

Webinar #3

What are the step-by-step changes a South African pasture-based dairy farmer would need to make to lower their cost of production and increase their profit margin to establish a more financially resilient business?

What are the challenges and opportunities when changing a production system and including a higher percentage of pasture in the diet?



**Standard
Bank**

David Beca

25 & 26 November 2020

Eastern Cape & KwaZulu-Natal

 **BARENBRUG**

Presentation outline

- ❑ Developing the model of an 'average' South African dairy farm
- ❑ What are the key assumptions that change as pasture as a percentage of the diet changes?
- ❑ What are the results including on profit, cost of production, profit margin and international competitiveness?
- ❑ Are these results impacted under a sensitivity analysis?
- ❑ What are the business challenges when making these changes?

Background on key profit ratios

Data analysis undertaken as part of the following:

Published paper (Australian data):

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

http://redskyagri.com/page/redsky_52.html

Unpublished addendum with South African data

Beca, D. (2020 unpublished), 'Addendum to Key Determinants of Profit for Pasture-based Dairy Farms – South Africa versus Australia'.

http://redskyagri.com/page/redsky_52.html

Mark Neal (DairyNZ) completed statistical analysis and provided insights

Gonzalo Tuñon (Argentina) completed original analysis and provided insights

Developing an 'average' farm model

Based on Red Sky benchmarks for South Africa

Data primarily collected by Intelact

Steady-state model (assets same opening and closing)

- ❑ Land values – from last year (2019/20)
- ❑ Milk price – average of last 4-5 years
- ❑ Livestock values – average of last 2-3 years
- ❑ Other commodity prices – average of last 4-5 years
- ❑ Pasture harvest – average of last 4 years
- ❑ Other costs – average of last 1-2 years

Input and output assumptions for 'average' farm

SOUTH AFRICA PRODUCTION SYSTEMS	Base Year 41% Pasture
Size of farm (effective ha)	134,0
Number of cows in herd	603
Stocking rate on effective area	4,50
Stocking rate on pasture area	4,63
Stocking rate on irrigation	5,14
Stocking rate on dryland	2,57
Pasture harvest (tDM/ha)	11,3
Irrigated pasture harvest (tDM/ha)	12,6
Dryland pasture harvest (tDM/ha)	6,3
Production per cow (litres)	6 100
Production per hectare (litres)	27 450
Milk solids %	7,25%
Fat %	3,89%
Protein %	3,36%

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Size of farm (effective ha)	134,0
Number of cows in herd	603
Stocking rate on effective area	4,50
Stocking rate on pasture area	4,63
Stocking rate on irrigation	80% 5,14
Stocking rate on dryland	20% 2,57
Pasture harvest (tDM/ha)	11,3
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Concentrate as % of cow diet	37,0 %
Forage as % of cow diet	22,0 %
Concentrate per cow (ton/year)	1,99
Concentrate per cow (kg/day est.)	6,5
Value of dairy land per hectare	R 135 000
Milk price per litre	R 4,60
Return on capital	6,01%
Profit (total operating)	R 1 849 145
Profit per hectare	R 13 800
Profit per cow	R 3 067
Profit per litre (cents)	50,3
Cost of production per litre	R 4,10
Operating profit margin	10,2%

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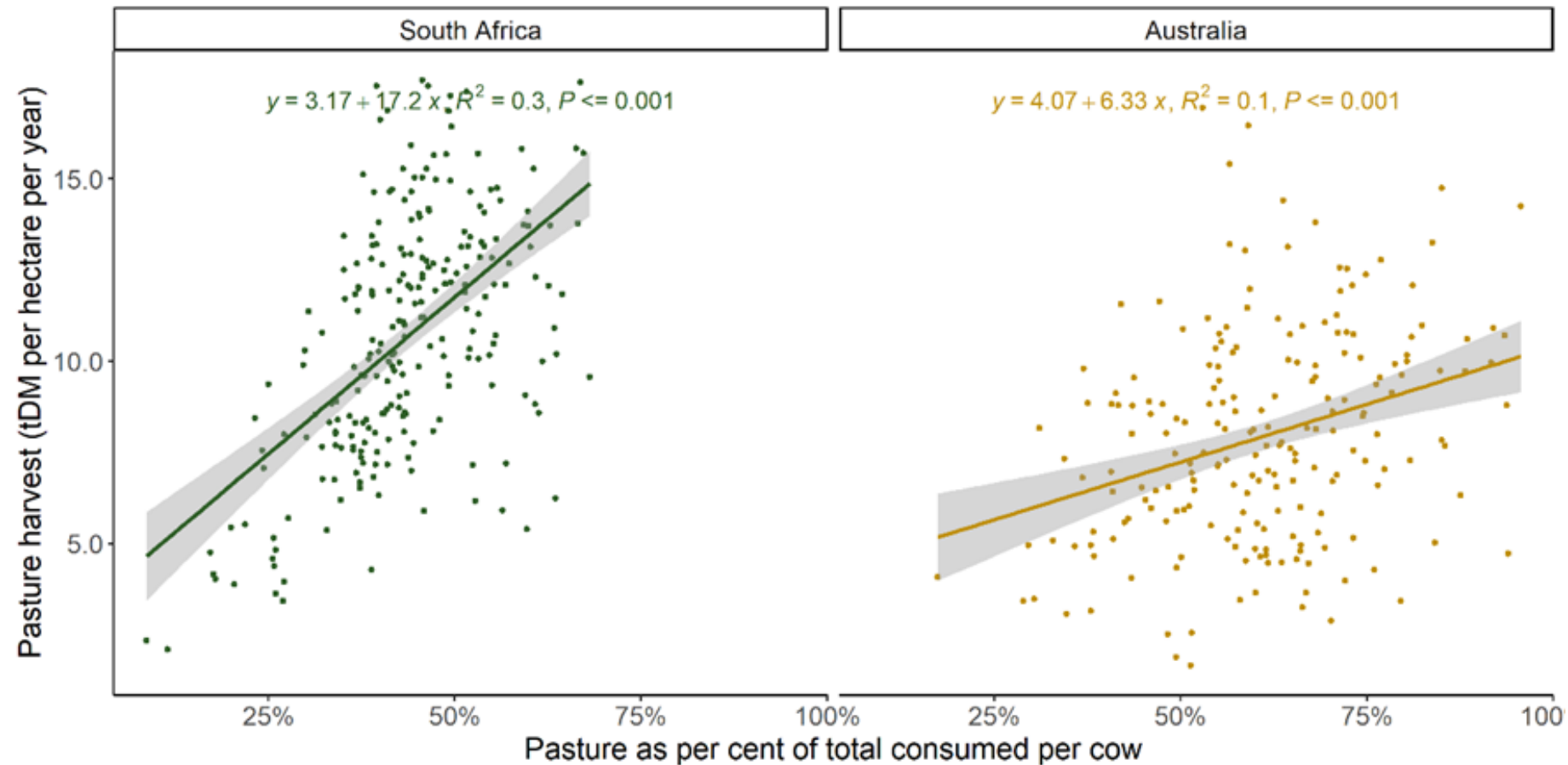
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What changes as pasture % of diet changes

Same process of data analysis followed for all cost areas

Mix of equations used from Australia and South Africa



Primary factors impacted by pasture as % of cows diet

Primary factors being impacted by pasture as % of cow's diet	As 	AU R ²	SA R ²
Cost of production per litre		0,16	0,16
Pasture consumed per cow		0,68	0,80
Supplement cost per litre		0,58	0,36
Total feed cost per litre		0,50	0,23
Core per hectare cost per tonne dry matter of pasture harvest		0,49	0,51
Milk production per cow		0,32	0,01
Total consumed per cow		0,31	0,01
Pasture cost per tonne dry matter		0,26	0,35
Pasture harvest	 	0,10	0,30
Core per cow cost		0,09	0,02
Labour cost per cow		0,08	0,02

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Pasture as % of cow diet	1,0 %	41,0 %	45,0 %	49,0 %	53,0 %	57,0 %
Concentrate as % of cow diet	-0,6 %	37,0 %	34,5 %	32,0 %	29,5 %	27,0 %
Forage as % of cow diet	-0,4 %	22,0 %	20,5 %	19,0 %	17,5 %	16,0 %
Concentrate per cow (ton/year)	-0,038	1,99	1,84	1,68	1,53	1,38
Concentrate per cow (kg/day est.)	-0,123	6,5	6,0	5,5	5,0	4,5
Pasture harvest (tDM/ha)	0,1125	11,34	11,79	12,23	12,69	13,12
Production per cow (litres)	-29,0	6 100	5 984	5 868	5 752	5 636
Cow liveweight (kg)	-0,50	560	558	556	554	552
Price of concentrate (/ton)	-R 5,00	R 3 800	R 3 780	R 3 760	R 3 740	R 3 720
Animal health per cow	-R 11,37	R 1 040	R 995	R 949	R 904	R 858
Breeding per cow	-R 4,88	R 460	R 440	R 421	R 401	R 382
Dairy shed expenses per cow	-R 1,23	R 265	R 260	R 255	R 250	R 245
Electricity per cow	-R 2,42	R 530	R 520	R 511	R 501	R 491
Grazing/support area per cow	R 9,50	R 950	R 988	R 1 022	R 1 050	R 1 077
Freight per cow	R 0,00	R 0	R 0	R 0	R 0	R 0
Repairs & maintenance per cow	-R 5,14	R 1 050	R 1 029	R 1 009	R 988	R 968
Vehicle expenses per cow	-R 8,21	R 1 350	R 1 317	R 1 284	R 1 252	R 1 219
Management & labour expenses per cow	-R 14,67	R 3 465	R 3 406	R 3 345	R 3 281	R 3 217
Labour/staff expenses per cow	-R 11,17	R 2 800	R 2 755	R 2 711	R 2 666	R 2 621
Imputed management per cow	-R 3,50	R 665	R 651	R 634	R 615	R 596
Depreciation per cow	-R 9,90	R 1 320	R 1 280	R 1 241	R 1 201	R 1 162

