity / Energy	100%
Freight	100%
Support / Youngstock	100%
Repairs & Maintenance	50%
Vehicle Expenses incl. fuel & oil	70%
Industry Levies	100%
Depreciation	50%

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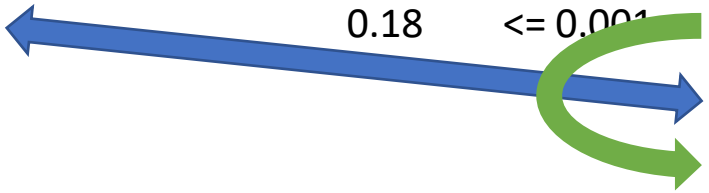

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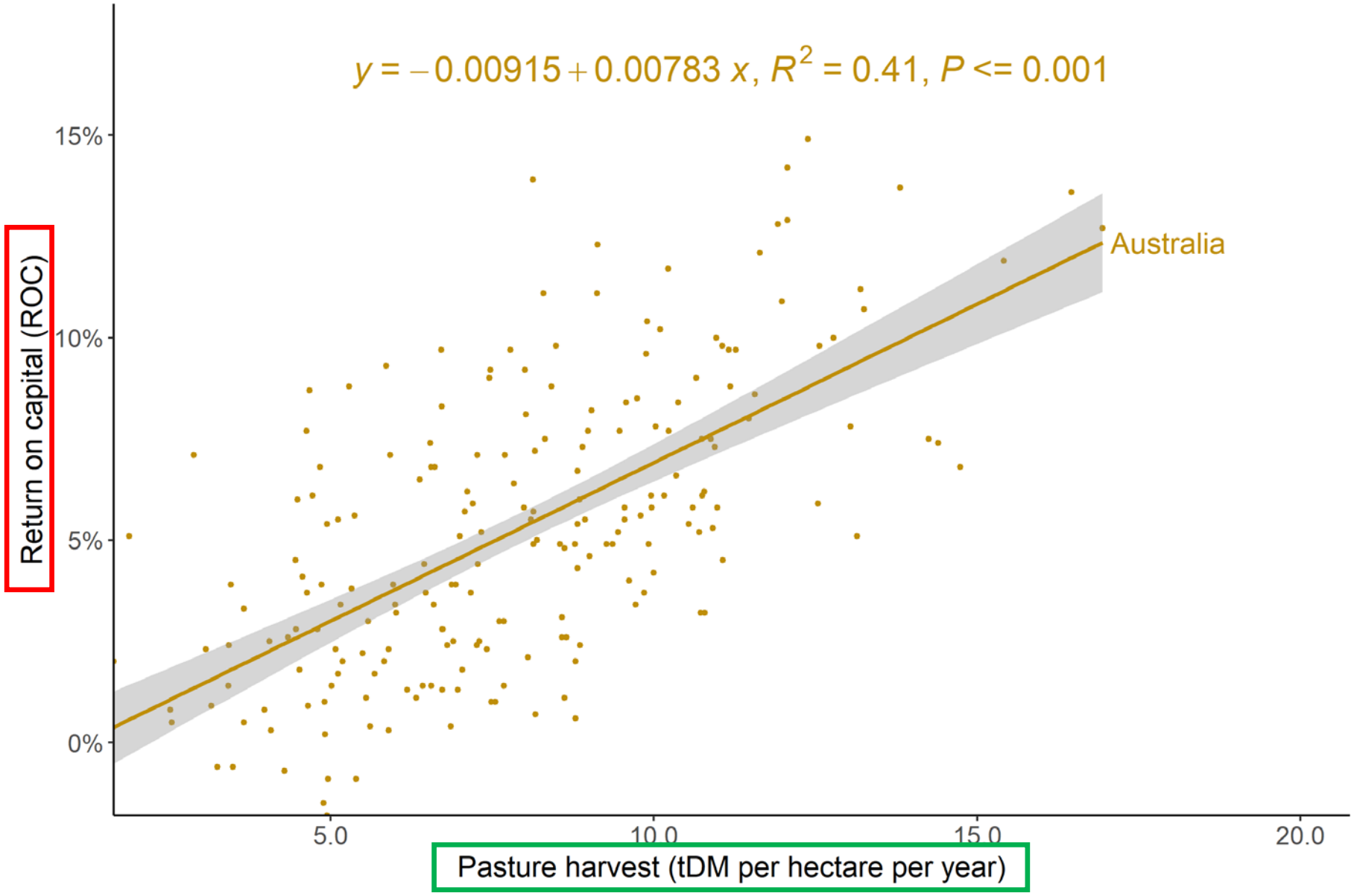
Costs incl. in Core per Hectare Costs	Percent
Cropping (greenfeed)	100%
Fertiliser excl. Nitrogen	100%
Pasture Maintenance & Renewal	100%
Repairs & Maintenance	50%
Vehicle Expenses incl. fuel & oil	30%
Administration	100%
Insurance, Land Taxes, Licenses	100%
Professional fees	100%
Depreciation	50%

Primary factors impacted by pasture harvest



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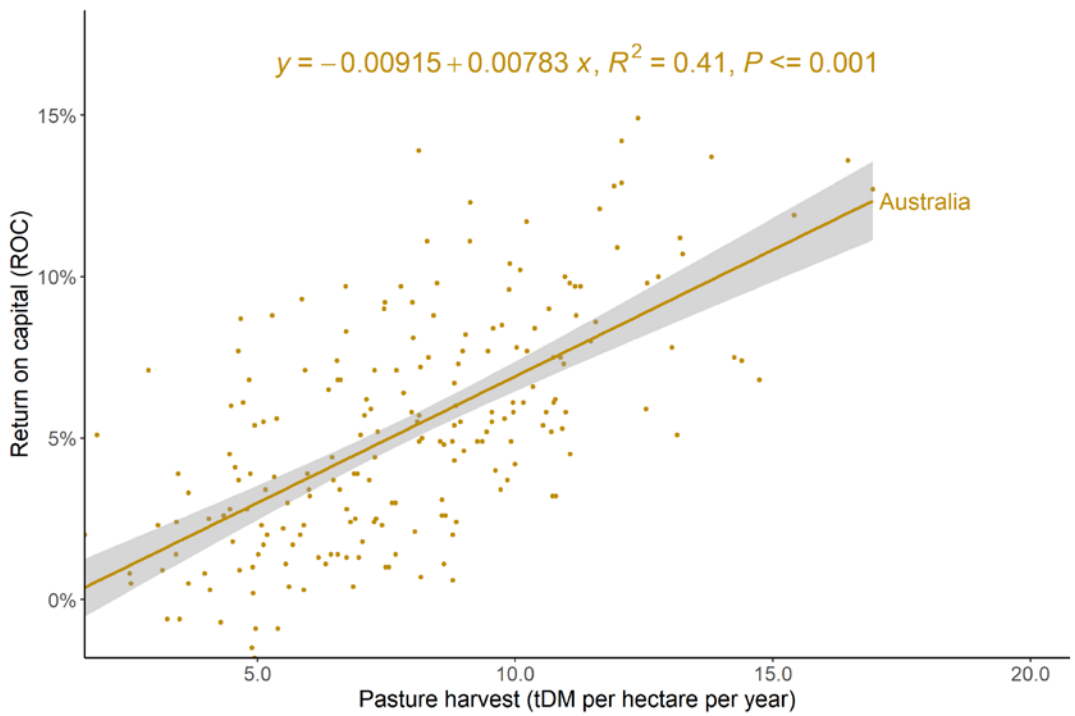

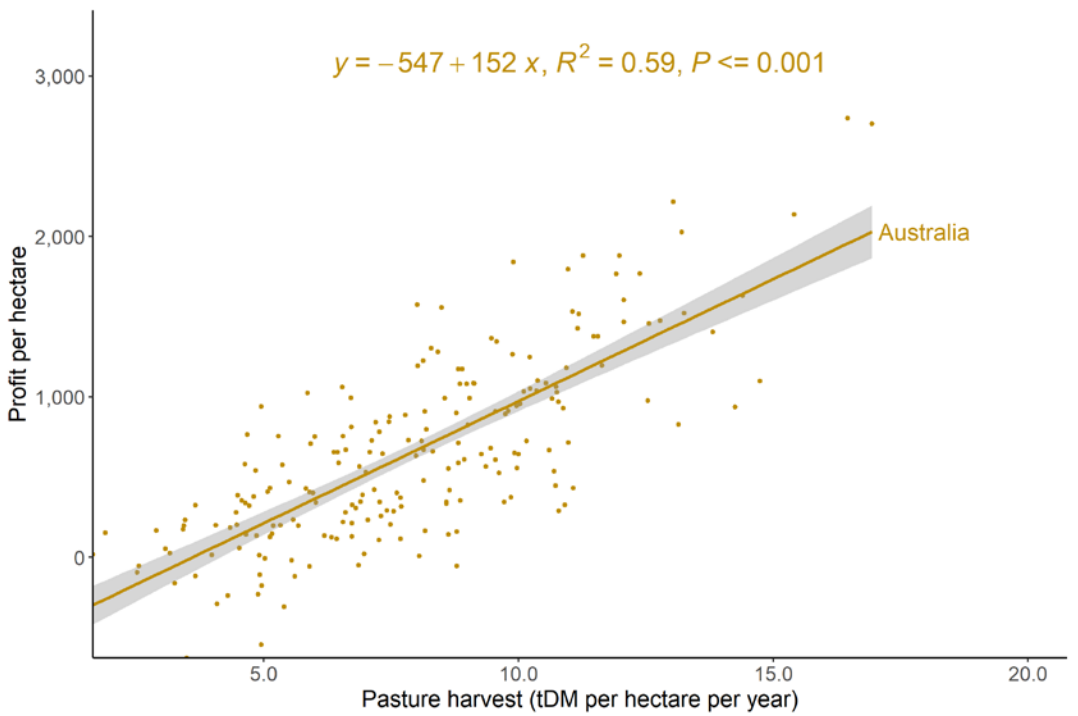

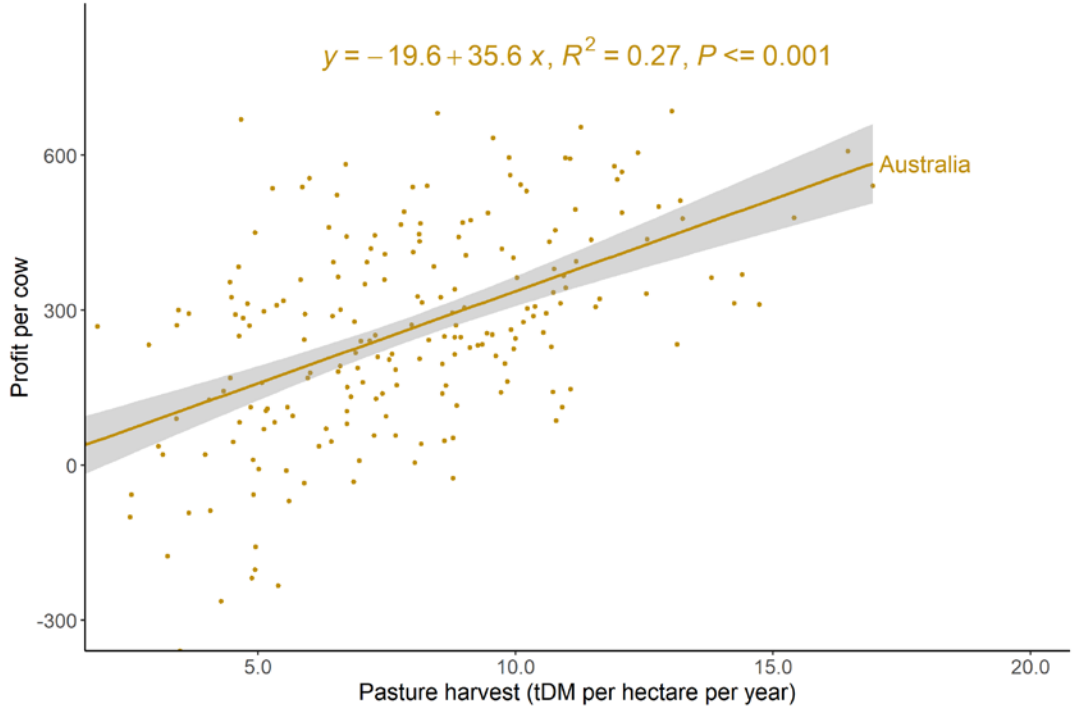

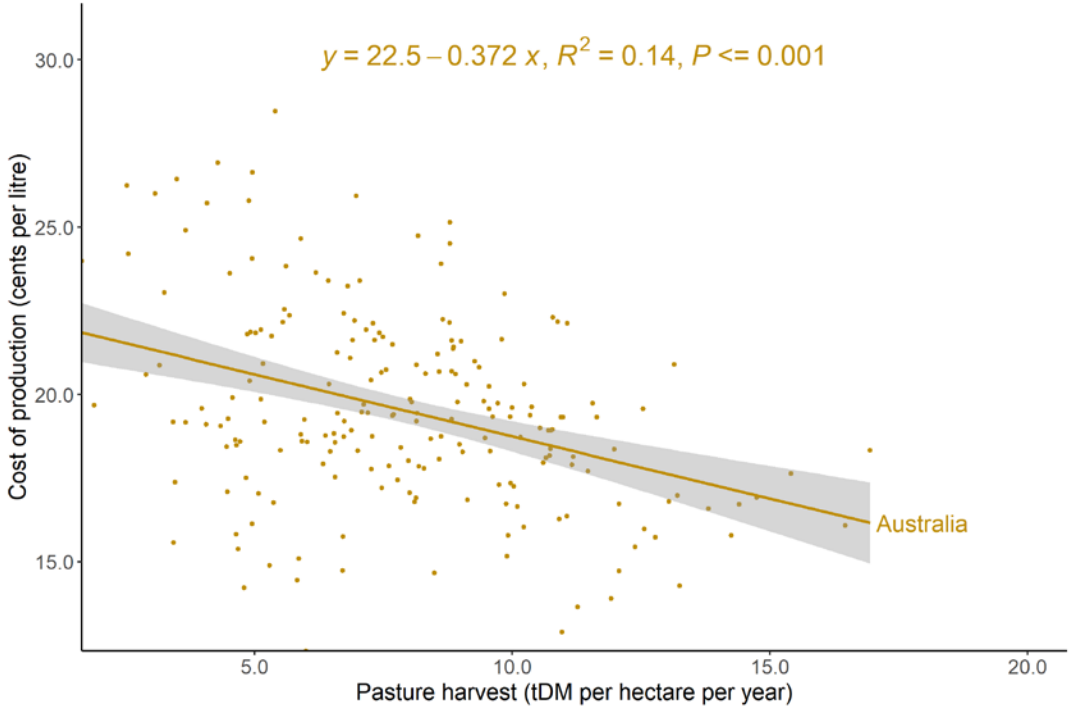

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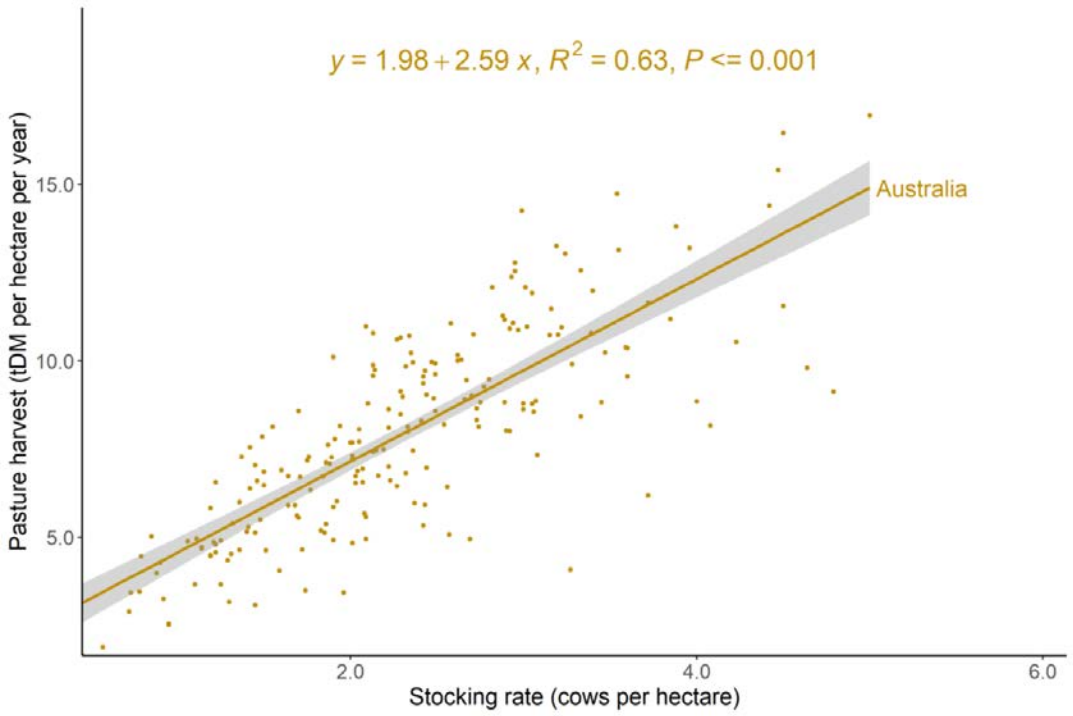