**Factors that
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Production per cow (litres)	-29,0	6 100	5 984	5 868	5 752	5 636
Cow liveweight (kg)	-0,50	560	558	556	554	552
Price of concentrate (/ton)	-R 5,00	R 3 800	R 3 780	R 3 760	R 3 740	R 3 720
Animal health per cow	-R 11,37	R 1 040	R 995	R 949	R 904	R 858
Breeding per cow	-R 4,88	R 460	R 440	R 421	R 401	R 382
Dairy shed expenses per cow	-R 1,23	R 265	R 260	R 255	R 250	R 245
Electricity per cow	-R 2,42	R 530	R 520	R 511	R 501	R 491
Grazing/support area per cow	R 9,50	R 950	R 988	R 1 022	R 1 050	R 1 077
Freight per cow	R 0,00	R 0	R 0	R 0	R 0	R 0
Repairs & maintenance per cow	-R 5,14	R 1 050	R 1 029	R 1 009	R 988	R 968
Vehicle expenses per cow	-R 8,21	R 1 350	R 1 317	R 1 284	R 1 252	R 1 219
Management & labour expenses per cow	-R 14,67	R 3 465	R 3 406	R 3 345	R 3 281	R 3 217
Labour/staff expenses per cow	-R 11,17	R 2 800	R 2 755	R 2 711	R 2 666	R 2 621
Imputed management per cow	-R 3,50	R 665	R 651	R 634	R 615	R 596
Depreciation per cow	-R 9,90	R 1 320	R 1 280	R 1 241	R 1 201	R 1 162

**Factors that
change with
changes in
pasture as %
of diet**

SOUTH AFRICA PRODUCTION SYSTEMS	Change per 1% Pasture	Base Year 41% Pasture	Model #1 45% Pasture	Model #2 49% Pasture	Model #3 53% Pasture	Model #4 57% Pasture
Pasture as % of cow diet	1,0 %	41,0 %	45,0 %	49,0 %	53,0 %	57,0 %
Concentrate as % of cow diet	-0,6 %	37,0 %	34,5 %	32,0 %	29,5 %	27,0 %
Forage as % of cow diet	-0,4 %	22,0 %	20,5 %	19,0 %	17,5 %	16,0 %
Concentrate per cow (ton/year)	-0,038	1,99	1,84	1,68	1,53	1,38
Concentrate per cow (kg/day est.)	-0,123	6,5	6,0	5,5	5,0	4,5
Pasture harvest (tDM/ha)	0,1125	11,34	11,79	12,23	12,69	13,12
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change with
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**Factors that
change with
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pasture as %
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SOUTH AFRICA PRODUCTION SYSTEMS	Change per 1% Pasture	Base Year 41% Pasture	Model #1 45% Pasture	Model #2 49% Pasture	Model #3 53% Pasture	Model #4 57% Pasture
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**Factors that
change with
changes in
pasture as %
of diet**

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**Factors that
change with
changes in
pasture as %
of diet**

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**Factors that
change with
changes in
pasture as %
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**Factors that
change with
changes in
pasture as %
of diet**

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**Factors that
change with
changes in
pasture as %
of diet**

Results of models from changes in pasture as % of diet

SOUTH AFRICA PRODUCTION SYSTEMS	Base Year 41% Pasture	Model #1 45% Pasture	Model #2 49% Pasture	Model #3 53% Pasture	Model #4 57% Pasture
Size of farm (effective ha)	134,0	134,0	134,0	134,0	134,0
Number of cows in herd	603	580	561	546	532
Stocking rate on effective area	4,50	4,55	4,19	4,07	3,97
Stocking rate on pasture area	4,63	4,45	4,30	4,19	4,08
Stocking rate on irrigation	5,14	4,94	4,78	4,66	4,53
Stocking rate on dryland	2,57	2,47	2,39	2,33	2,27
Pasture harvest (tDM/ha)	11,3	11,8	12,2	12,7	13,1
Irrigated pasture harvest (tDM/ha)	12,6	13,1	13,6	14,1	14,6
Dryland pasture harvest (tDM/ha)	6,3	6,6	6,8	7,1	7,3
Production per cow (litres)	6 100	5 984	5 868	5 752	5 636
Production per hectare (litres)	27 450	25 901	24 567	23 437	22 376
Milk solids %	7,25%	7,25%	7,25%	7,25%	7,25%
Fat %	3,89%	3,89%	3,89%	3,89%	3,89%
Protein %	3,36%	3,36%	3,36%	3,36%	3,36%

- 12%



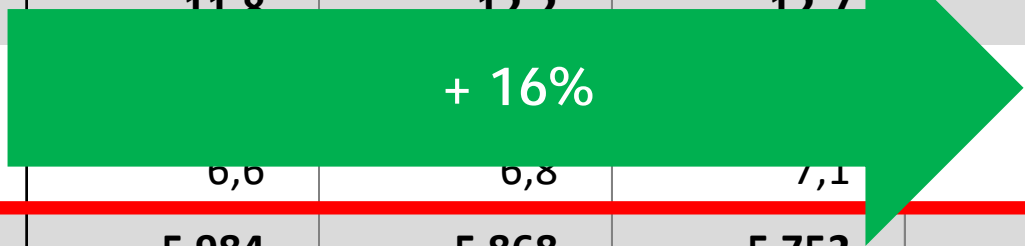
Results of models from changes in pasture as % of diet

SOUTH AFRICA PRODUCTION SYSTEMS	Base Year 41% Pasture	Model #1 45% Pasture	Model #2 49% Pasture	Model #3 53% Pasture	Model #4 57% Pasture
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Number of cows in herd	603	580	561	546	532
Stocking rate on effective area	4,50	4,33	4,19	4,07	3,97
Stocking rate on pasture area	4,63	4,15	4,20	4,10	4,08
Stocking rate on irrigation	5,14				4,53
Stocking rate on dryland	2,57	2,47	2,59	2,55	2,27
Pasture harvest (tDM/ha)	11,3	11,8	12,2	12,7	13,1
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Fat %	3,89%	3,89%	3,89%	3,89%	3,89%
Protein %	3,36%	3,36%	3,36%	3,36%	3,36%

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Results of models from changes in pasture as % of diet

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Stocking rate on dryland	2,57	2,47	2,39	2,33	2,27
Pasture harvest (tDM/ha)	11,3	11,8	12,2	12,7	13,1
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Results of models from changes in pasture as % of diet

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Stocking rate on dryland	2,57	2,47	2,39	2,33	2,27
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Production per cow (litres)	6 100	- 8%			5 636
Production per hectare (litres)	27 450	- 18%			22 376
Milk solids %	7,25%	7,25%	7,25%	7,25%	7,25%
Fat %	3,89%	3,89%	3,89%	3,89%	3,89%
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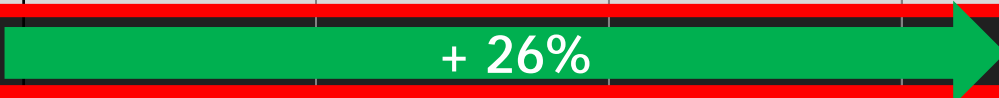
Results of models from changes in pasture as % of diet

SOUTH AFRICA PRODUCTION SYSTEMS	Base Year 41% Pasture	Model #1 45% Pasture	Model #2 49% Pasture	Model #3 53% Pasture	Model #4 57% Pasture
Size of farm (effective ha)	134,0	134,0	134,0	134,0	134,0
Number of cows in herd	603	580	561	546	532
Stocking rate on effective area	4,50	4,22	4,18	4,07	3,97
Stocking rate on pasture area	4,63	- 12%			4,08
Stocking rate on irrigation	5,14	4,91	4,78	4,65	4,53
Stocking rate on dryland	2,57	2,47	2,39	2,33	2,27
Pasture harvest (tDM/ha)	11,3	+ 16%			13,1
Irrigated pasture harvest (tDM/ha)	12,6	14,6	14,6	14,6	14,6
Dryland pasture harvest (tDM/ha)	6,3	6,0	6,8	7,1	7,3
Production per cow (litres)	6 100	- 8%			5 636
Production per hectare (litres)	27 450	- 18%			22 376
Milk solids %	7,25%	7,25%	7,25%	7,25%	7,25%
Fat %	3,89%	3,89%	3,89%	3,89%	3,89%
Protein %	3,36%	3,36%	3,36%	3,36%	3,36%


Results of models from changes in pasture as % of diet

SOUTH AFRICA PRODUCTION SYSTEMS	Base Year 41% Pasture	Model #1 45% Pasture	Model #2 49% Pasture	Model #3 53% Pasture	Model #4 57% Pasture
Pasture as % of cow diet	41,0 %	45,0 %	49,0 %	53,0 %	57,0 %
Concentrate as % of cow diet	37,0 %	34,5 %	32,0 %	29,5 %	27,0 %
Forage as % of cow diet	22,0 %	Maize silage area: - 40% 			16,0 %
Concentrate per cow (ton/year)	1,99	1,84	1,68	1,53	1,38
Concentrate per cow (kg/day est.)	6,5	6,0	5,5	5,0	4,5
Value of dairy land per hectare	R 135 000	R 135 000	R 135 000	R 135 000	R 135 000
Milk price per litre	R 4,60	R 4,60	R 4,60	R 4,60	R 4,60
Return on capital	6,01%	6,41%	6,82%	7,23%	7,59%
Profit (total operating)	R 1 849 145	R 1 986 441	R 2 127 359	R 2 273 843	R 2 393 755
Profit per hectare	R 13 800	R 14 824	R 15 876	R 16 969	R 17 864
Profit per cow	R 3 067	R 3 425	R 3 792	R 4 165	R 4 500
Profit per litre (cents)	50,3	57,2	64,6	72,4	79,8
Cost of production per litre	R 4,10	R 4,03	R 3,95	R 3,88	R 3,80
Operating profit margin	10,2%	11,6%	13,1%	14,6%	16,1%

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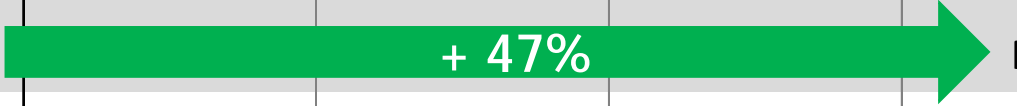
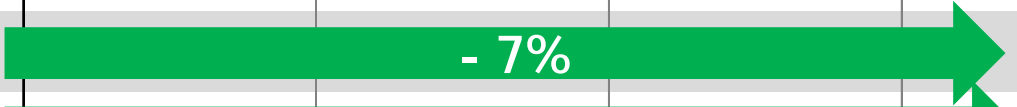

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Impact on key ratios from sensitivity analysis

Completing a sensitivity analysis important to test key assumptions

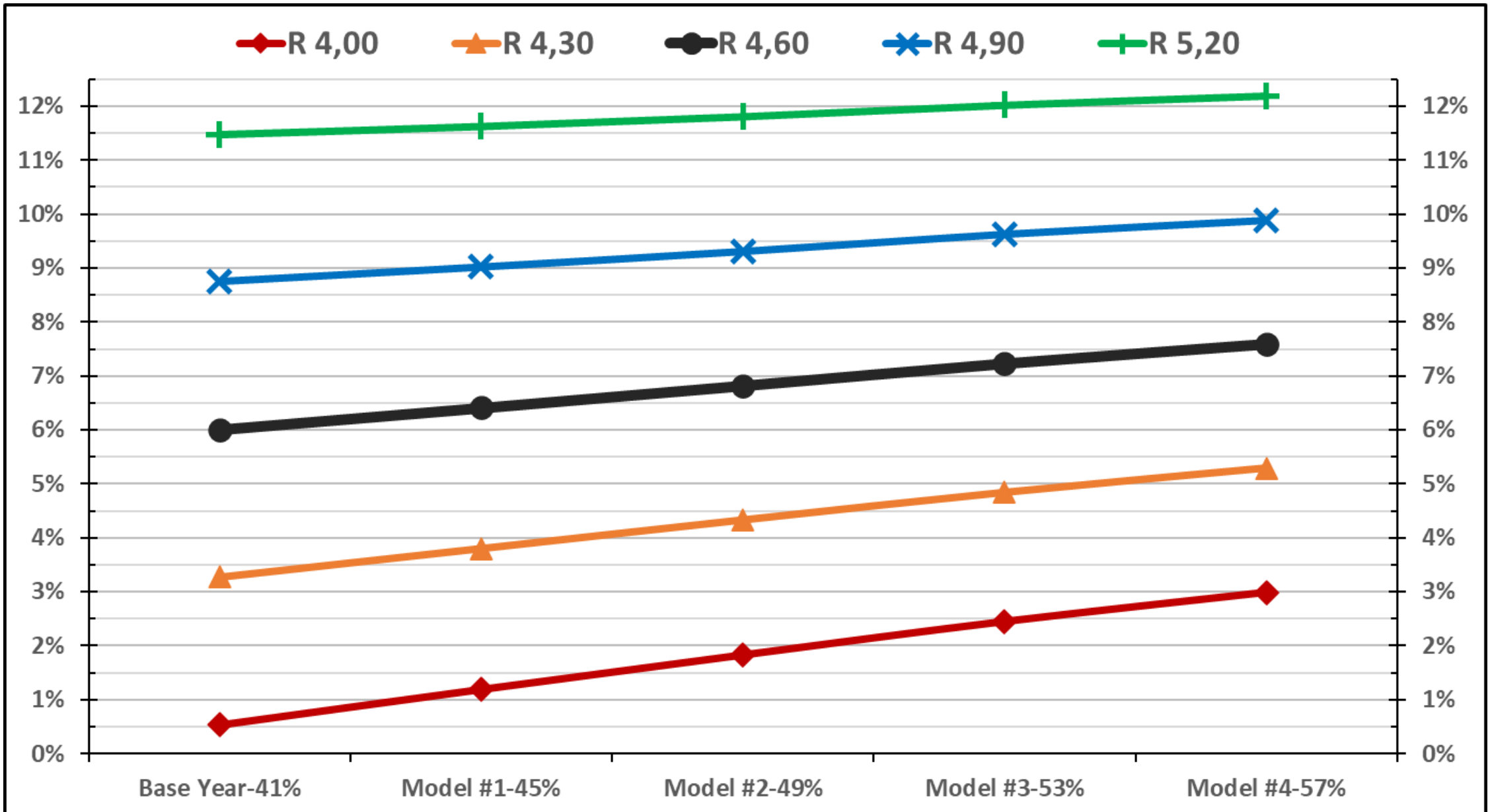
Major impact on business performance outcomes include:

- Milk price
- Concentrate price
- Seasonal climatic conditions impacting on pasture harvest, silage/crop yields, forage/silage cost

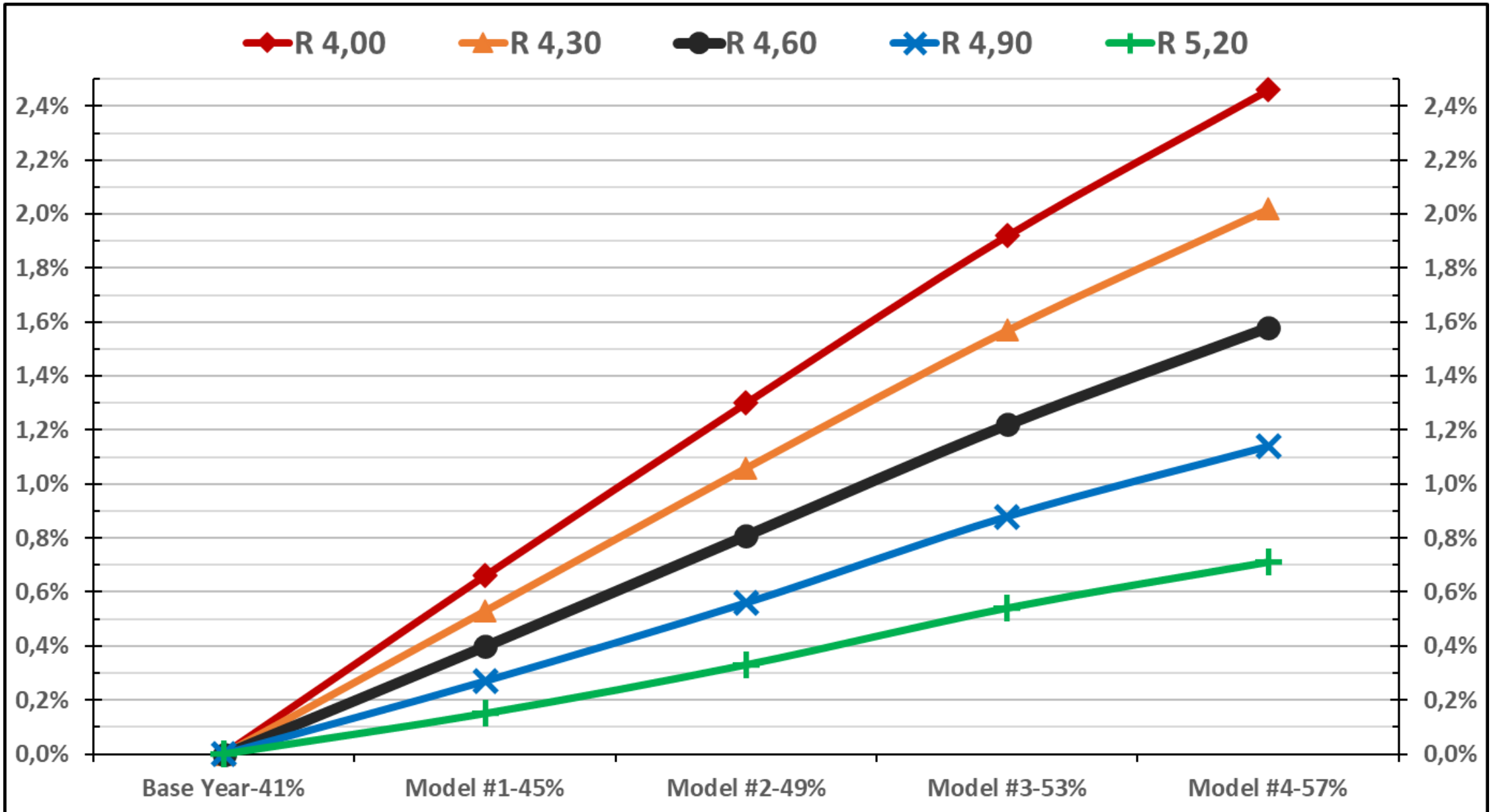
Sensitivity analysis parameters

SENSITIVITY TABLE	Units	- -	-	BASE	+	+ +
Milk Price Variance	R c/litre	- R 0,60	- R 0,30	----+----	+ R 0,30	+ R 0,60
Milk Price - 2019/20	R c/litre	R 4,00	R 4,30	R 4,60	R 4,90	R 5,20
Milk Price - 2020/21	R c/litre	R 4,50	R 4,80	R 5,10	R 5,40	R 5,70
Concentrate Variance	R / tonne	+ R 400	+ R 200	-----+-----	- R 200	- R 400
Concentrate Price	R / tonne	R 4 200	R 4 000	R 3 800	R 3 600	R 3 400
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	R / tDM	R 1 238	R 1 193	R 1 150	R 1 110	R 1 073
Concentrate Variance	R / tonne	+ R 200	+ R 100	-----+-----	- R 100	- R 200
Concentrate Price	R / tonne	R 4 000	R 3 900	R 3 800	R 3 700	R 3 600