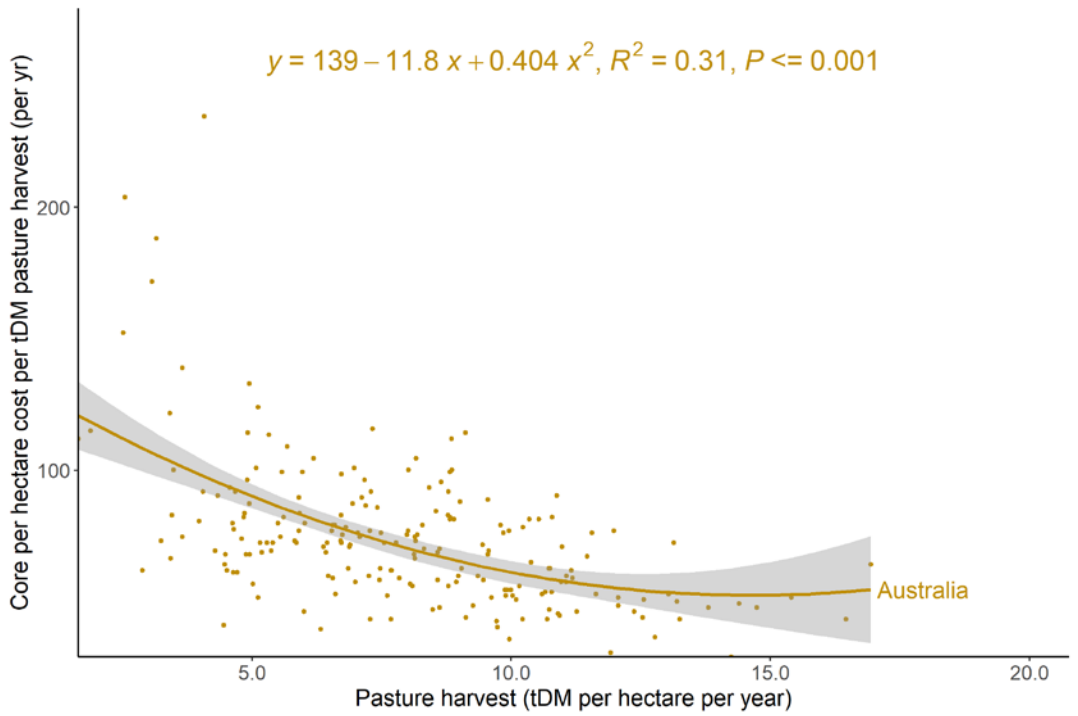

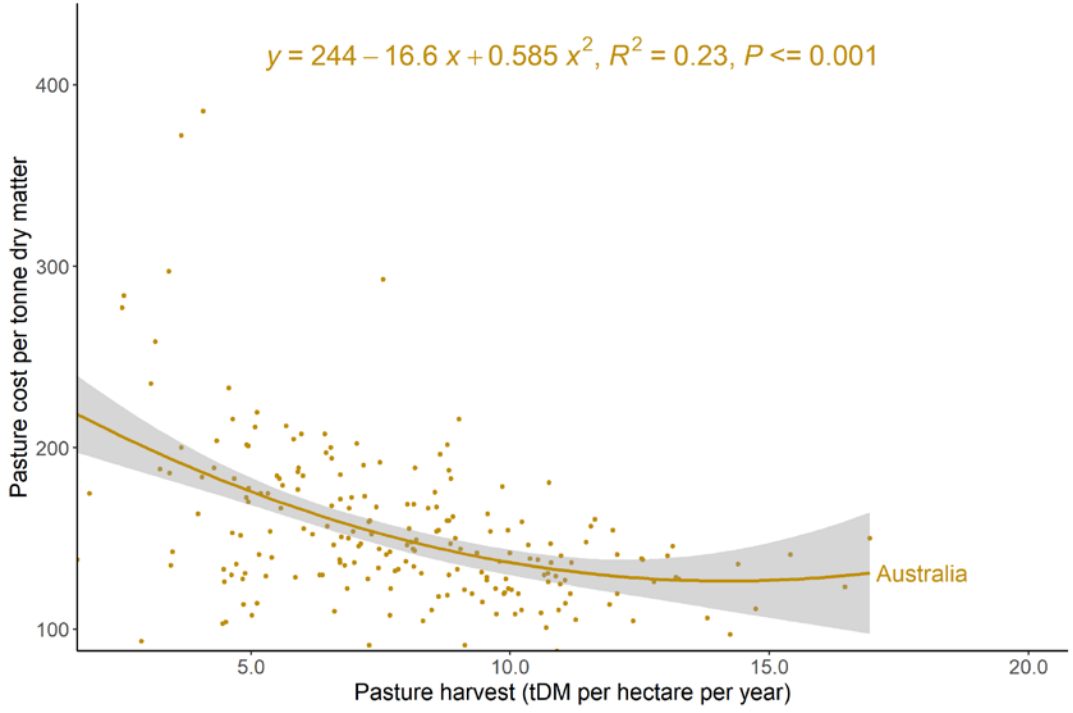

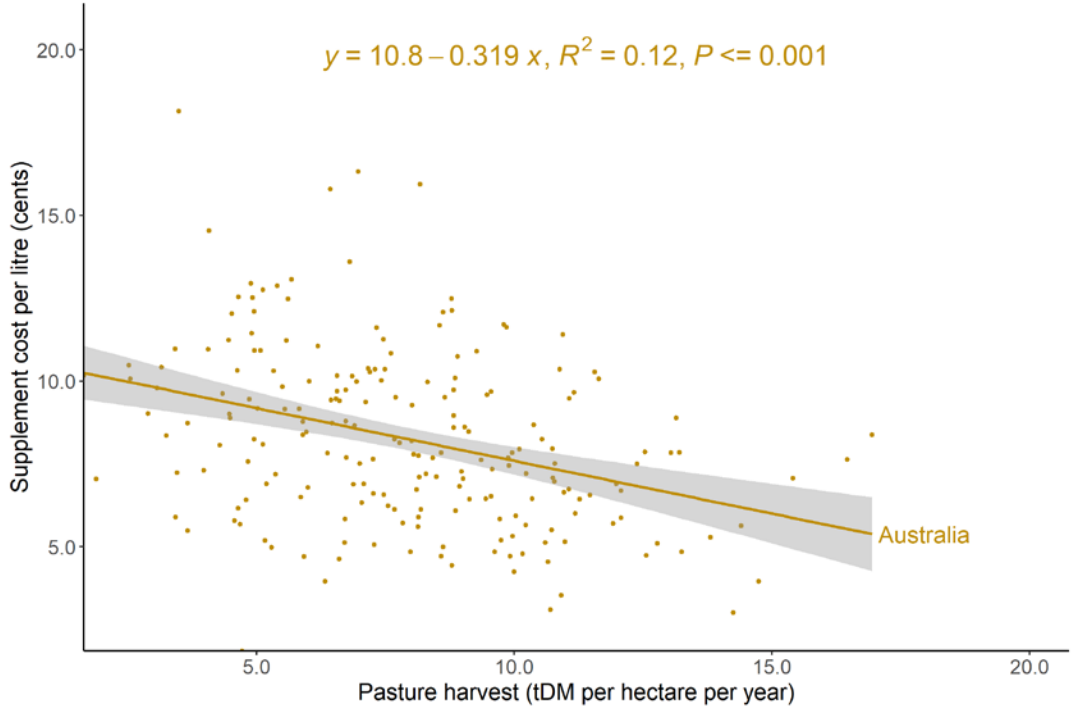

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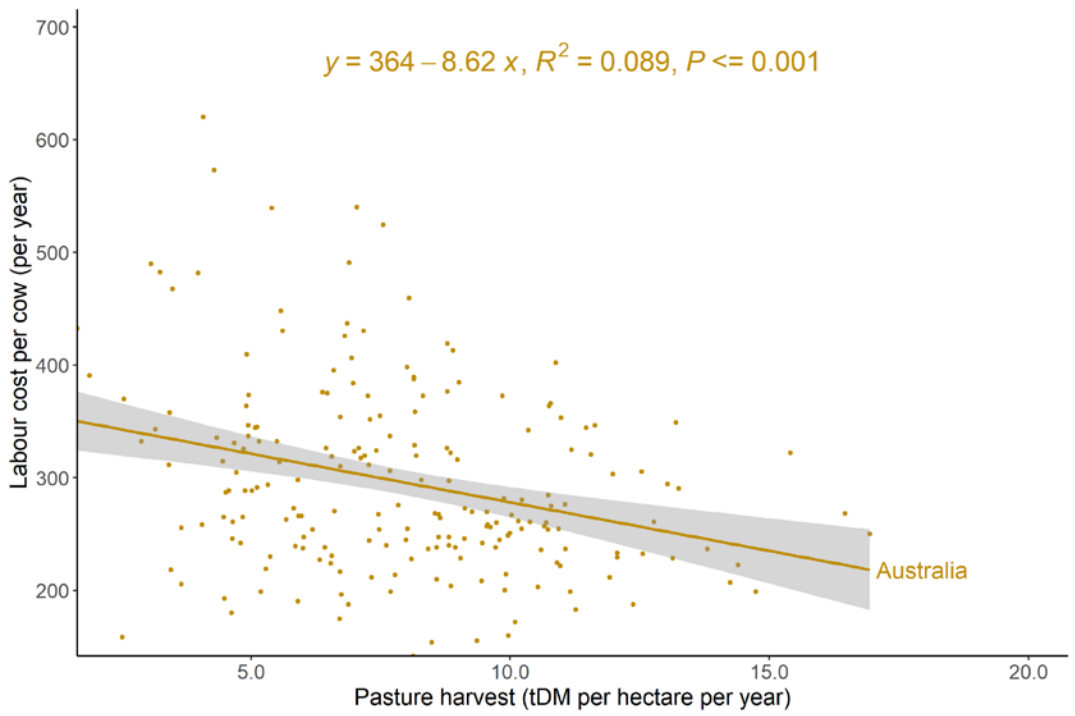
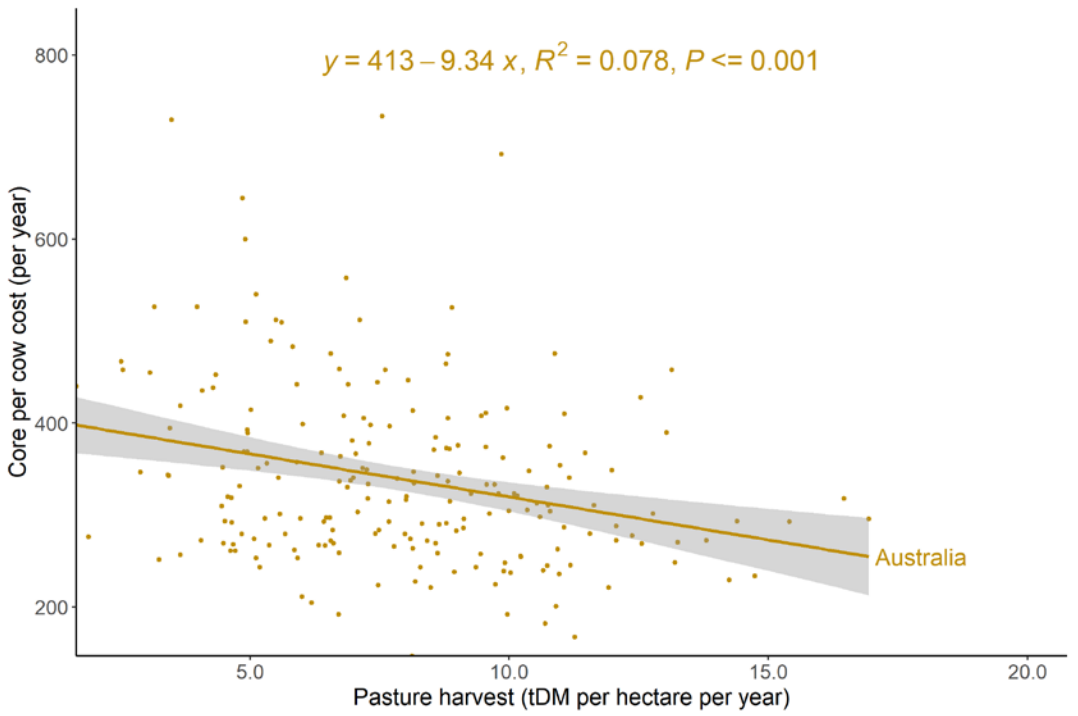
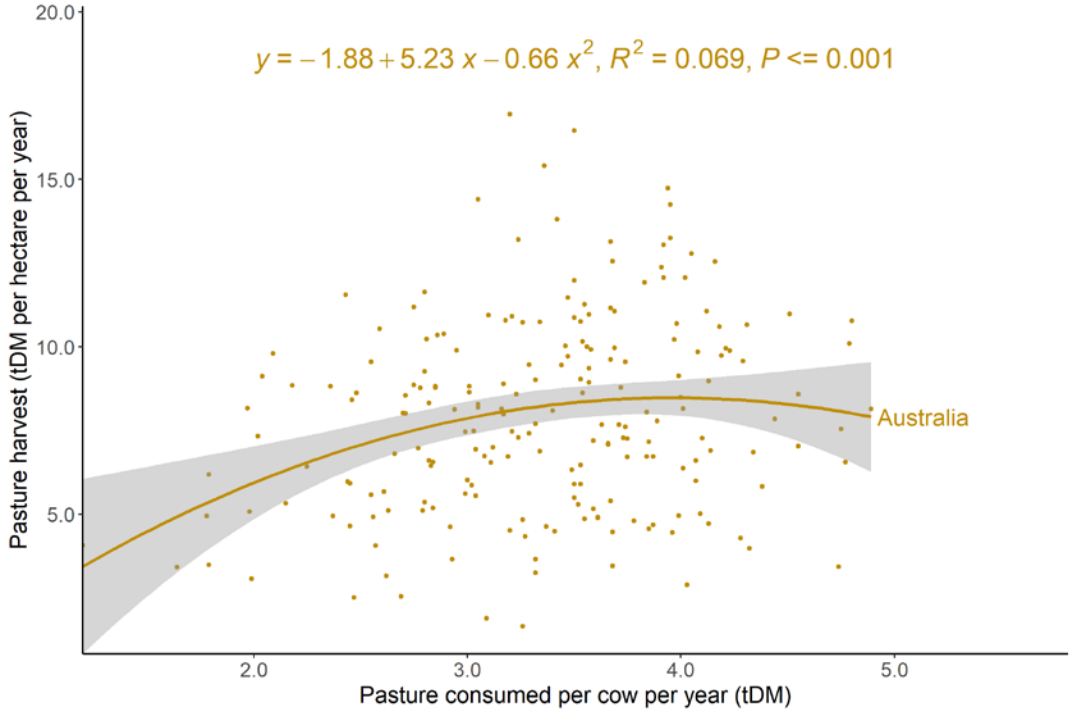


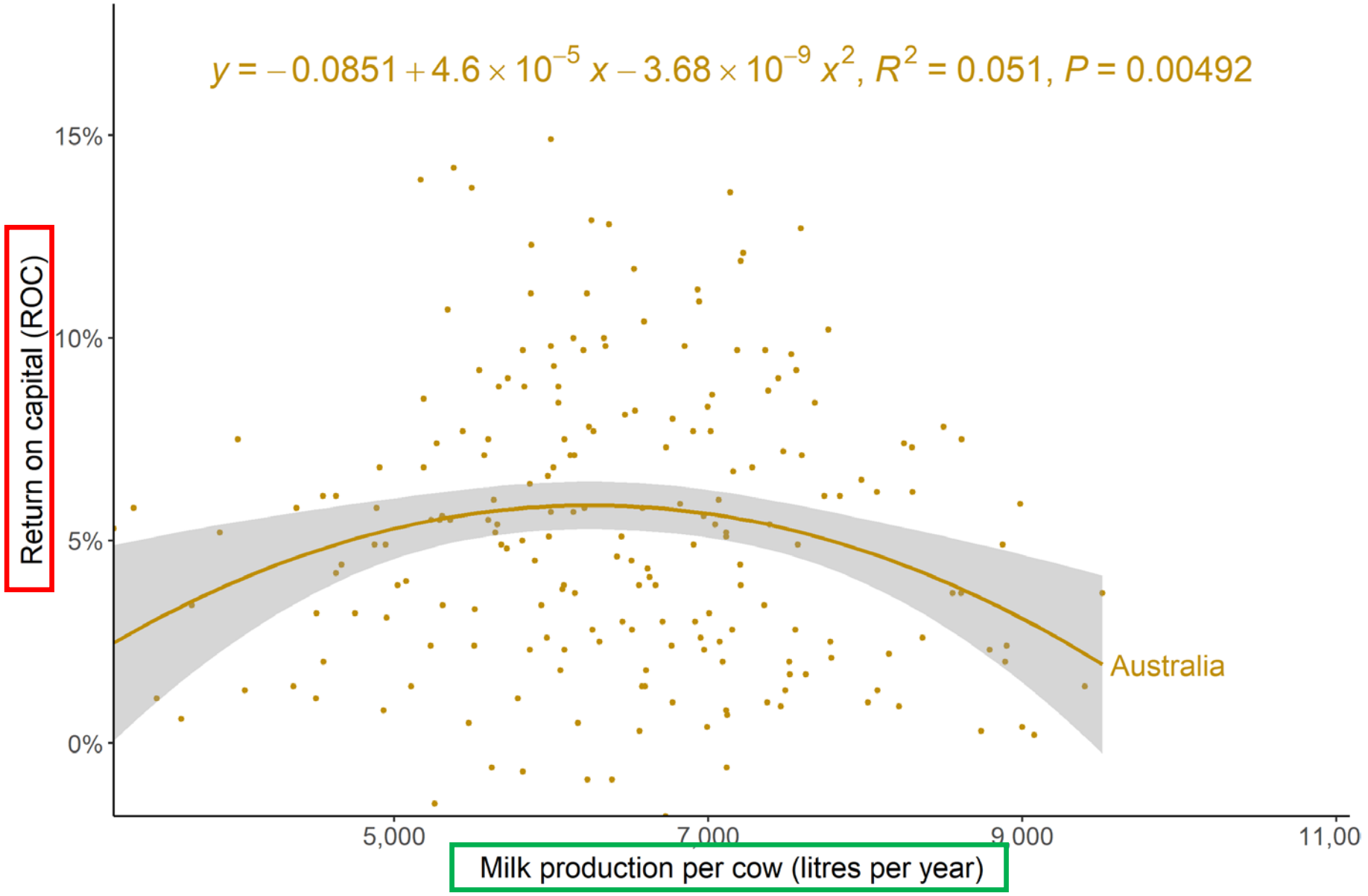




Primary factors impacted by pasture harvest

Primary factors being impacted by pasture harvest	As 	R^2	P
Cost of production per litre		0.14	<= 0.001
Core per hectare cost per tonne dry matter of pasture harvest		0.31	<= 0.001
Pasture cost per tonne dry matter		0.23	<= 0.001
Supplement cost per litre		0.12	<= 0.001
Labour cost per cow		0.09	<= 0.001
Core per cow cost		0.08	<= 0.001
Other factors			
Stocking rate impact on pasture harvest		0.63	<= 0.001
Pasture consumed per cow impact on pasture harvest		0.07	<= 0.001