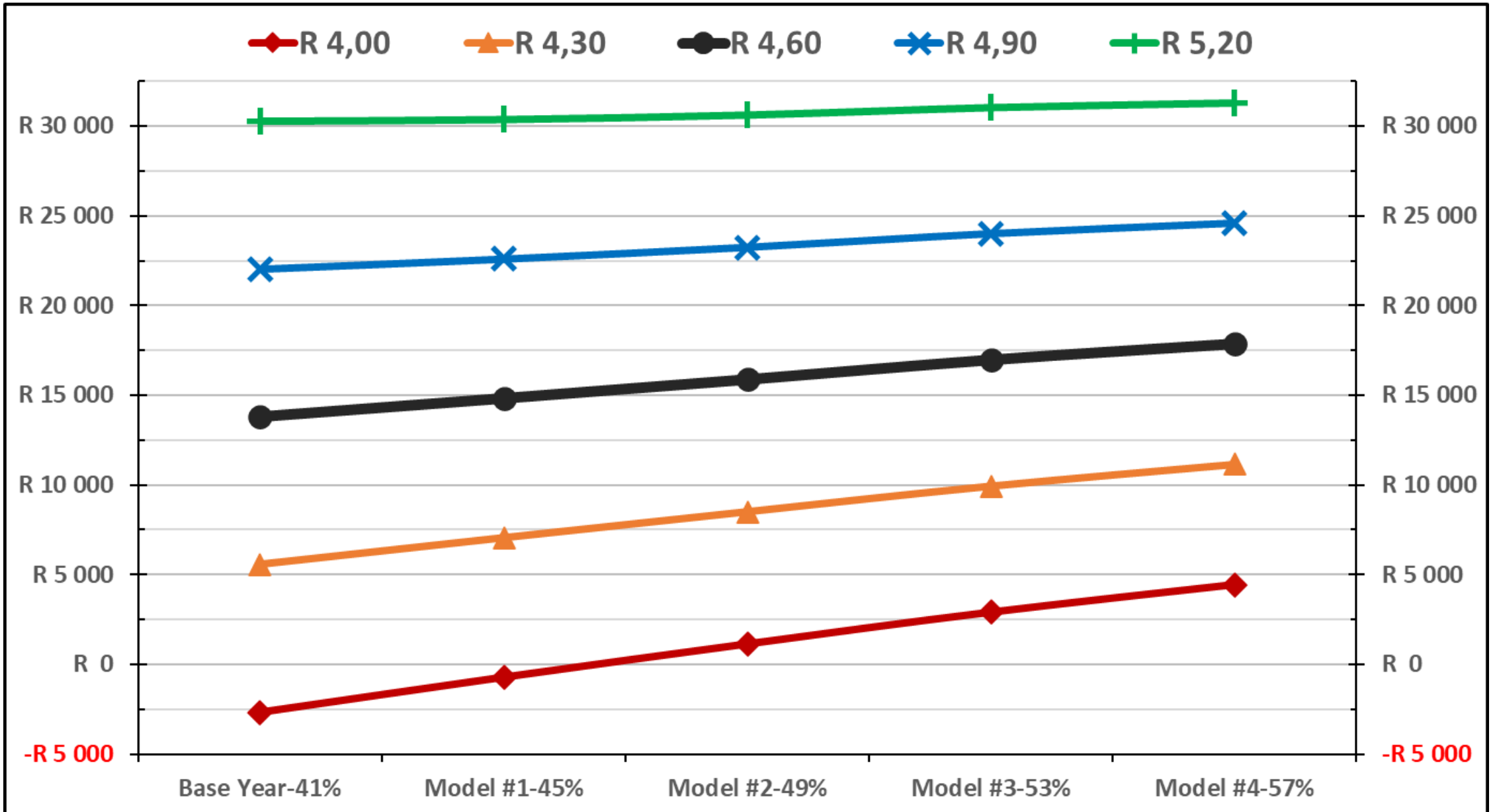
Profit (return on capital) sensitivity to MILK PRICE (R/litre)



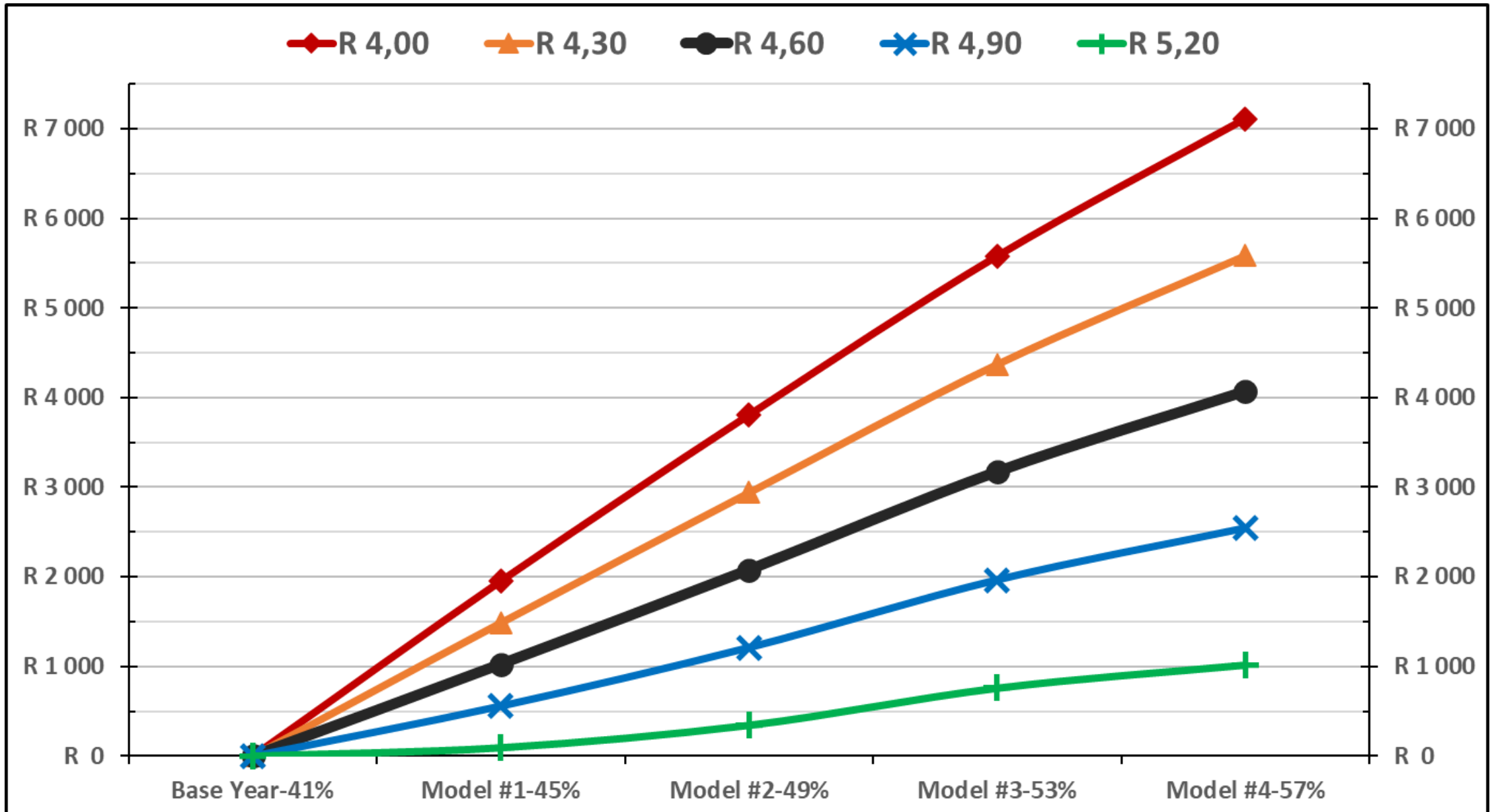
Change in profit (return on capital) sensitivity to milk price