Primary factors impacted by milk production per cow



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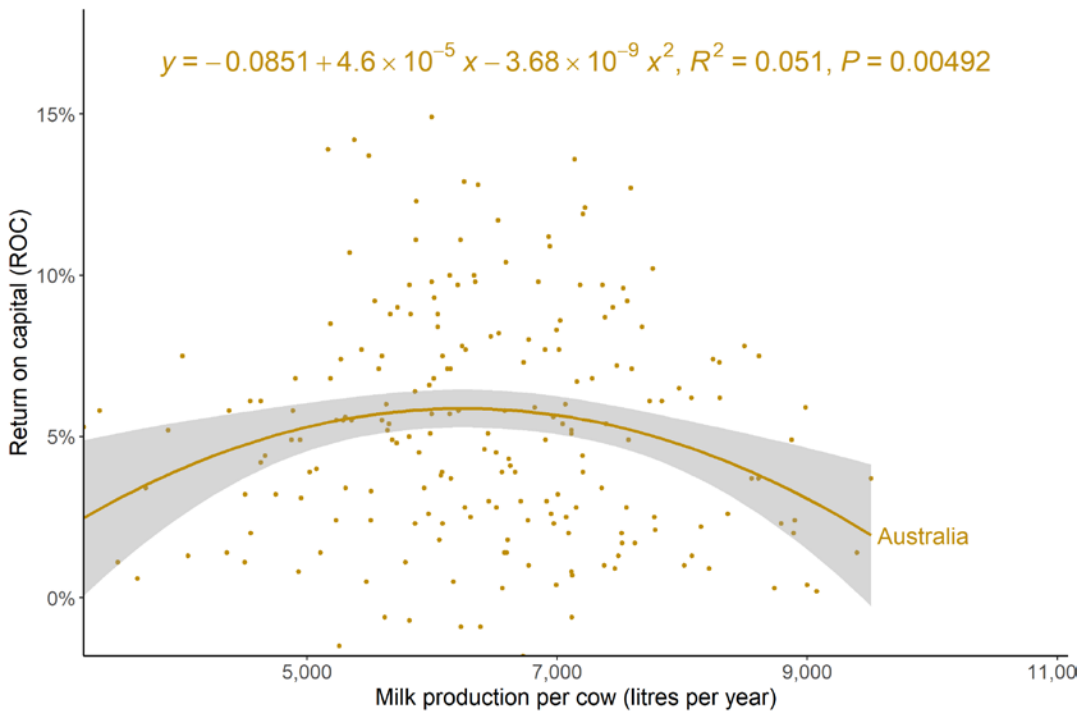

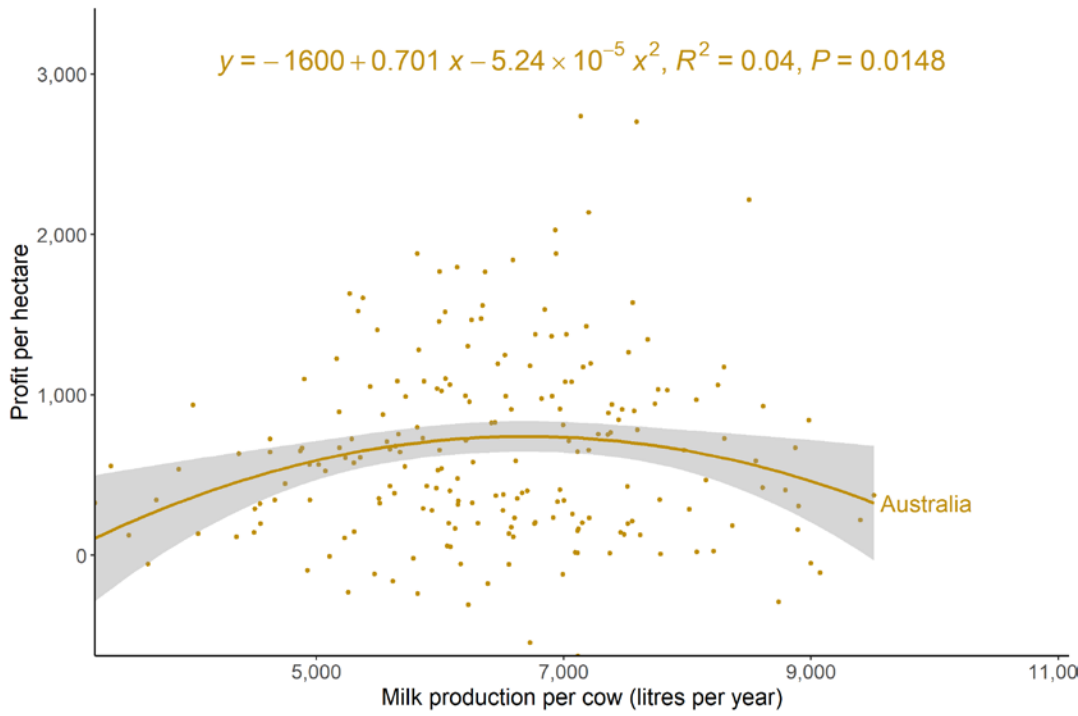

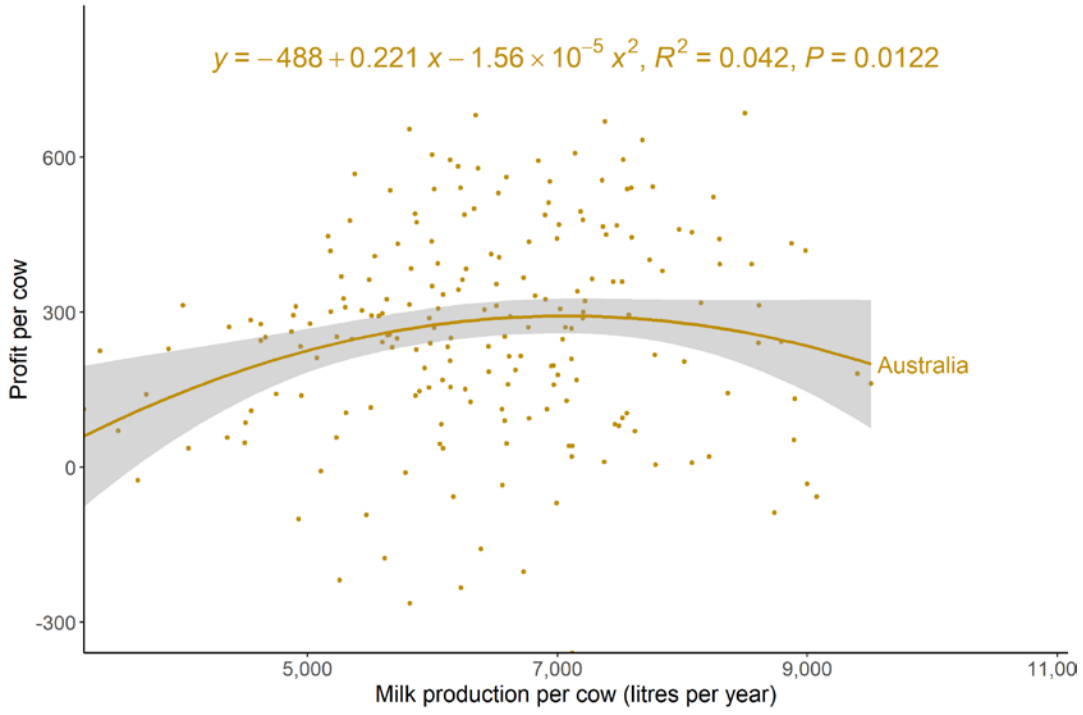

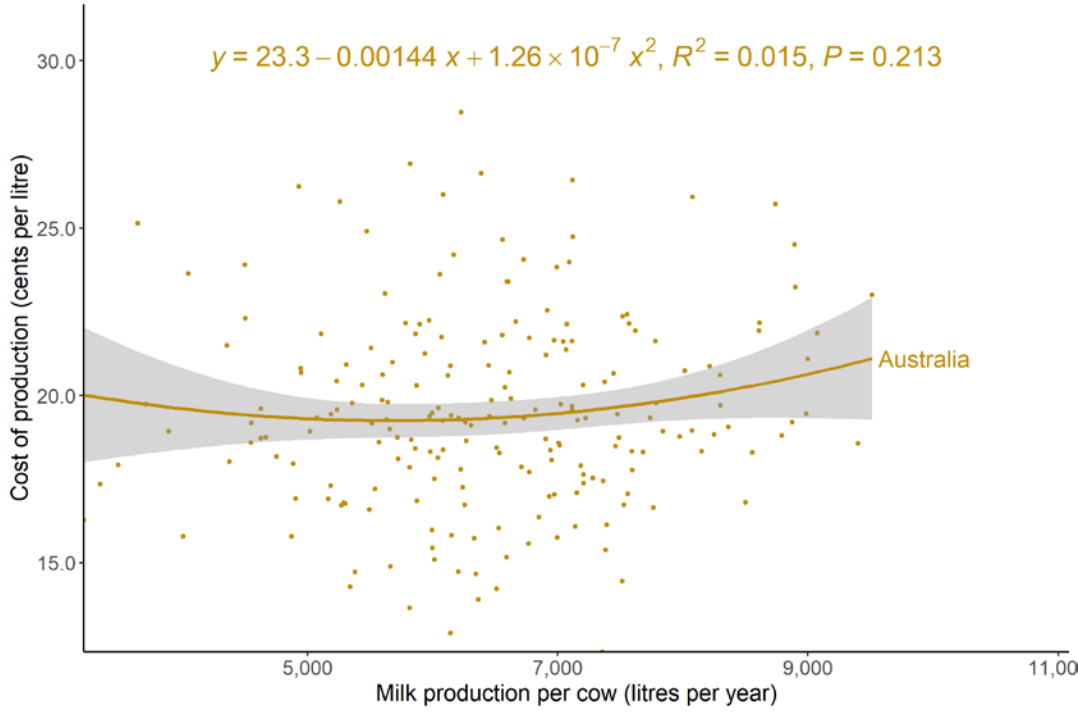

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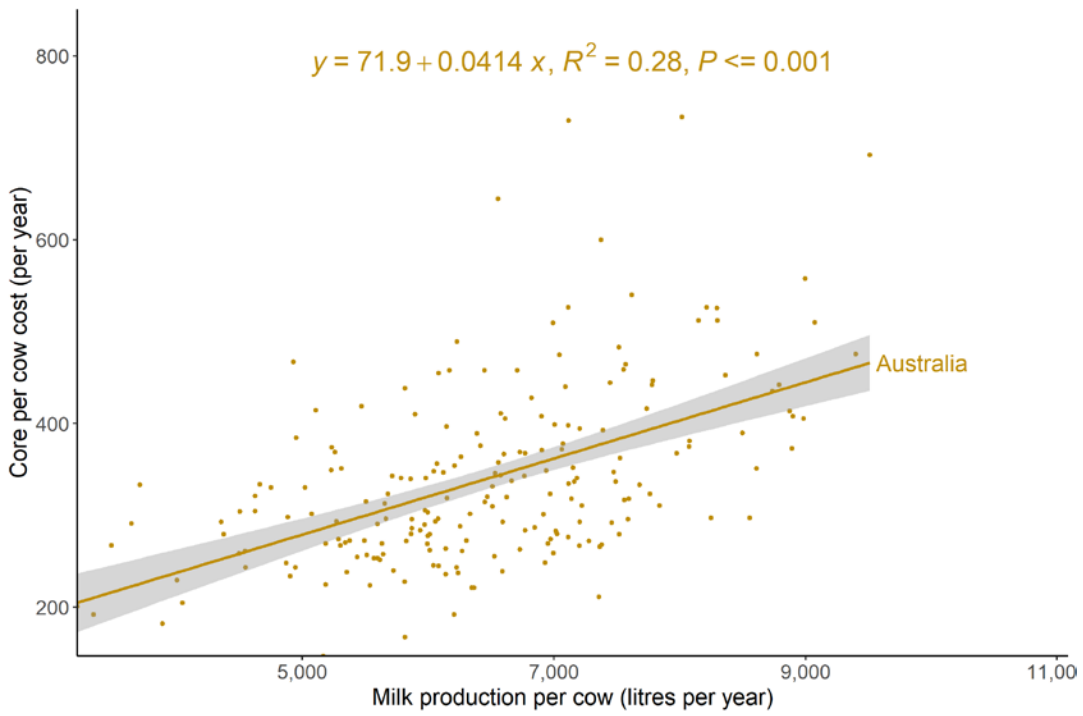