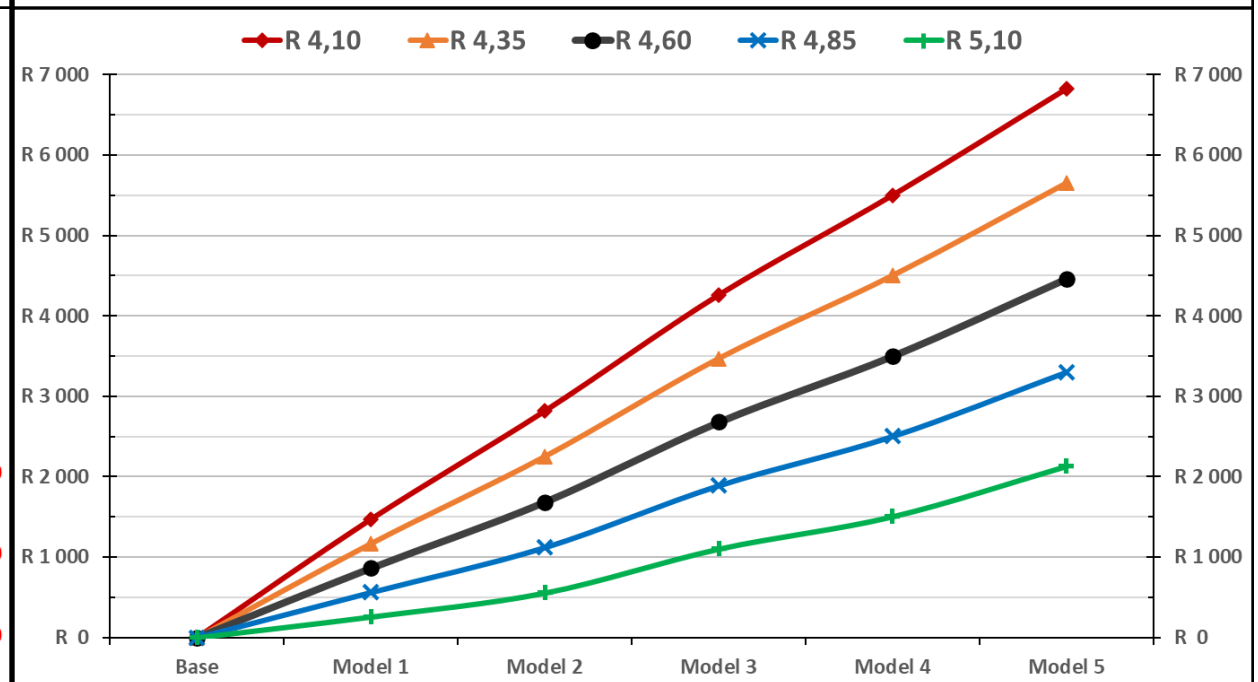
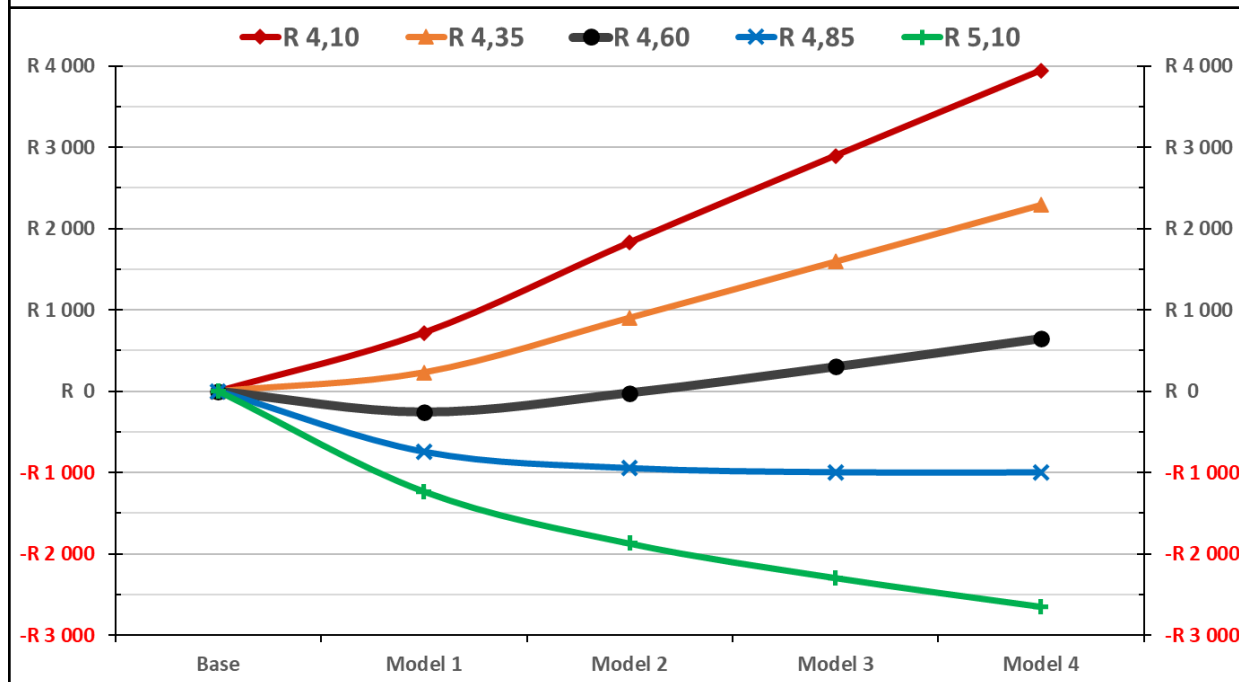
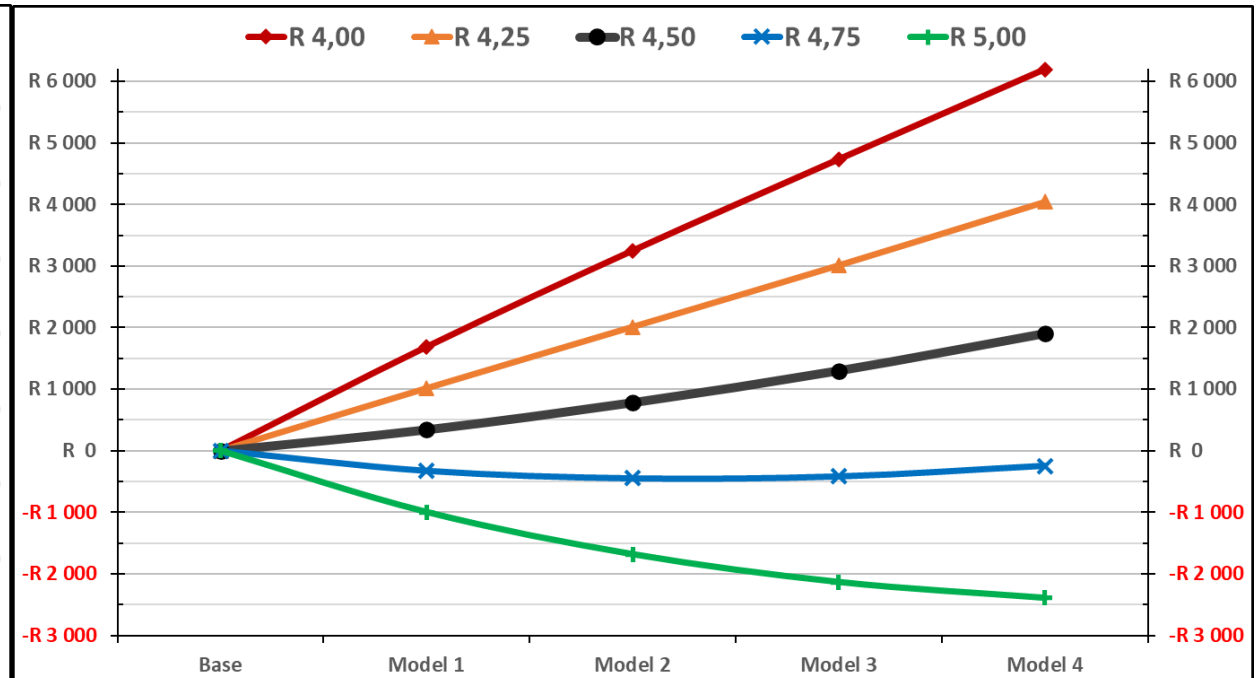
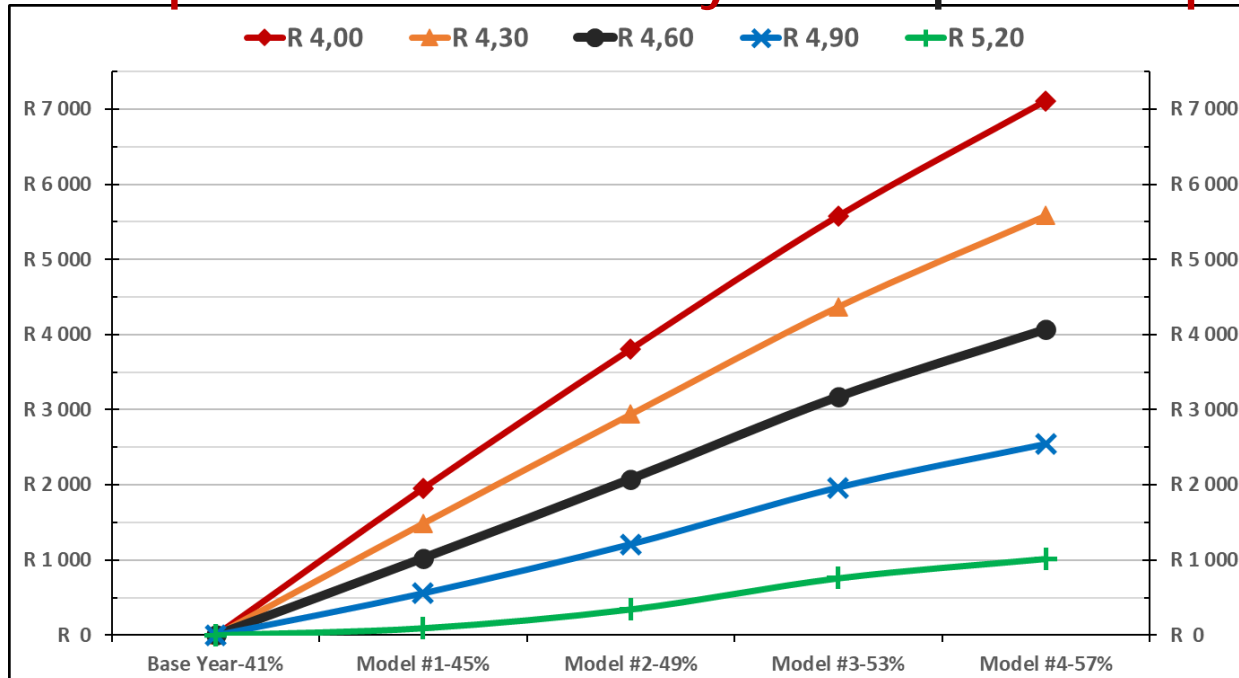
Profit per hectare sensitivity to milk price (R/litre)



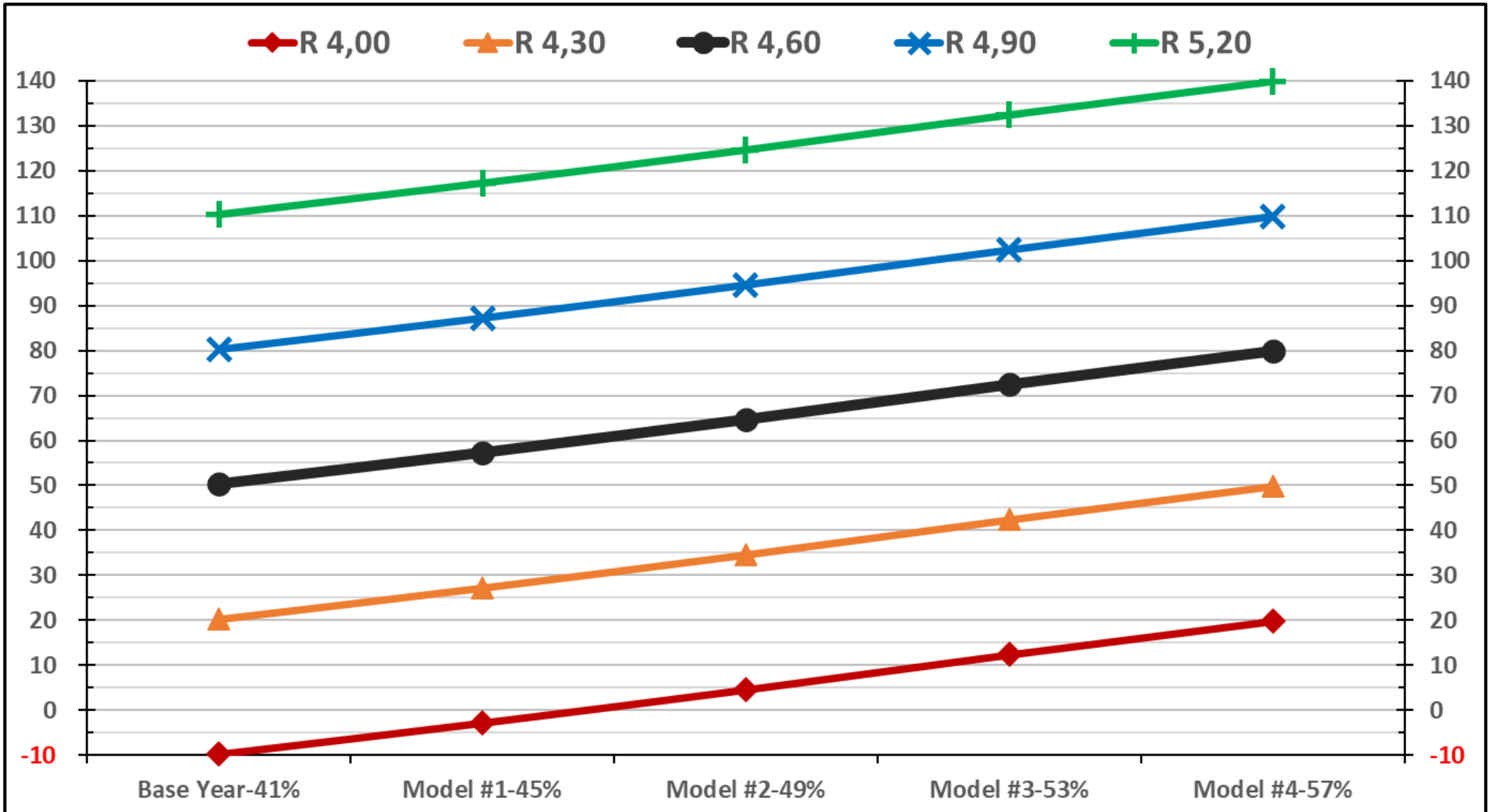
Change in profit per hectare sensitivity to milk price (R/litre)



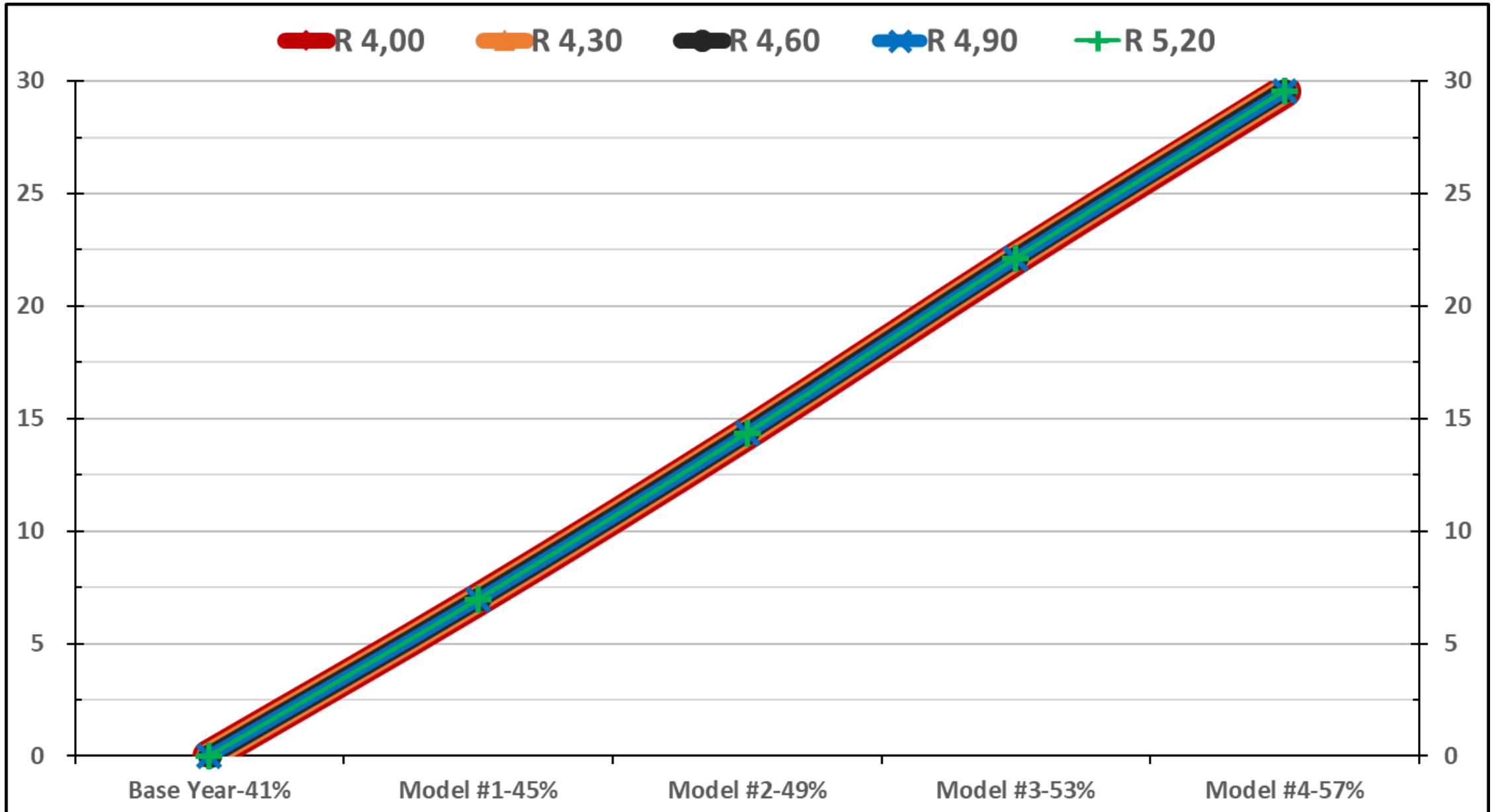
Profit per hectare sensitivity to milk price - impact not same for all farms



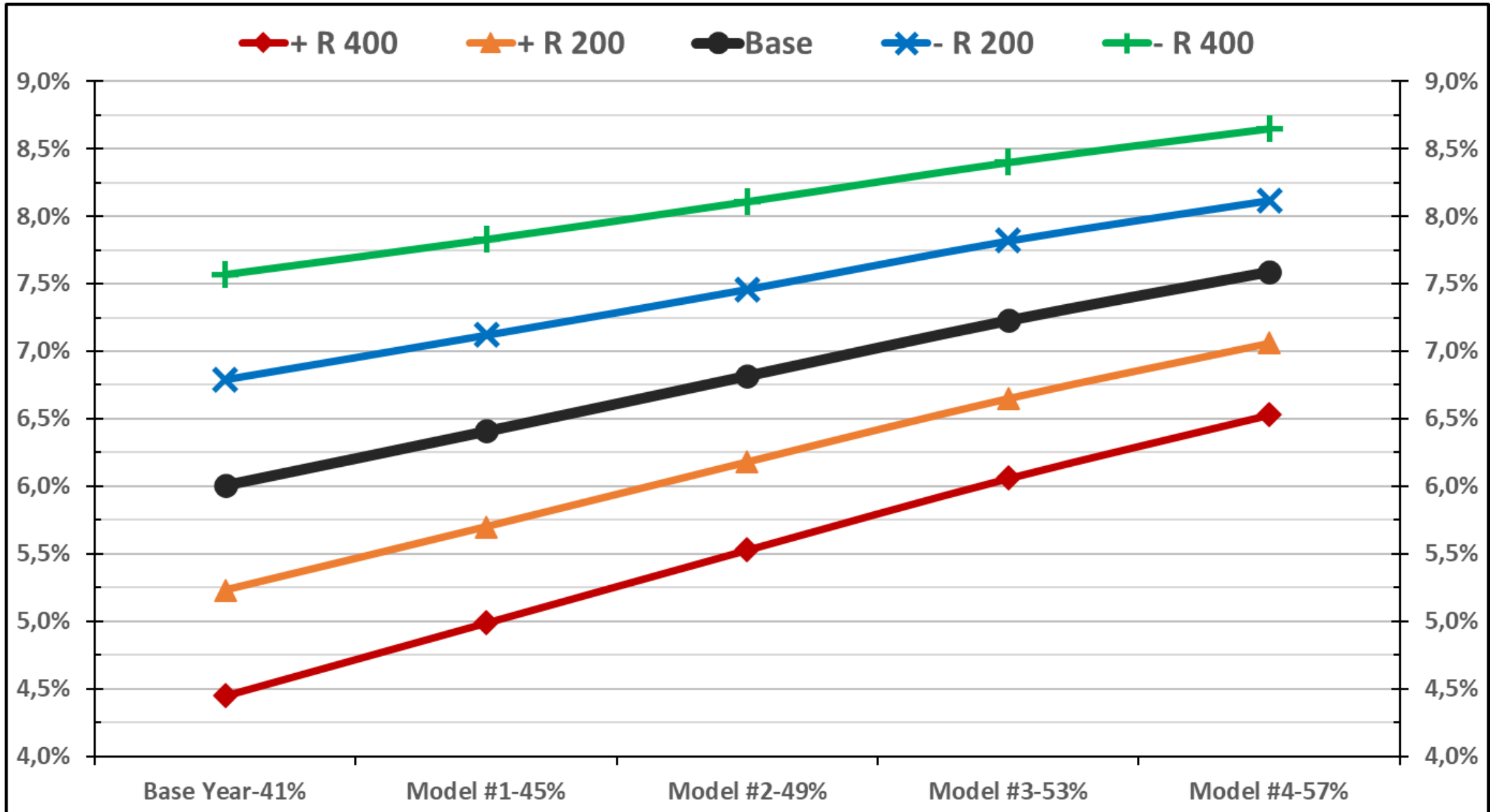
Profit per litre (cents) sensitivity to milk price (R/litre)