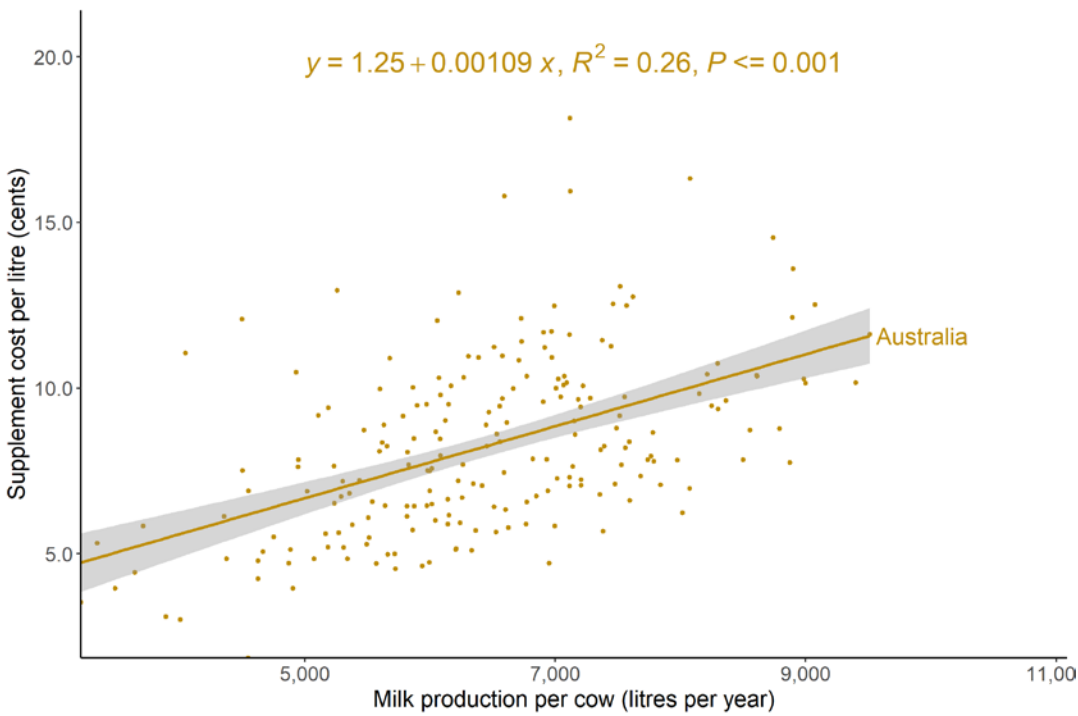

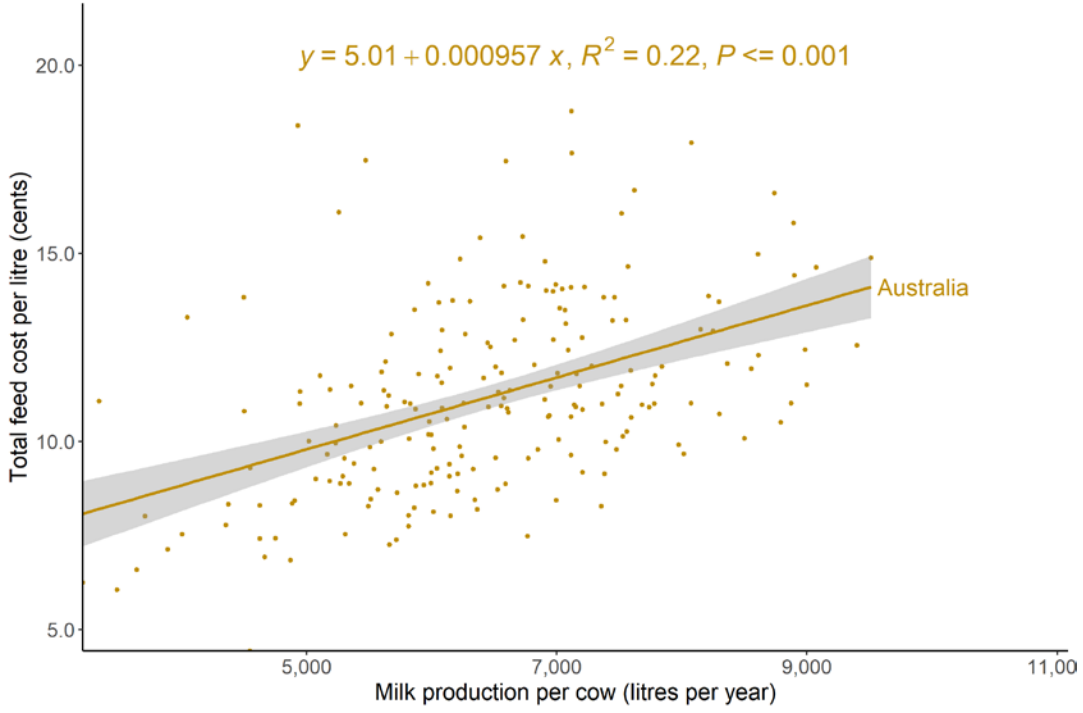

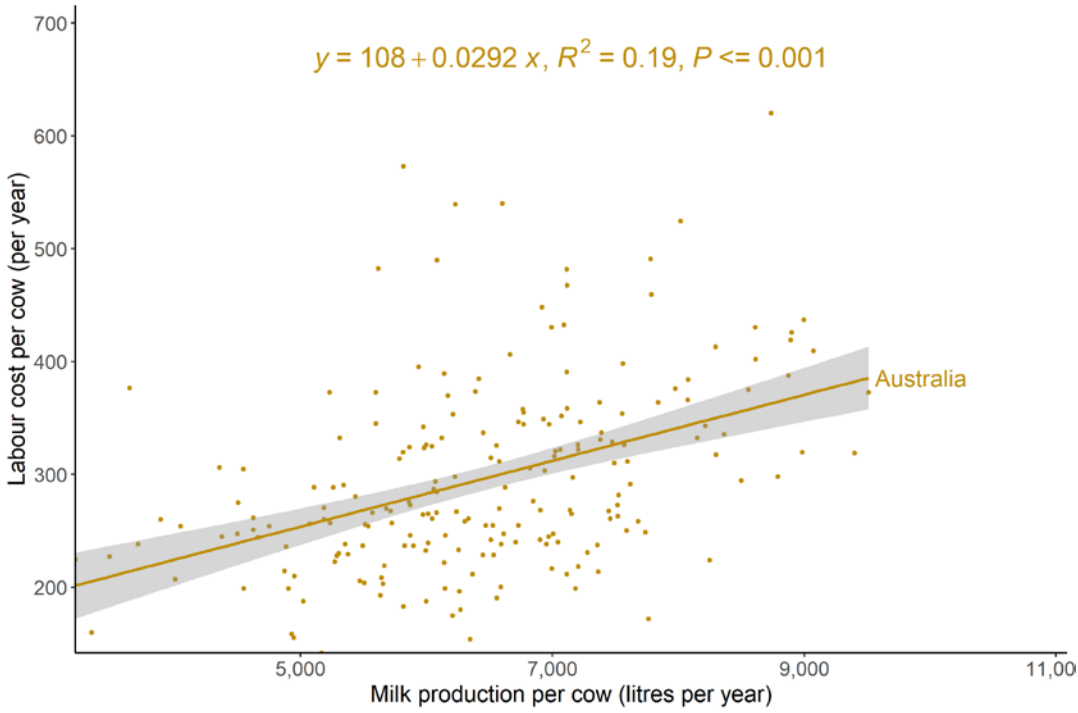

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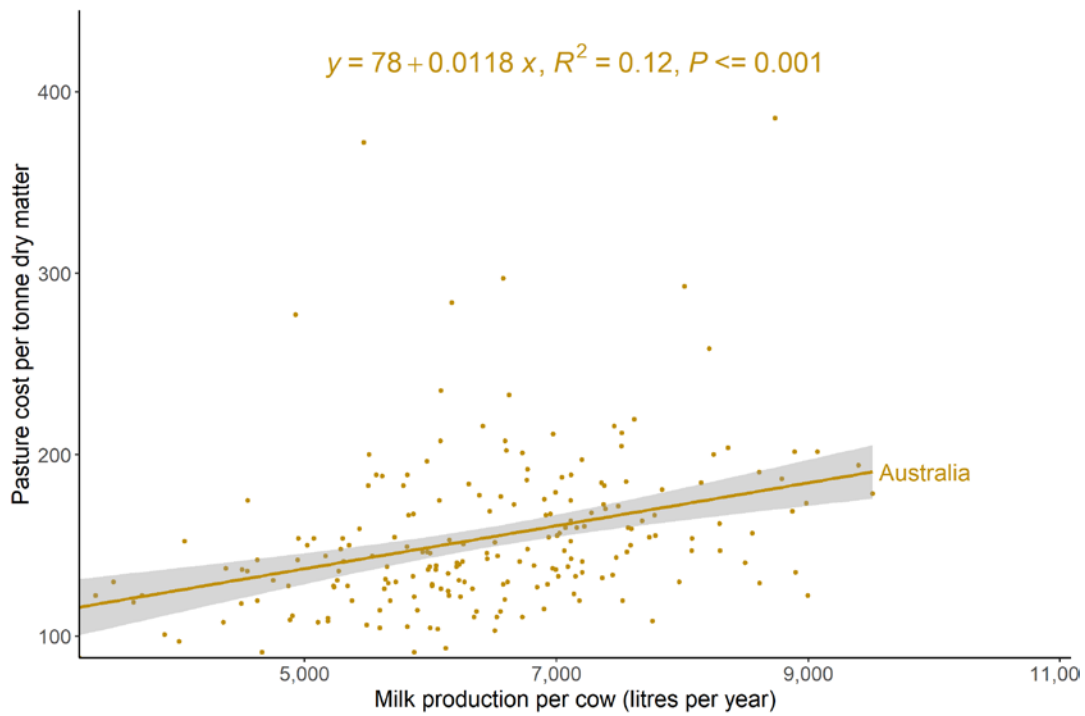
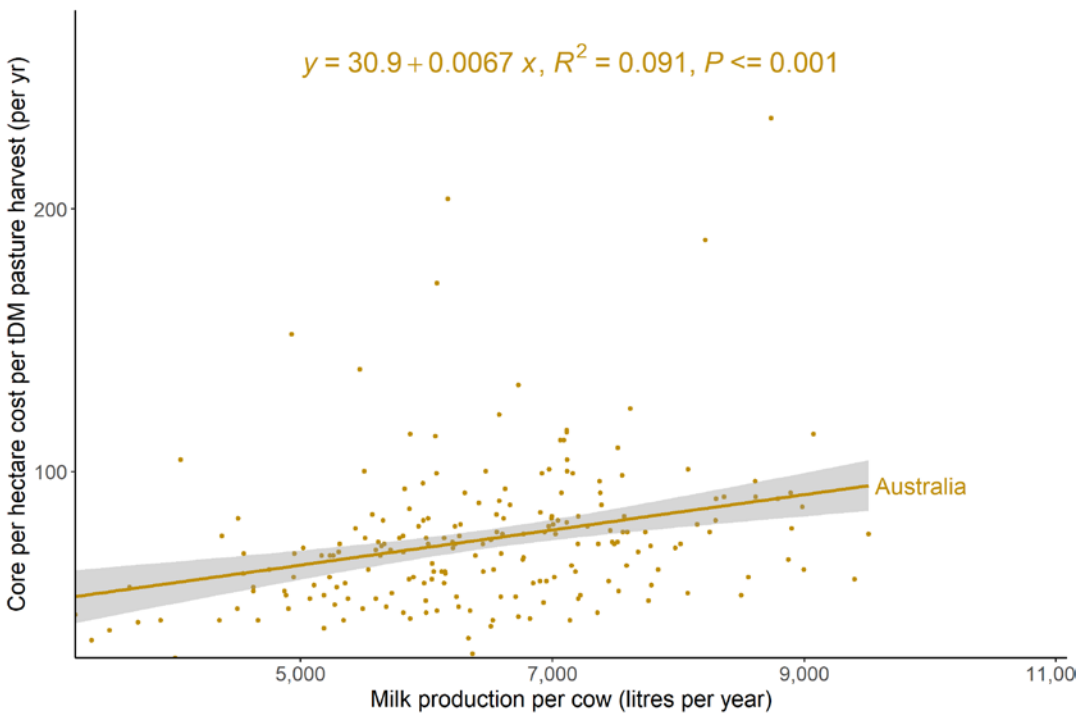
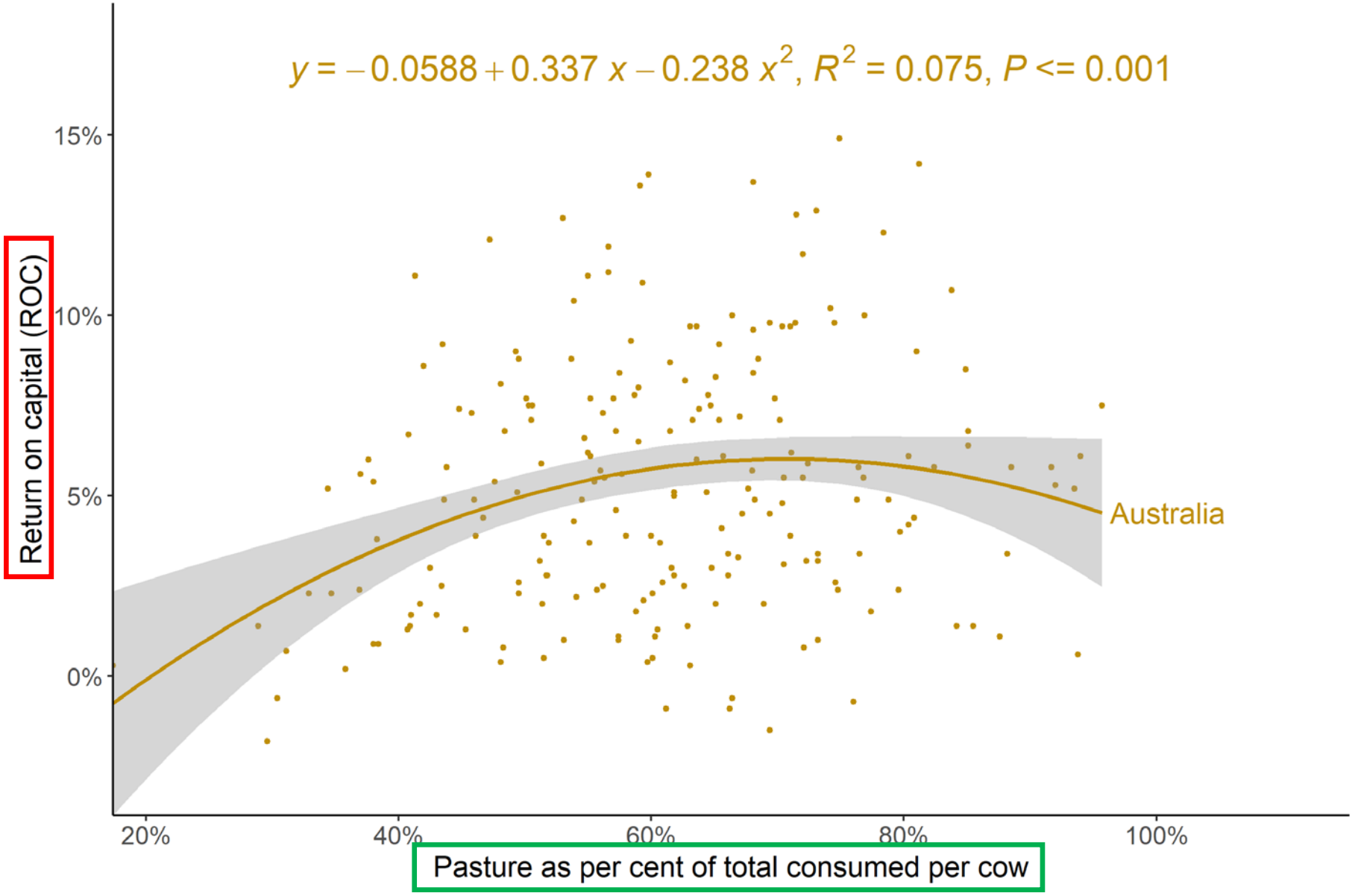




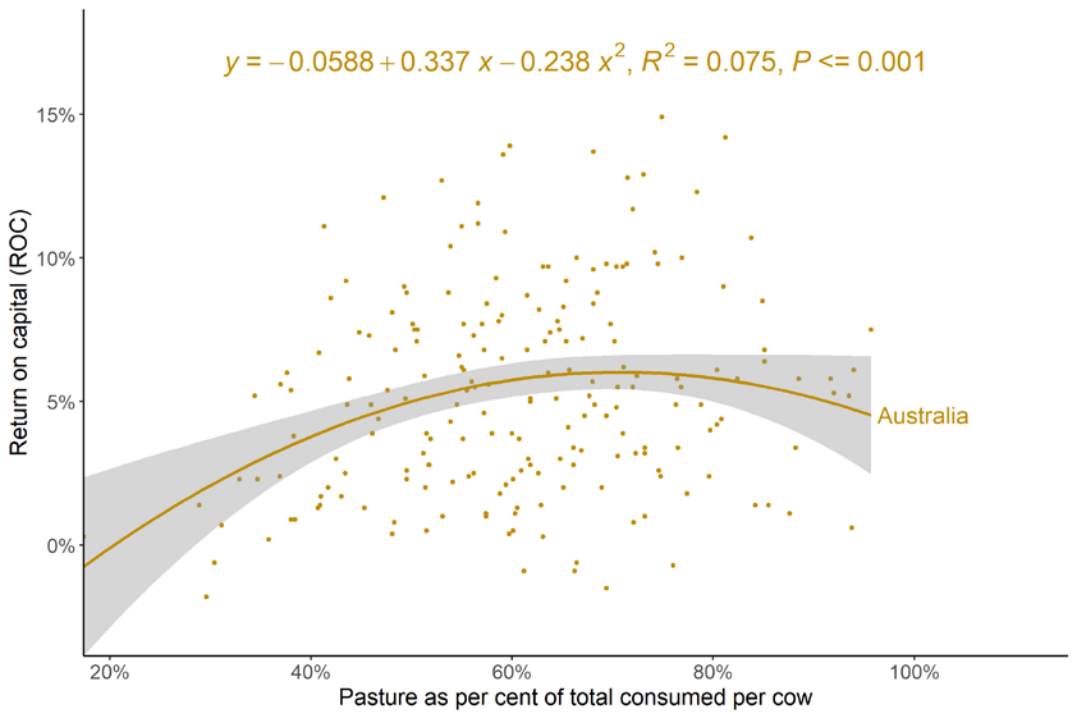
Primary factors impacted by milk production per cow

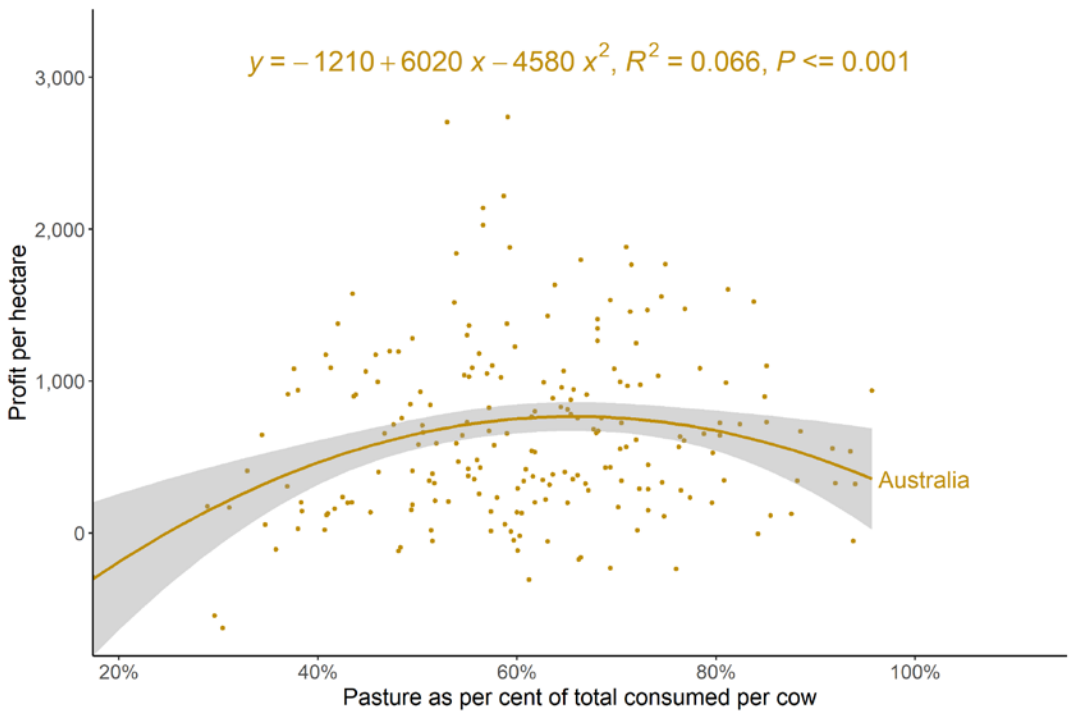
Primary factors being impacted by milk production per cow	As 	R^2	P
Core per cow cost		0.28	<= 0.001
Supplement cost per litre		0.26	<= 0.001
Total feed cost per litre		0.22	<= 0.001
Labour cost per cow		0.19	<= 0.001
Pasture cost per tonne dry matter		0.12	<= 0.001
Core per hectare cost per tonne dry matter of pasture harvest		0.09	<= 0.001