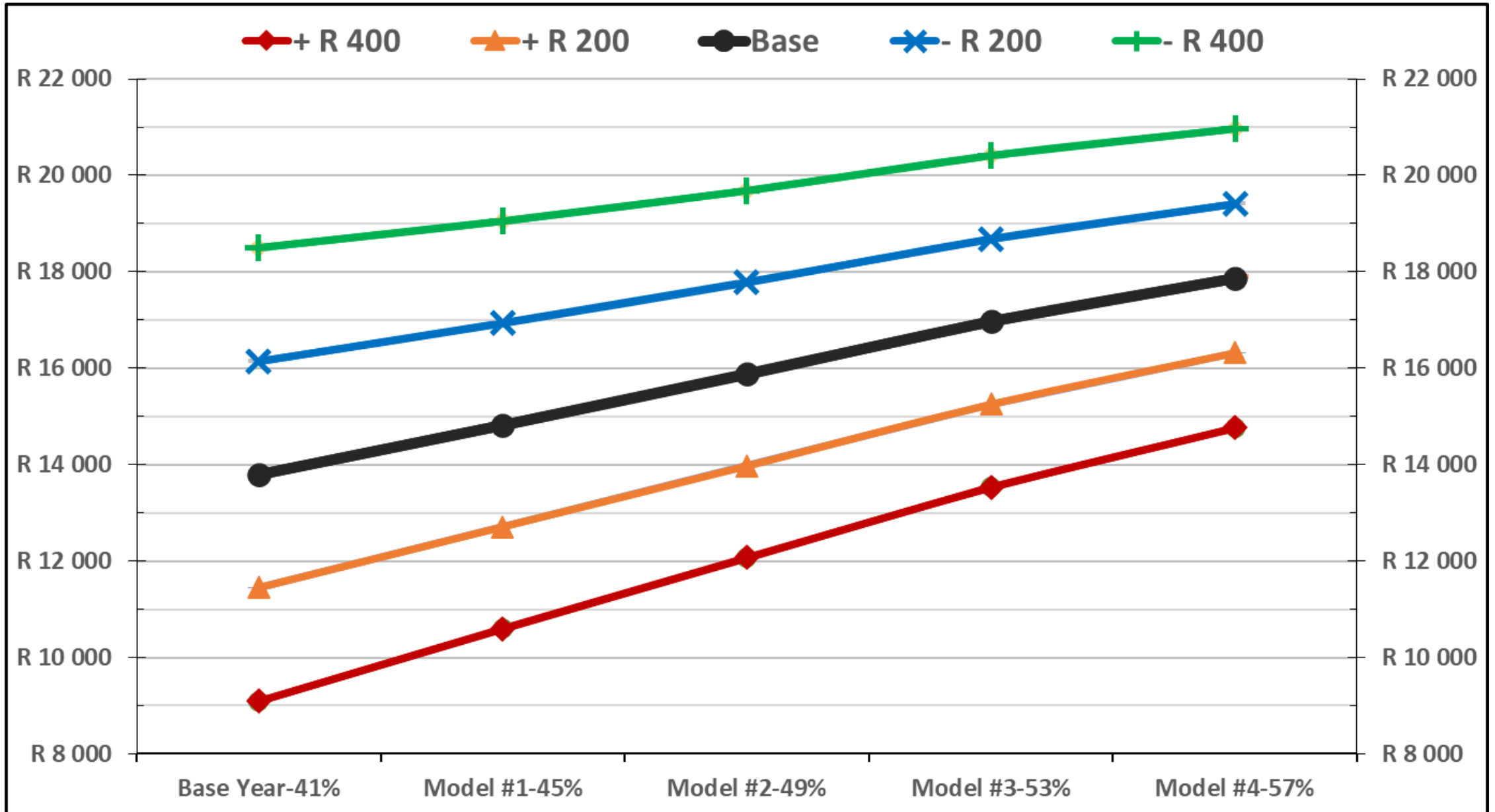
Change in profit per litre (cents) sensitivity to milk price (R/litre)



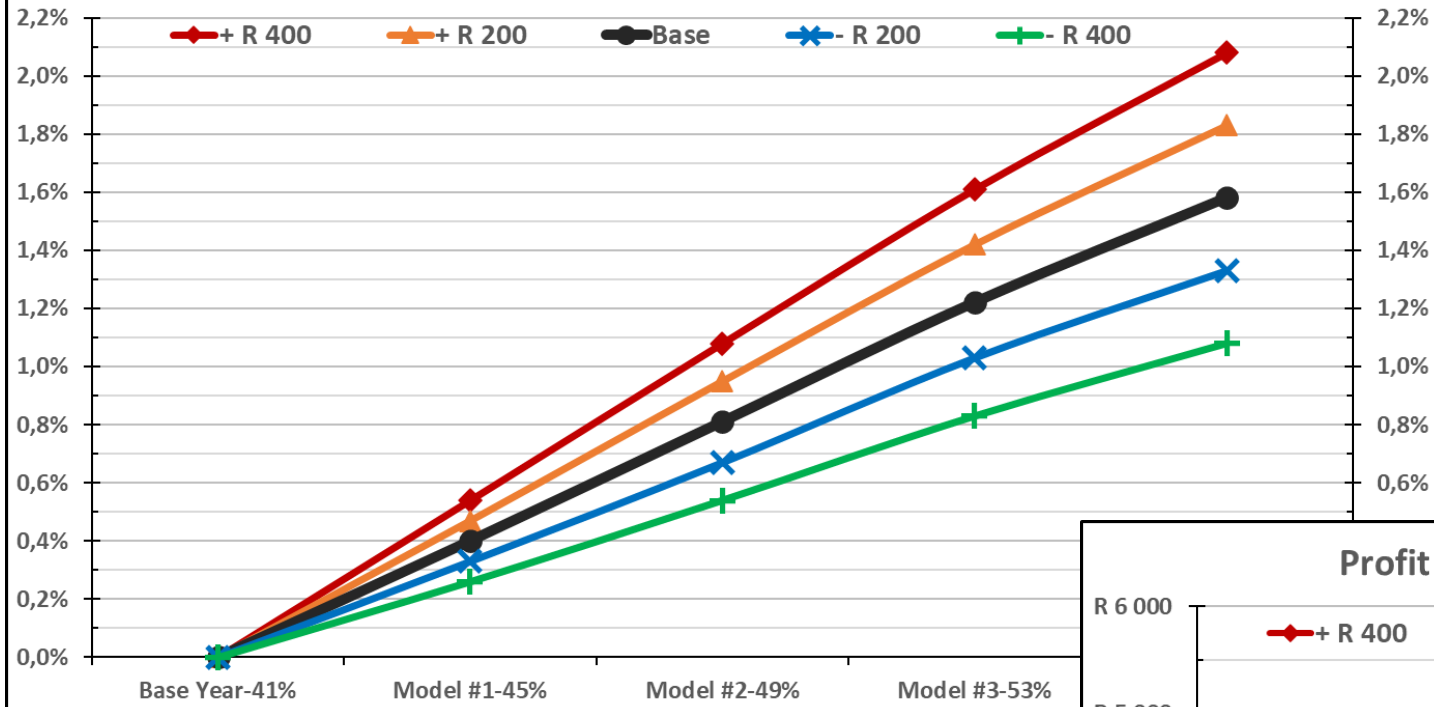
Profit (return on capital) sensitivity to CONCENTRATE PRICE (R/ton)



Profit per hectare sensitivity to concentrate price (R/ton)