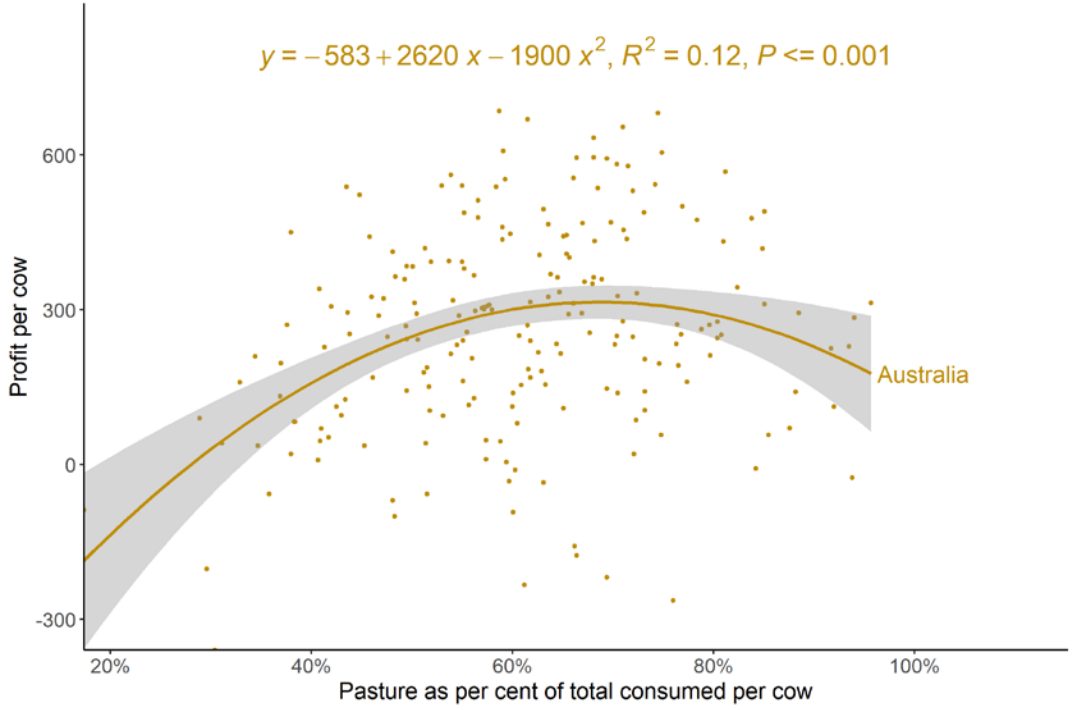
Primary factors impacted by pasture as % of cows diet

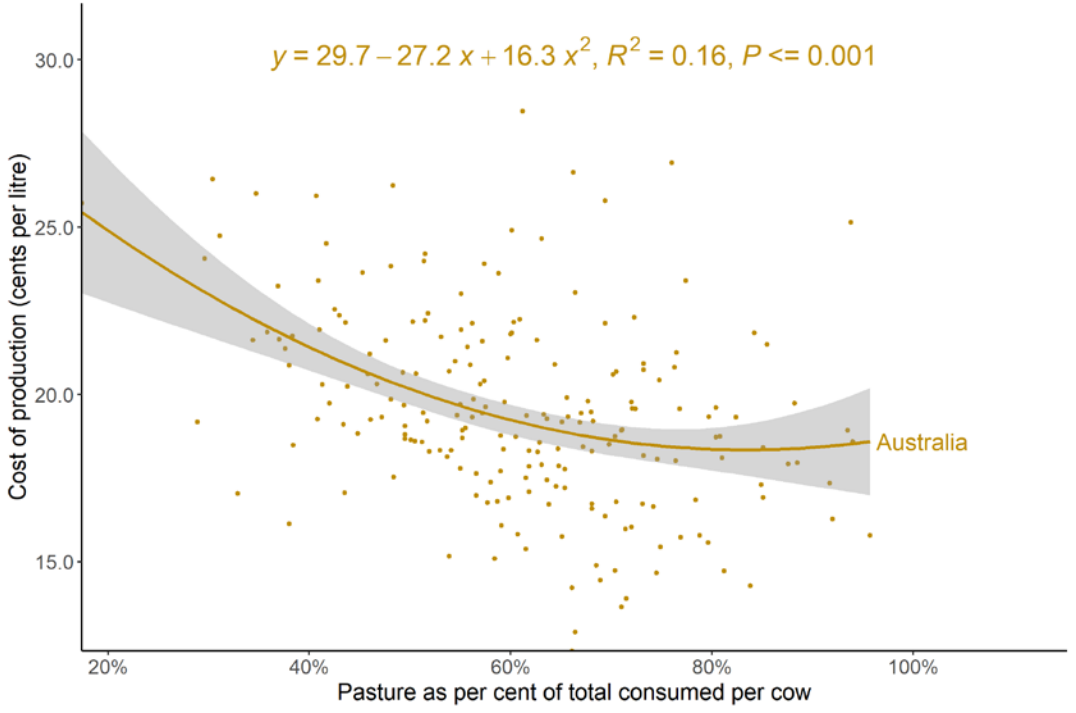


Primary factors impacted by pasture as % of cows diet









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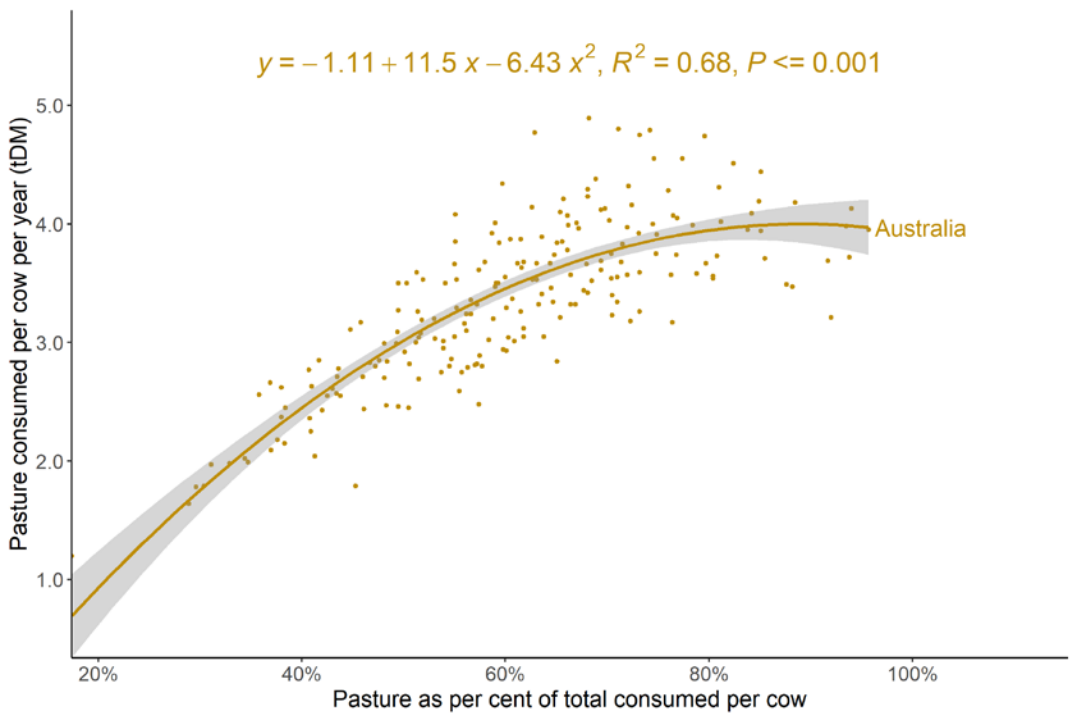

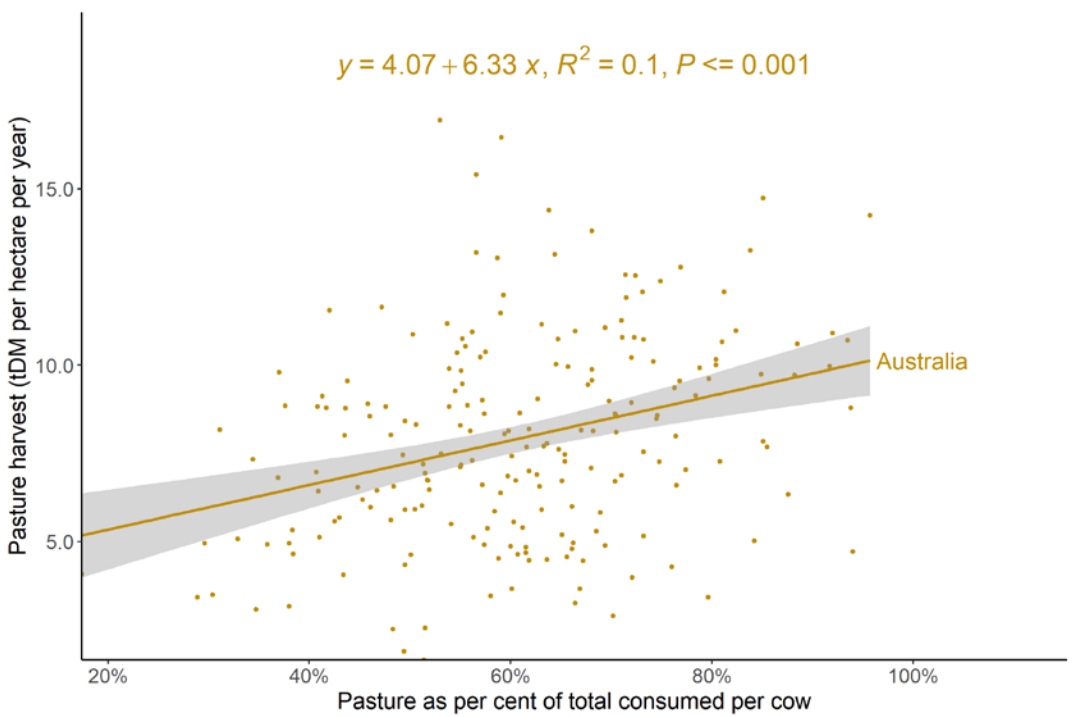

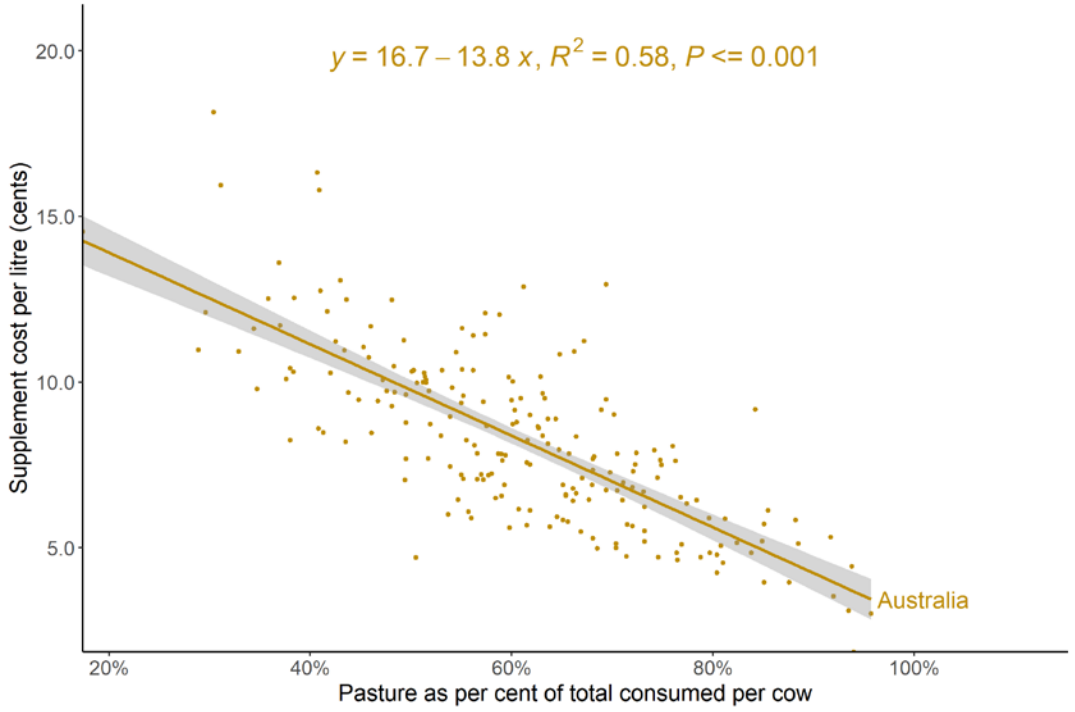

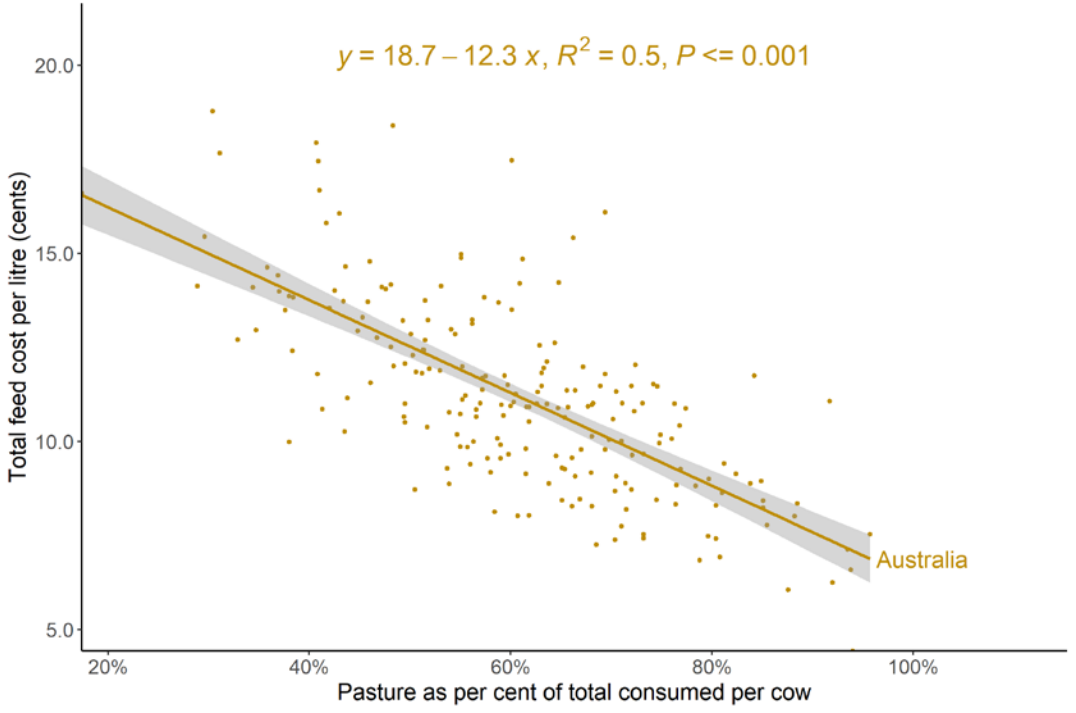

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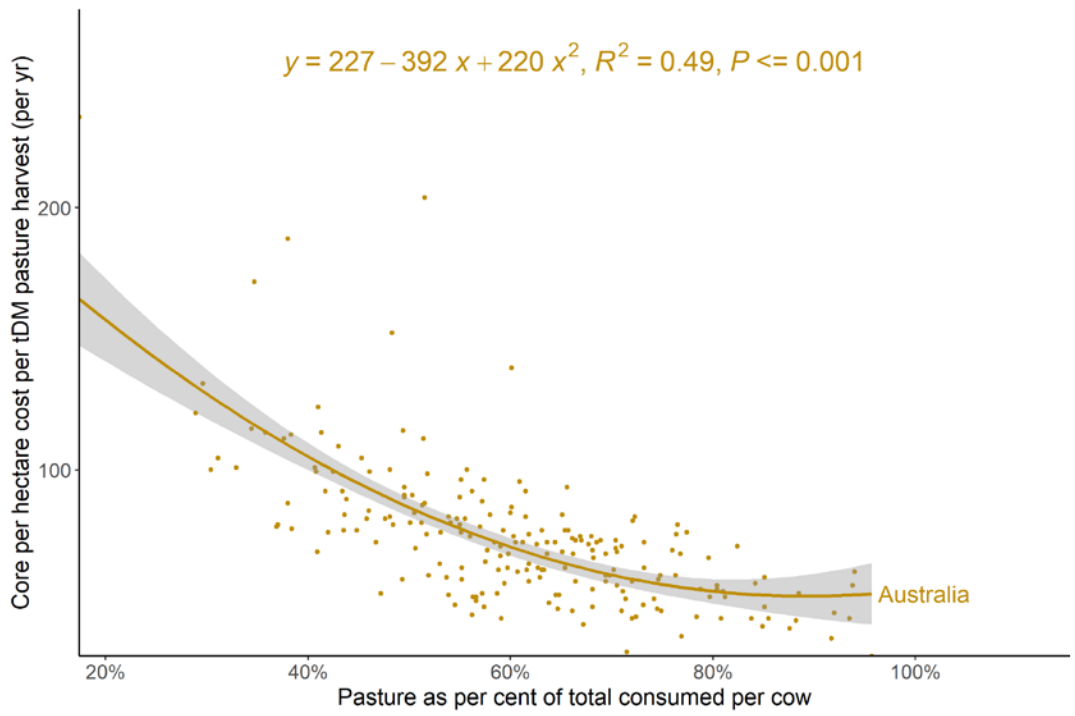

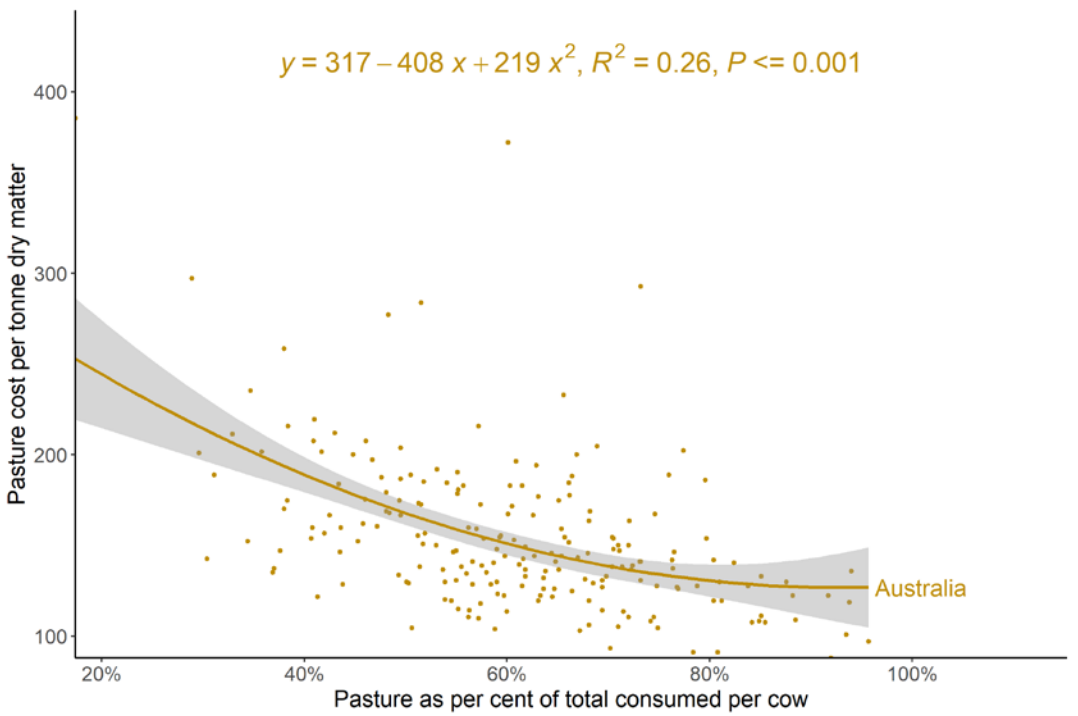

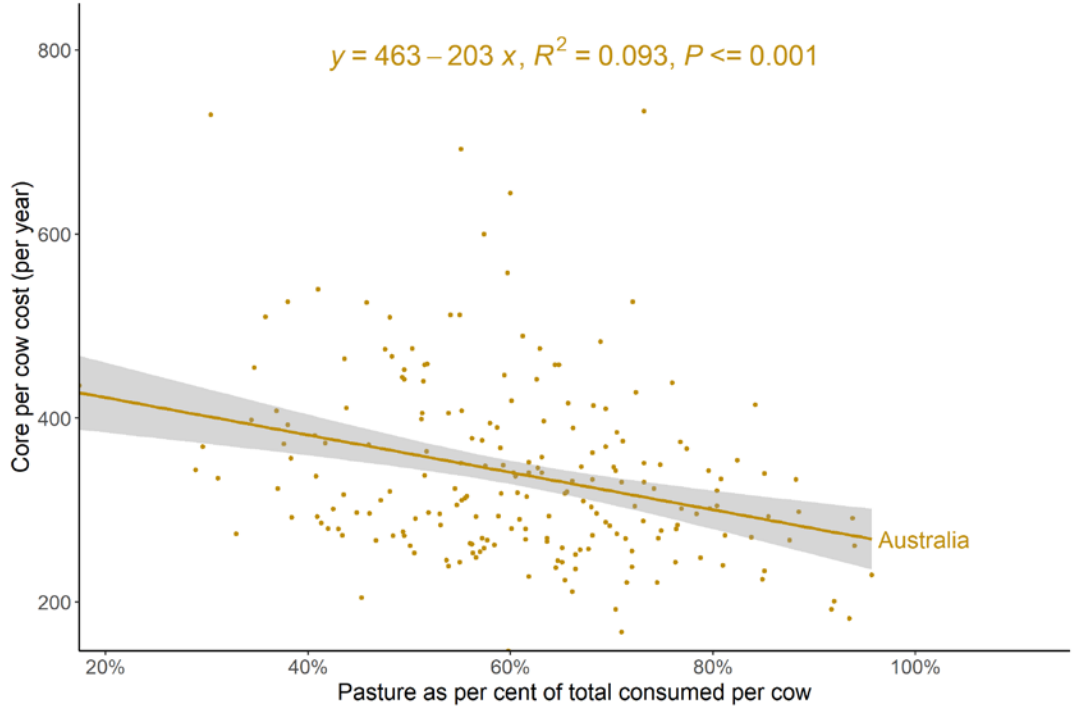

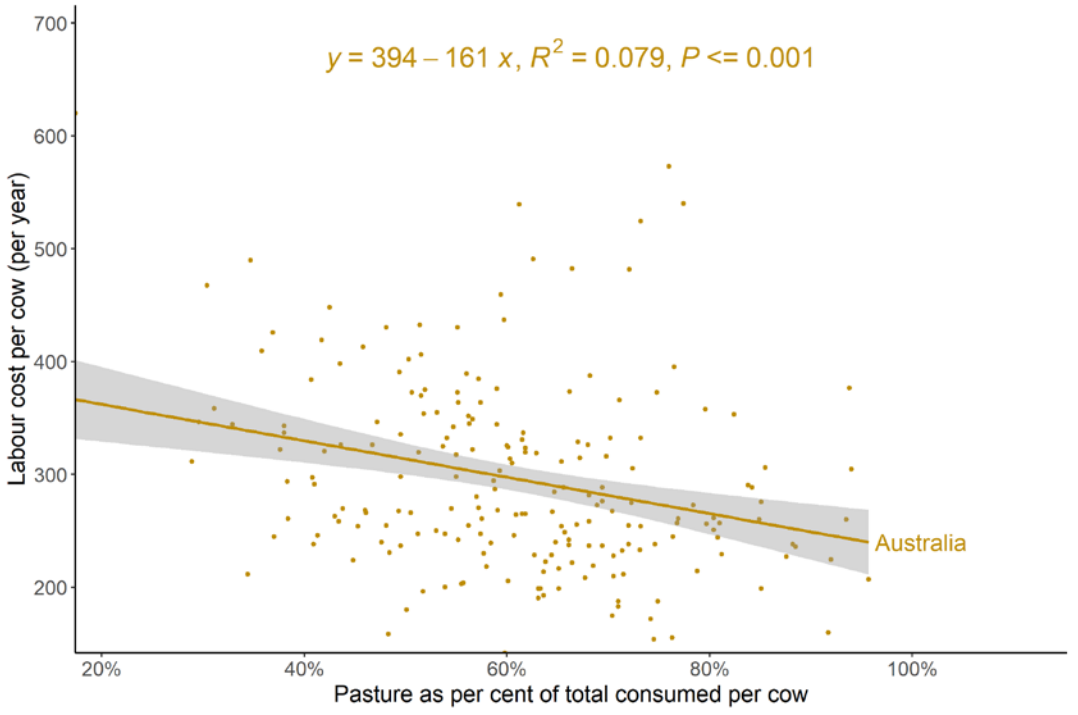

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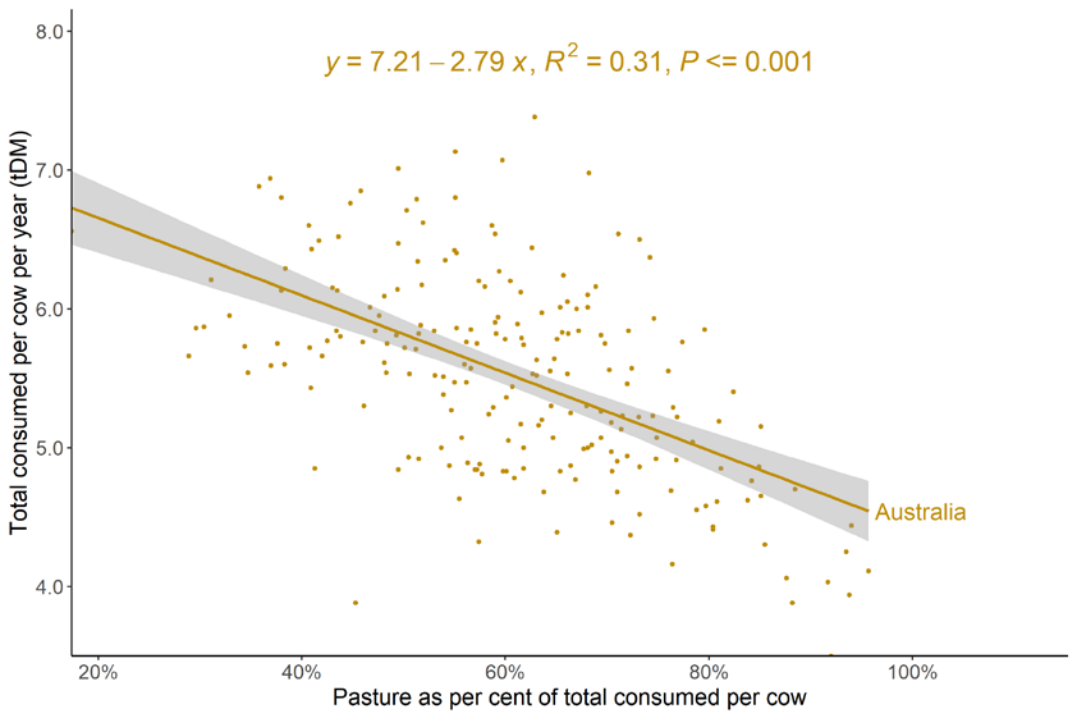
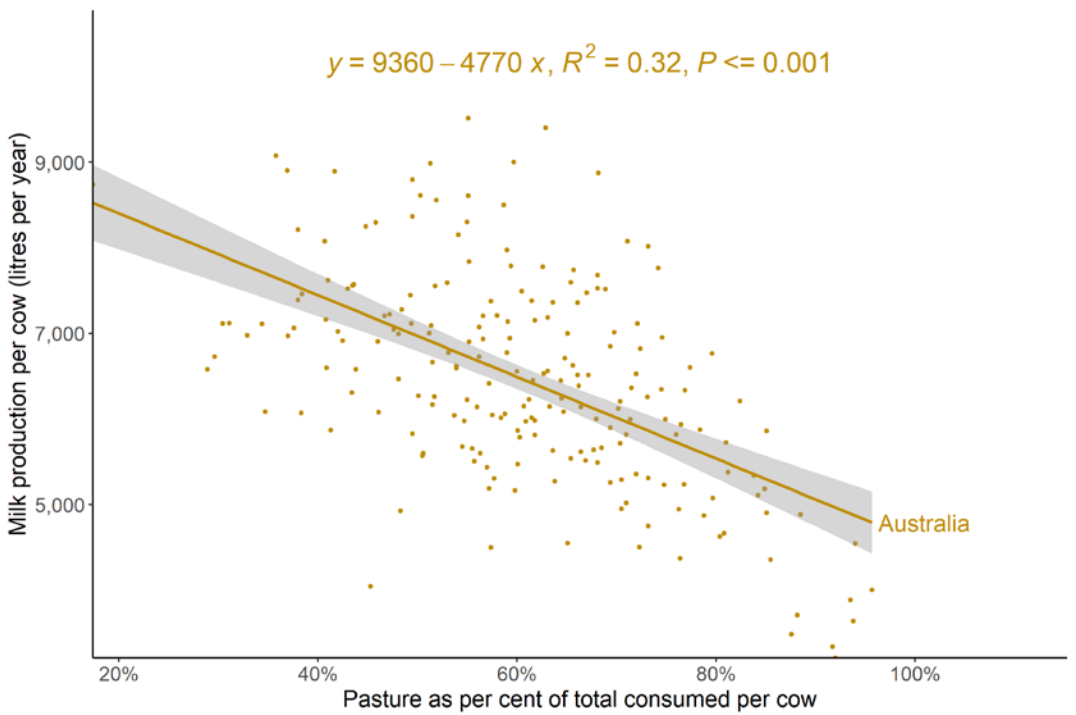
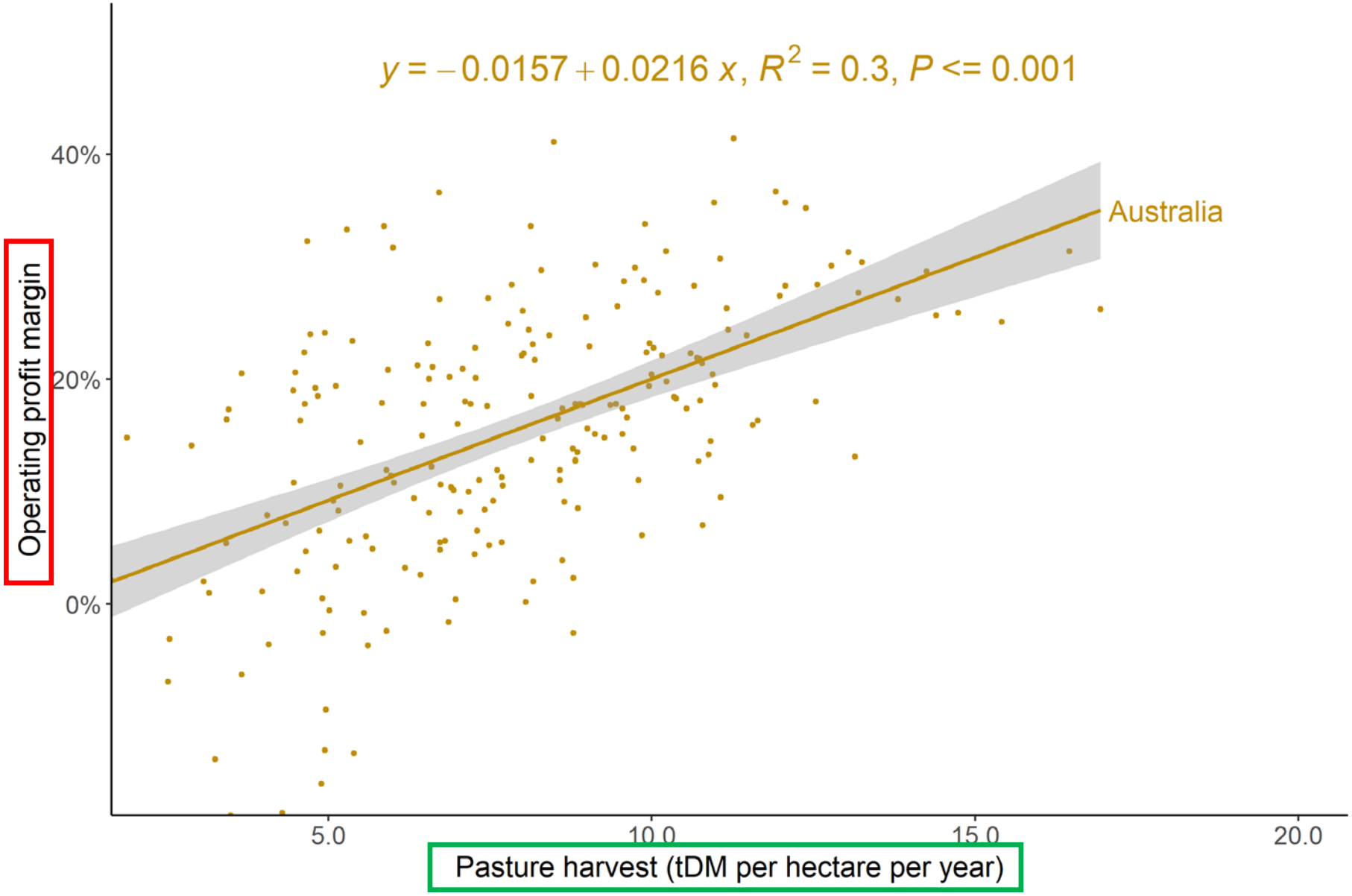




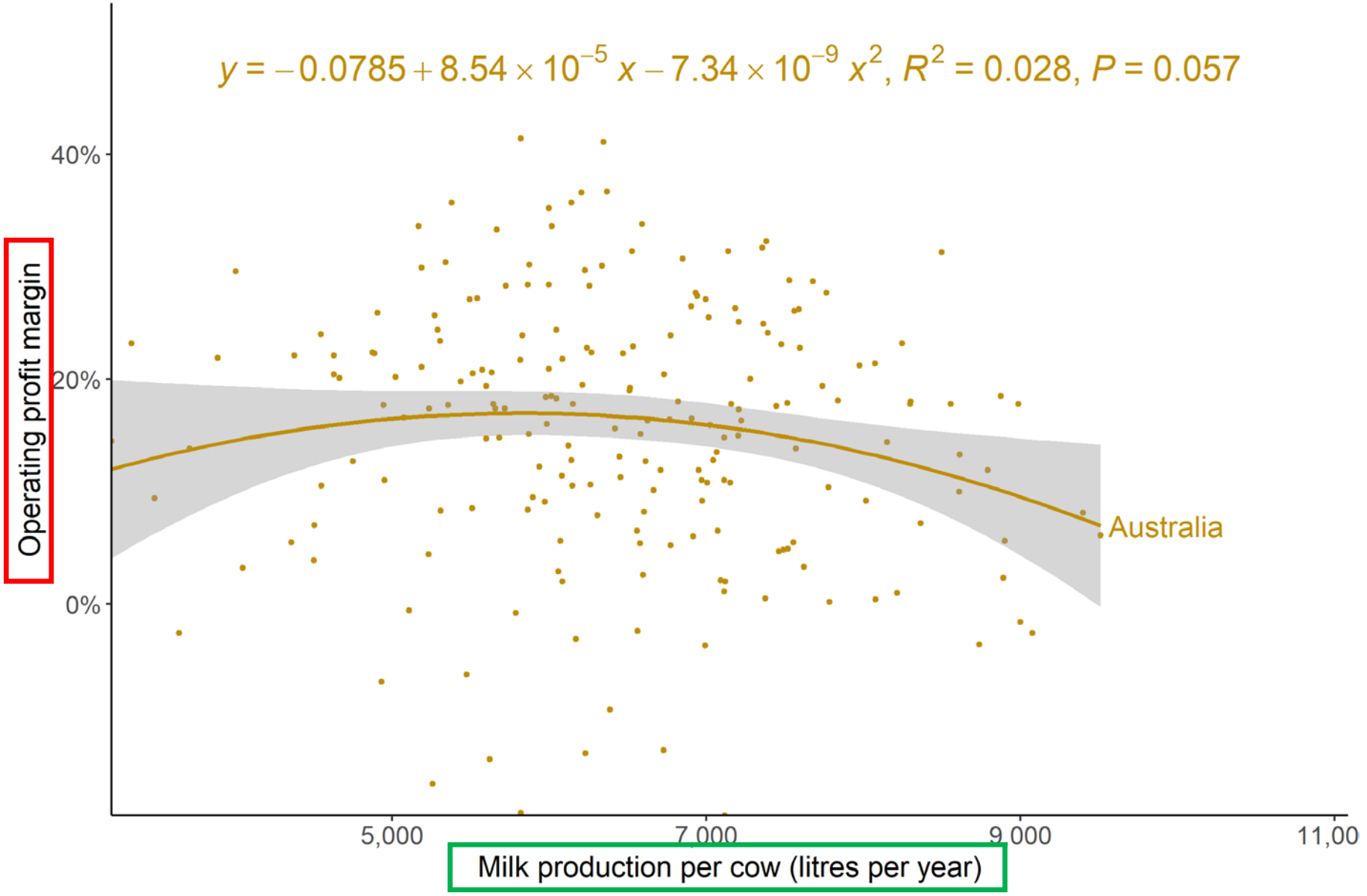
Primary factors impacted by pasture as % of cows diet

Primary factors being impacted by pasture as % of cow's diet	As 	R^2	P
Cost of production per litre		0.16	<= 0.001
Pasture consumed per cow		0.68	<= 0.001
Supplement cost per litre		0.58	<= 0.001
Total feed cost per litre		0.50	<= 0.001
Core per hectare cost per tonne dry matter of pasture harvest		0.49	<= 0.001
Milk production per cow		0.32	<= 0.001
Total consumed per cow		0.31	<= 0.001
Pasture cost per tonne dry matter		0.26	<= 0.001
Pasture harvest	 	0.10	<= 0.001
Core per cow cost		0.09	<= 0.001
Labour cost per cow		0.08	<= 0.001

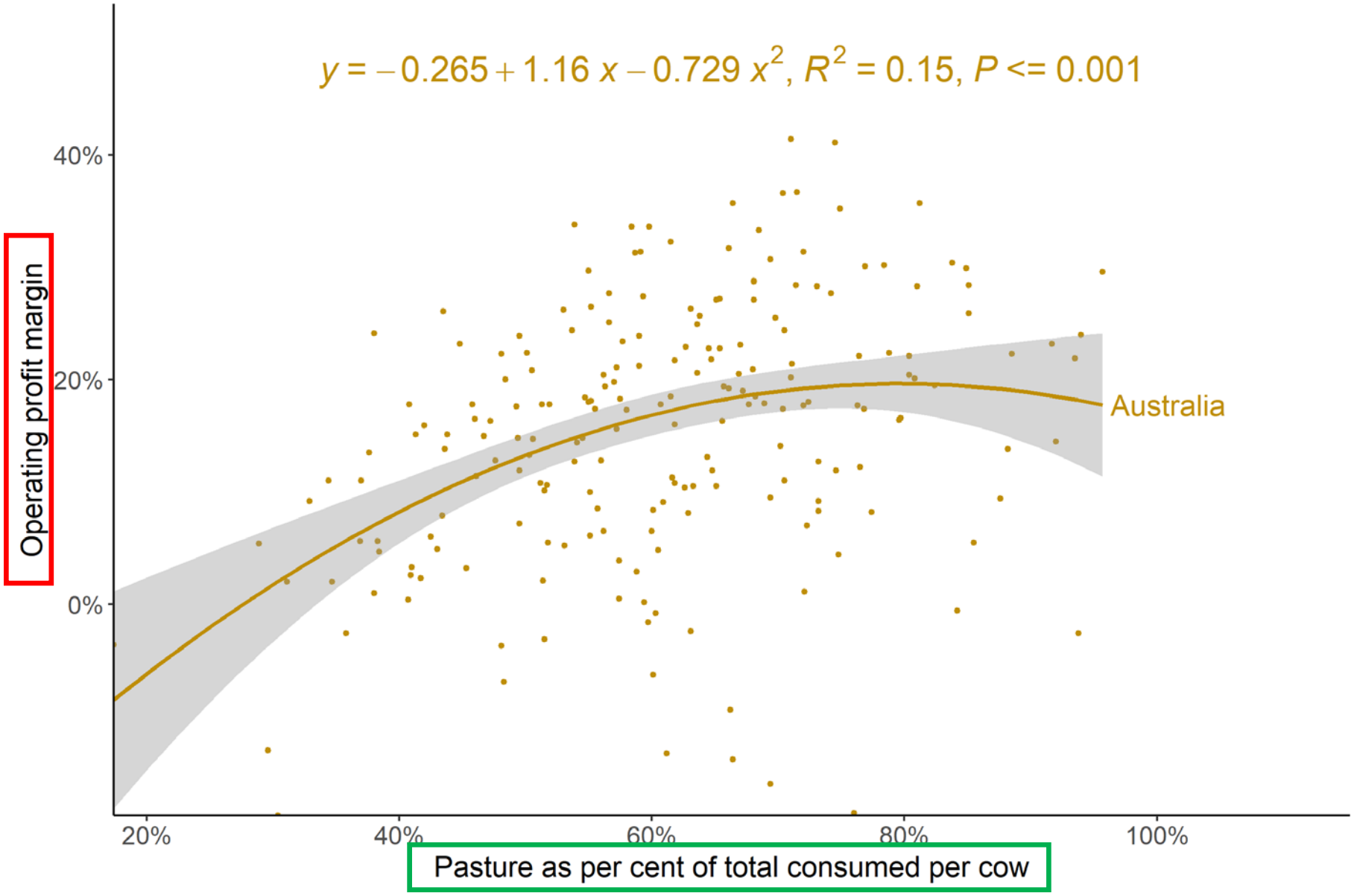
Pasture harvest impact on ‘Profit Margin’ (economic resilience)



Milk production per cow impact on ‘Profit Margin’ (resilience)



Pasture as % of cows diet impact on ‘Profit Margin’ (resilience)



Climatic variability and potential warming

What is the logical response to impact of climatic variability

- **In particular, lower pasture and crop yields**

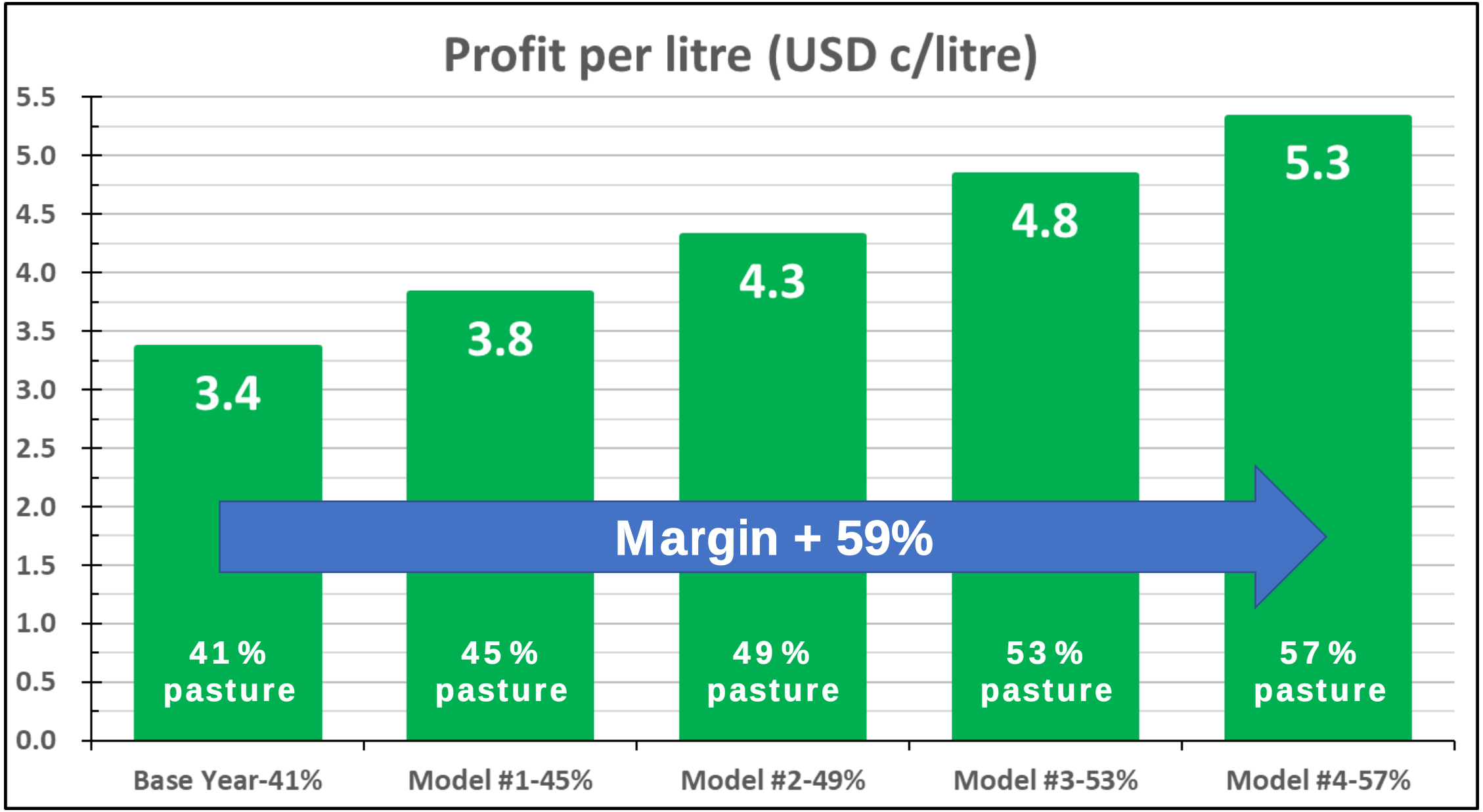
INCREASE pasture as a percent of the diet!

Why? To increase profit margin so production system more resilient

This principle further highlighted by South African study

Modelled results for 41% pasture ➔ 57% pasture (4 x 4% increments)

Economic RESILIENCE – higher profit margin per litre



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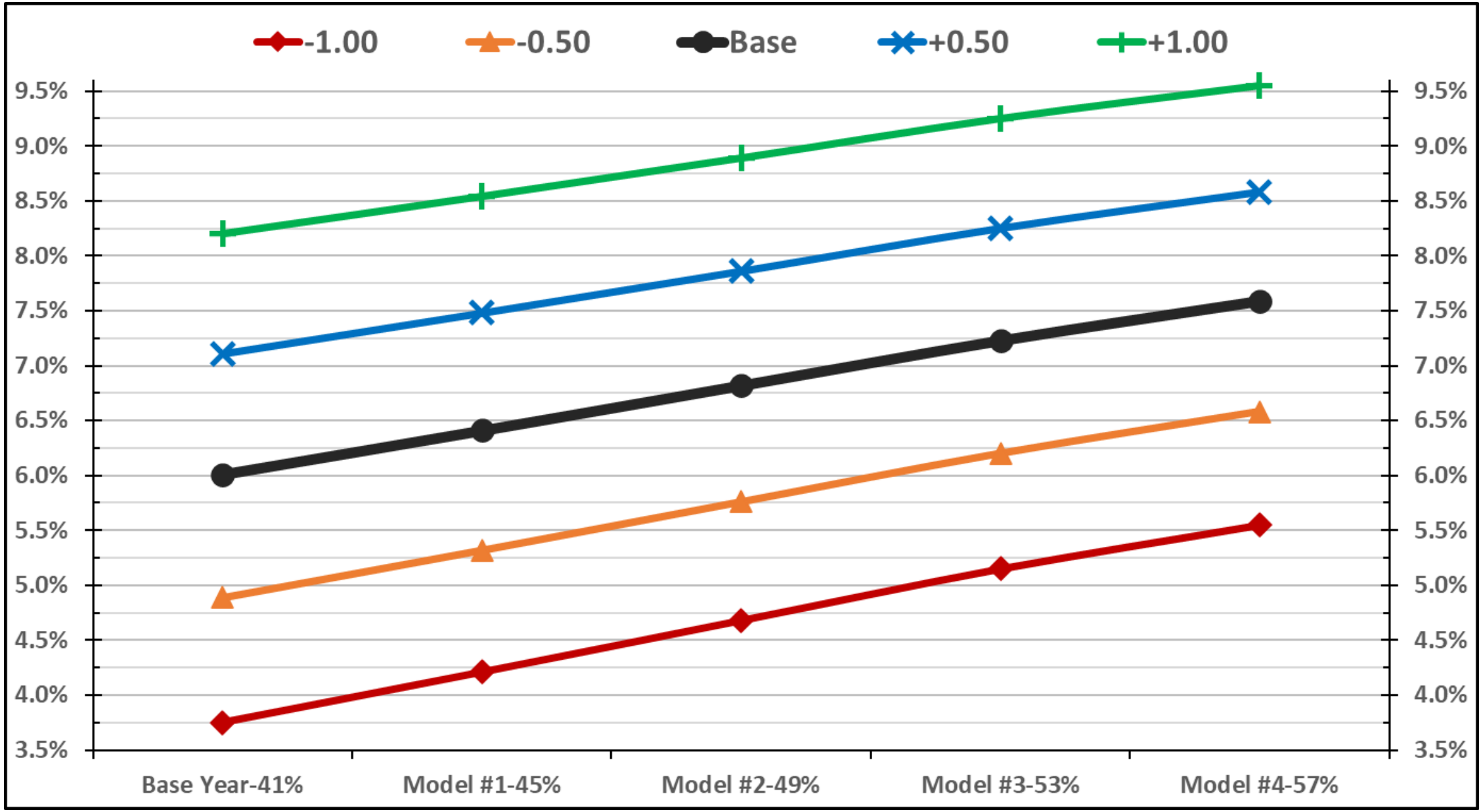
So how sensitive are these results to variability in climatic conditions including the impact on:

1. **Pasture harvest**
2. **Silage / crop yields**
3. **Silage / forage cost**
4. **Concentrate cost**

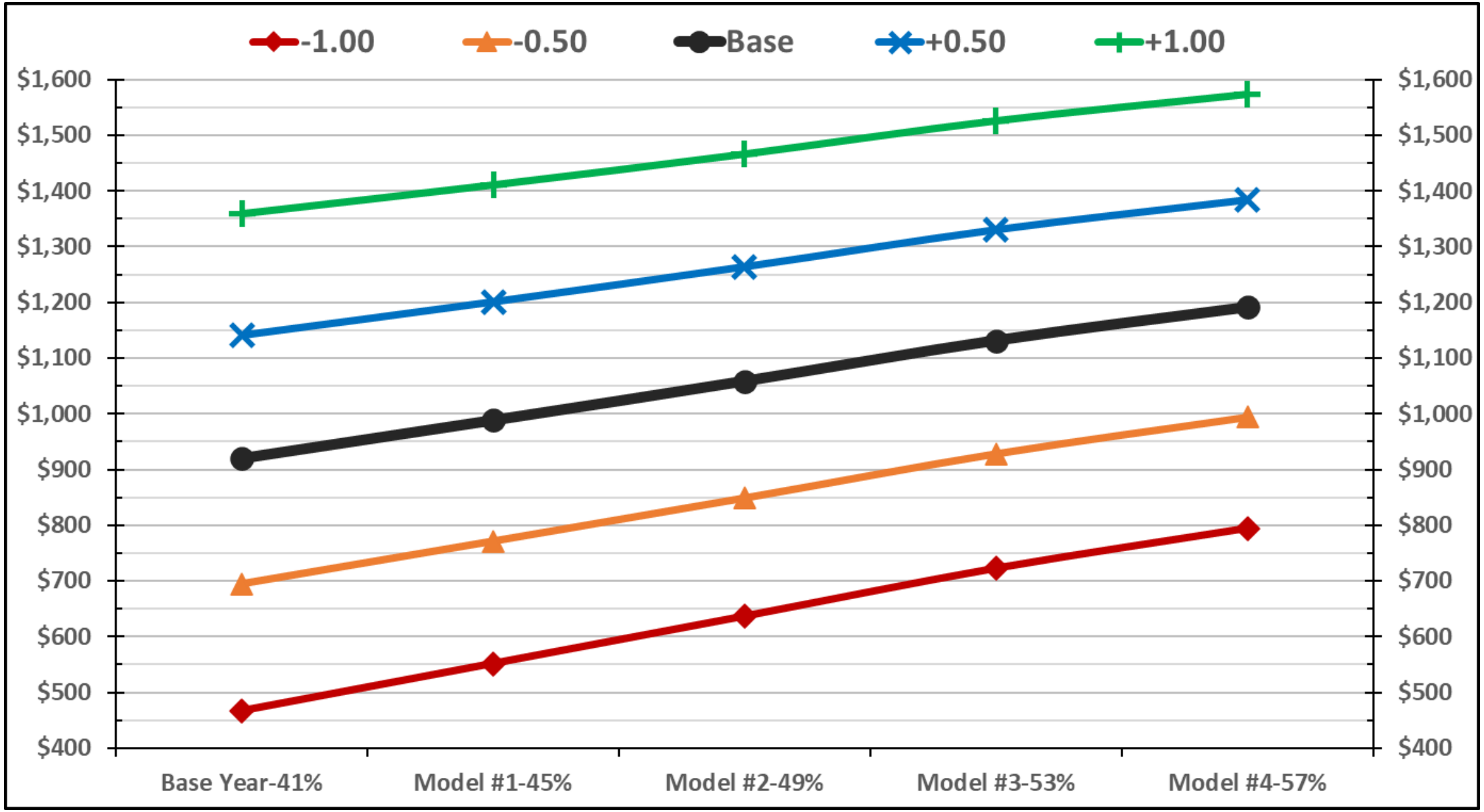
Sensitivity analysis parameters – seasonal climatic conditions

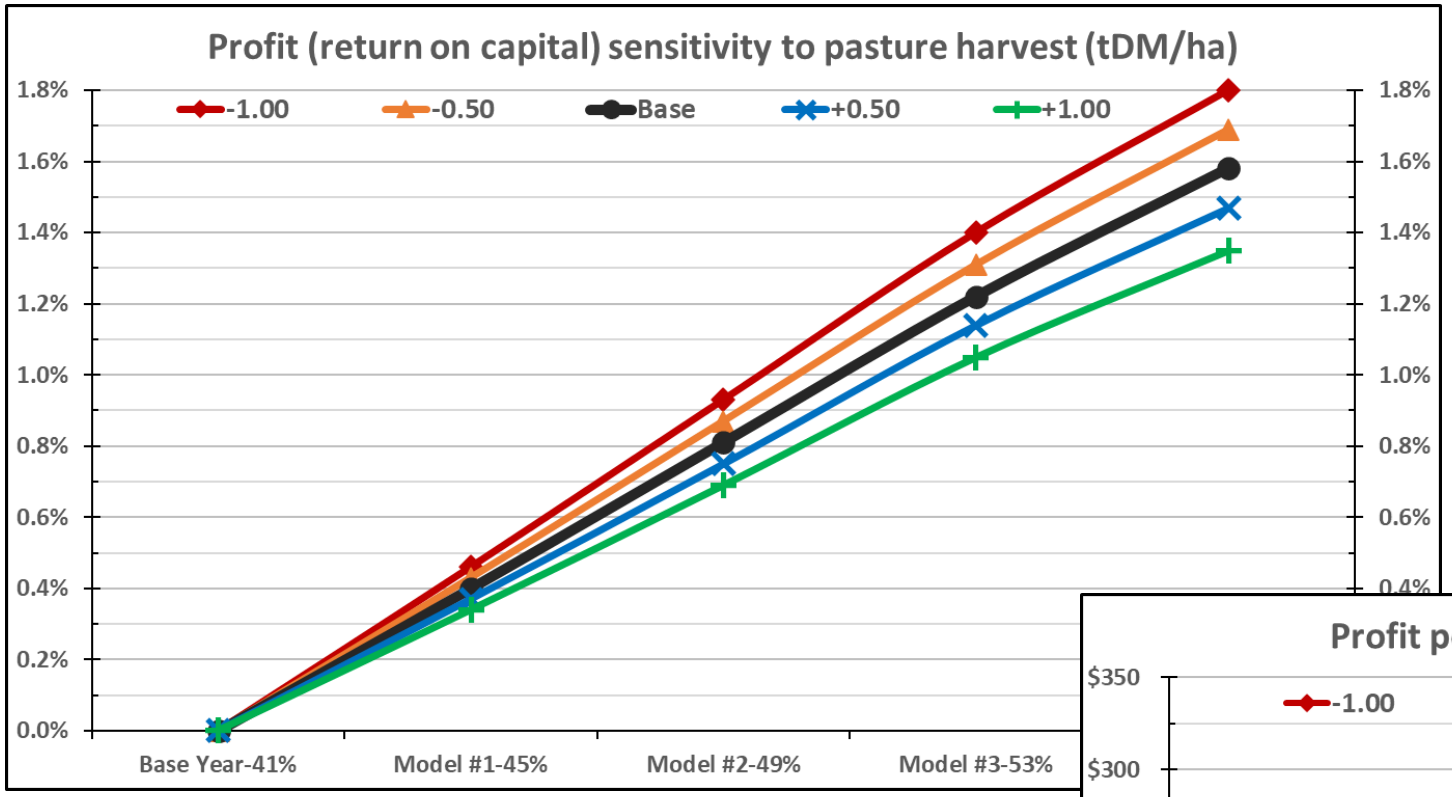
SENSITIVITY TABLE	Units	- -	-	BASE	+	+ +
Seasonal Climatic Conditions						
Pasture Harvest Variance	**tDM / ha**	**- 1.0**	**- 0.5**	**---+---**	**+ 0.5**	**+ 1.0**
Pasture Harvest	tDM / ha	10.3	10.8	**11.3**	11.8	12.3
Maize Silage Variance	**tDM / ha**	**- 1.0**	**- 0.5**	**---+---**	**+ 0.5**	**+ 1.0**
Maize silage Yield	tDM / ha	13.0	13.5	**14.0**	14.5	15.0
Maize Silage Cost	USD / tDM	$ 83	$ 80	**$ 77**	$ 74	$ 72
Maize Silage Cost	€ / tDM	€ 75	€ 72	**€ 69**	€ 67	€ 65
Concentrate Variance	**USD / tonne**	**$ 13**	**$ 7**	**---+---**	**-$ 7**	**-$ 13**
Concentrate Price	USD / tonne	$ 267	$ 260	**$ 253**	$ 247	$ 240
Concentrate Price	€ / tonne	€ 241	€ 235	**€ 229**	€ 223	€ 217

Profit (return on capital) sensitivity to CLIMATE / PASTURE HARVEST (tDM/ha)

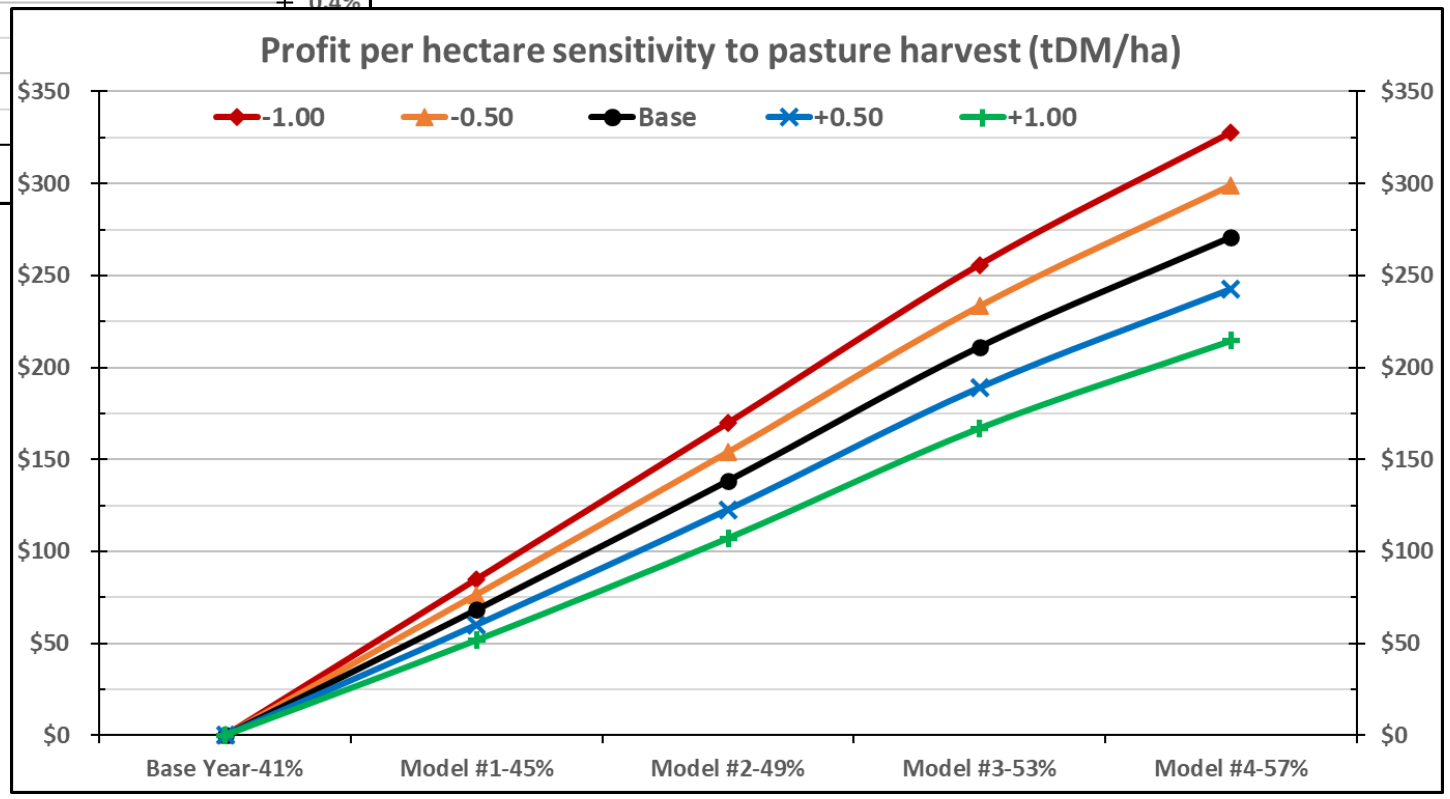


Profit per hectare (USD) sensitivity to climate/pasture harvest (tDM/ha)

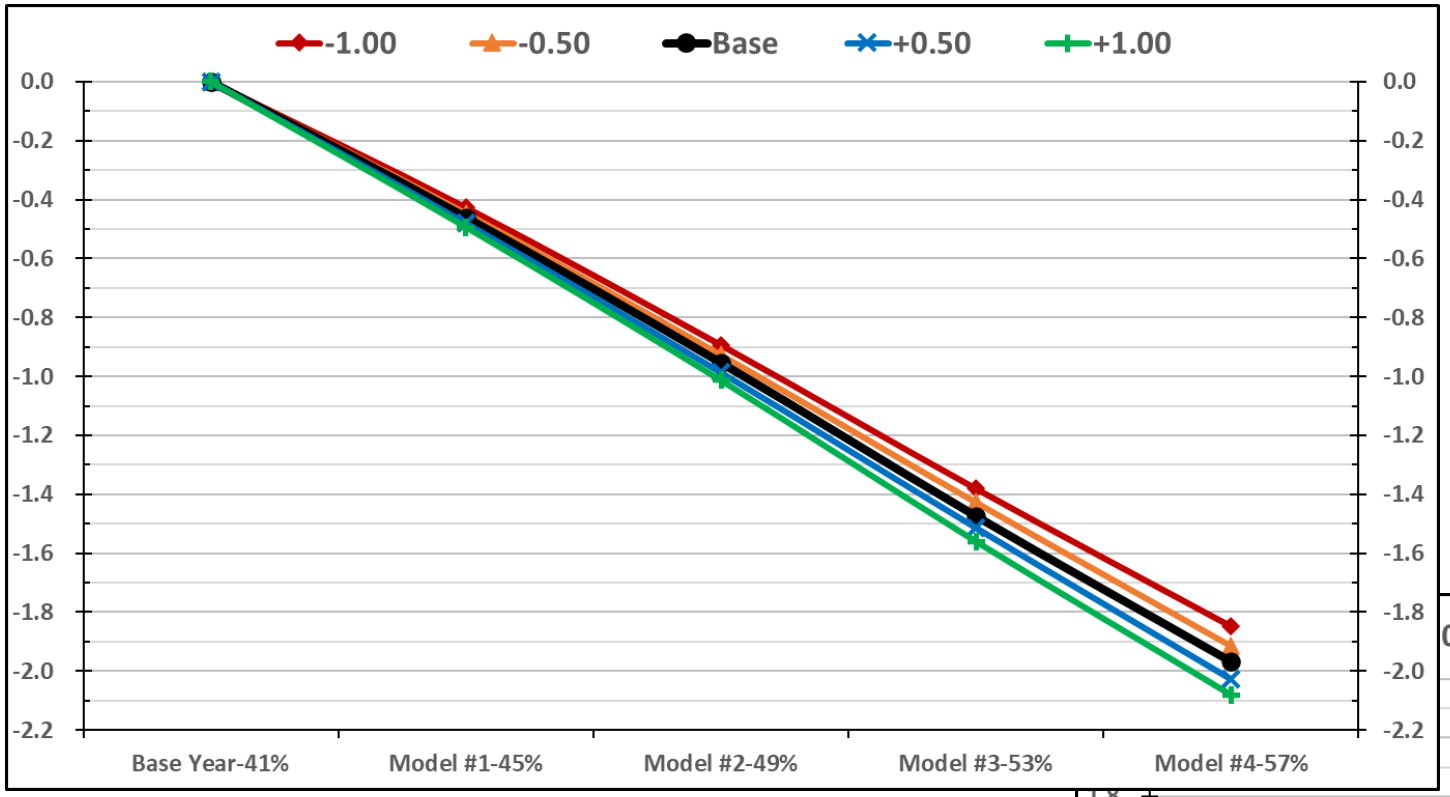


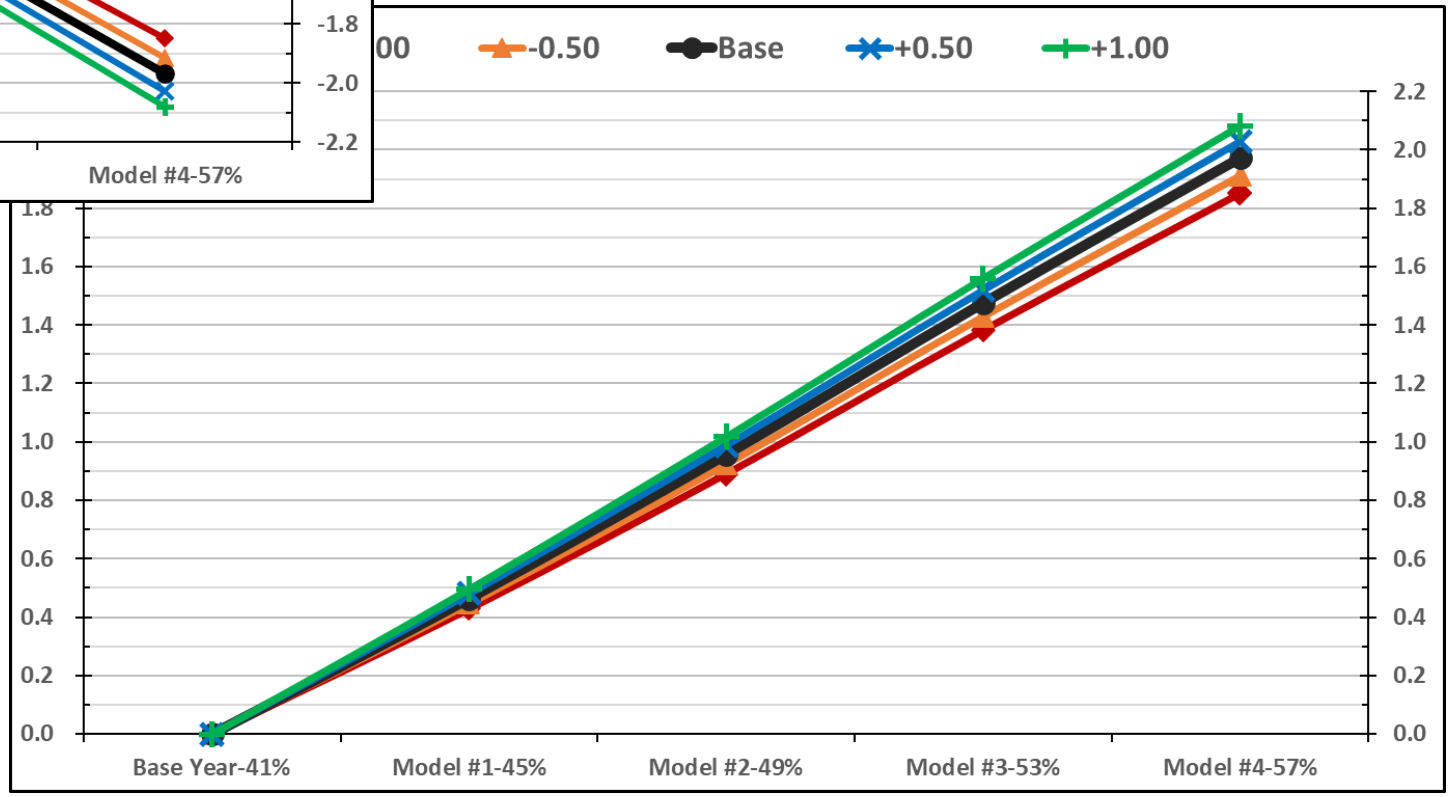


Change in profit sensitivity to climate / pasture harvest



Change in cost of production and profit margin sensitivity to climate / pasture harvest





Why has there been “slippage” in production systems

Why have UK and other farmers progressively increased supplement fed…and reduced pasture as percent of the diet?

- **Firstly, complex business…pasture the profit driver, not milk**
- **Almost all economic relationships counter-intuitive to biological ones**
- **Add “a plague of economic illiteracy” (Prof Bill Malcolm, Uni of Melbourne)**
- **Farmers seduced by pride in producing more milk per cow**
- **Farmers seduced by higher milk prices offered for flatter milk supply curves**
- **Farmers seduced by simplistic and inaccurate gross margins**

Biological multi-year production system plus climate variability result in profitability trends take 10+ years to emerge

Cow genotype often determining production system and not production system determining cow genotype

Difficult and ‘scary’ to consider ‘unwinding’ production system

So…to maximise profitability and build resilience

1. Maximise pasture harvest
2. Optimise the farm production system
   - High percent of pasture in the diet
3. Optimise management in executing the operational plan
   - "Right action, first time, on time" with physical management
   - Minimising every cost centre wherever possible
   - Minimising depreciation…of machinery and the HERD

UK farmers and the industry could compete internationally and grow…

…though this will require a change in production system and a higher percent of pasture in the cows diet

Thank you

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