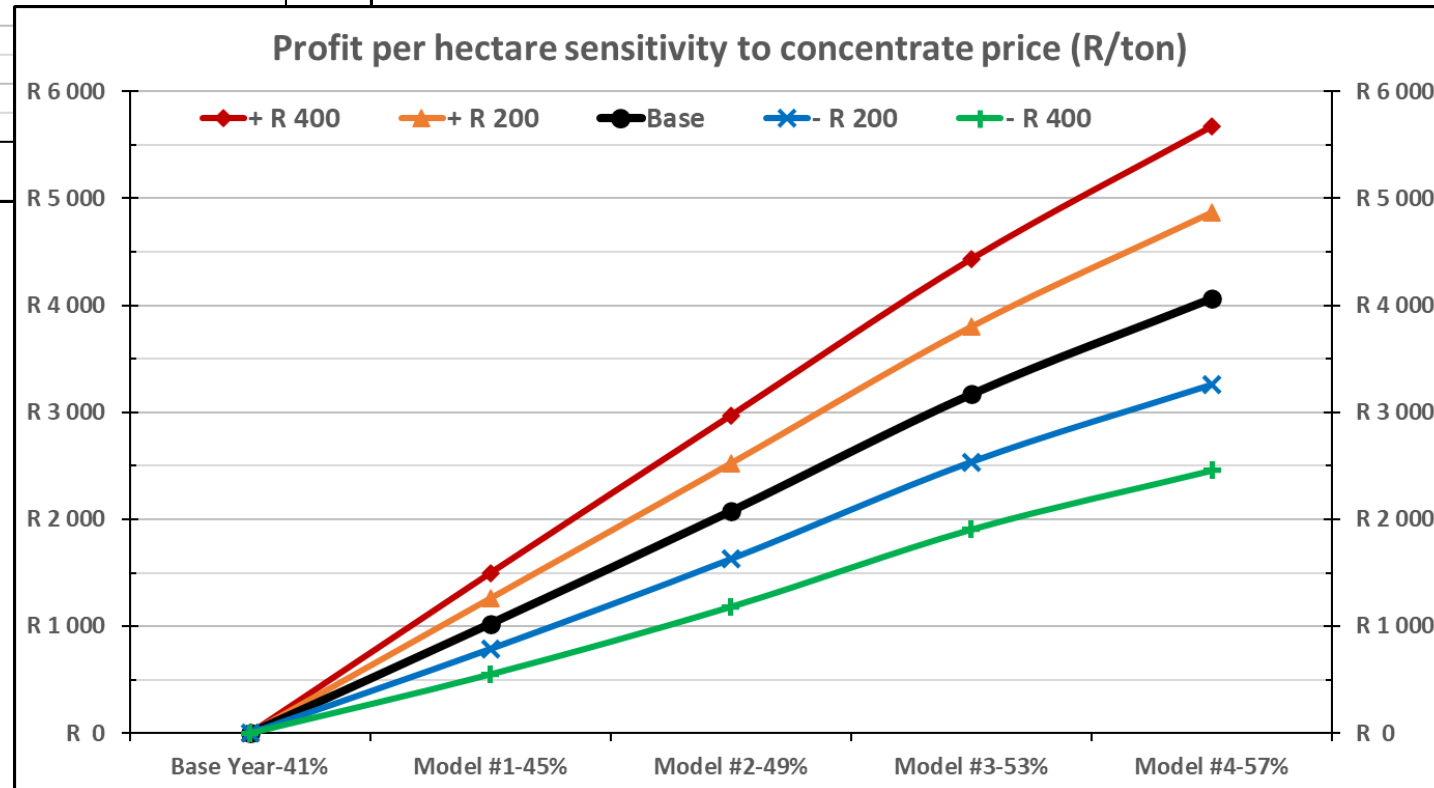


Profit (return on capital) sensitivity to concentrate price (R/ton)

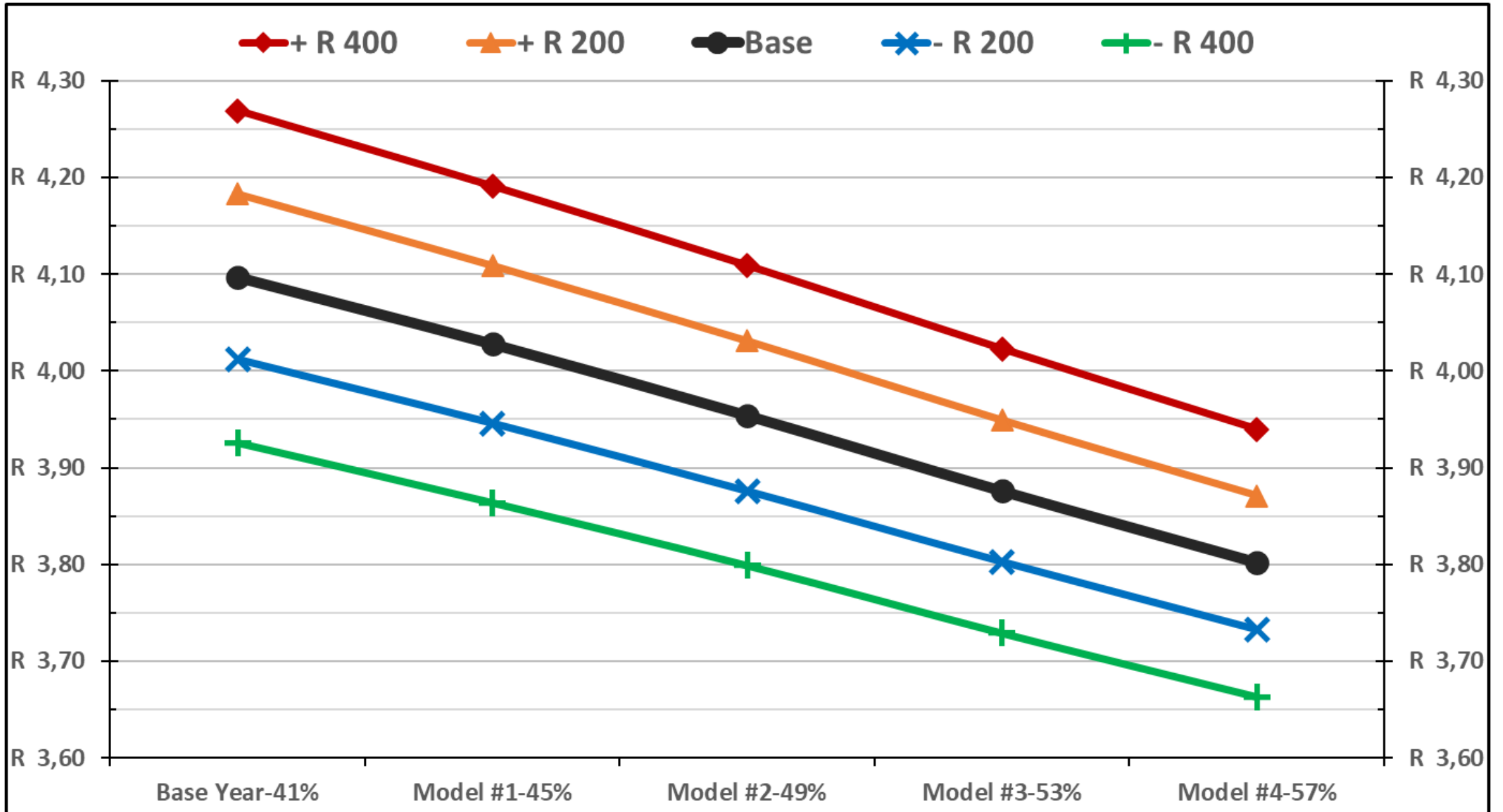


Change in profit sensitivity to concentrate price

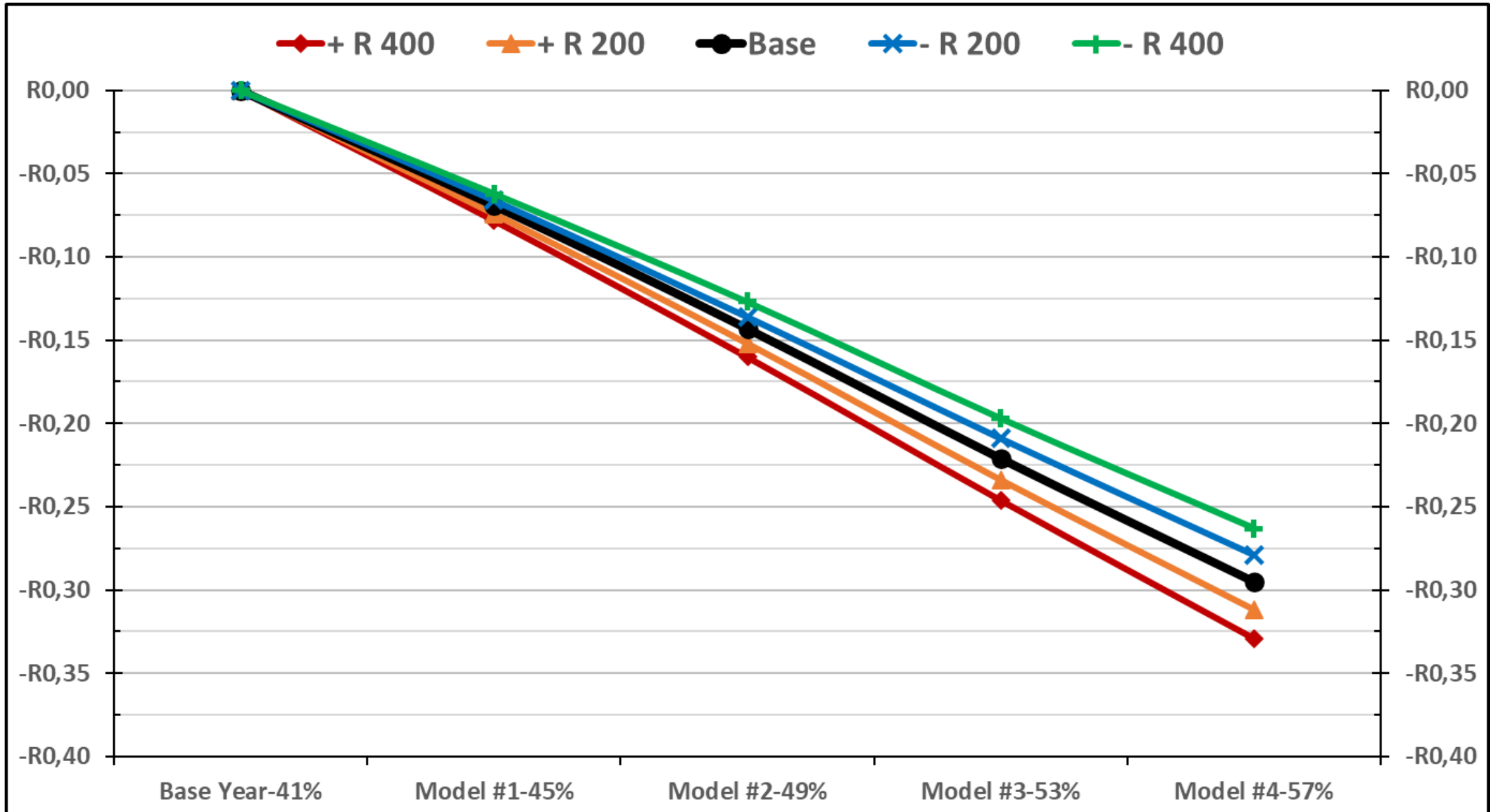
Profit per hectare sensitivity to concentrate price (R/ton)



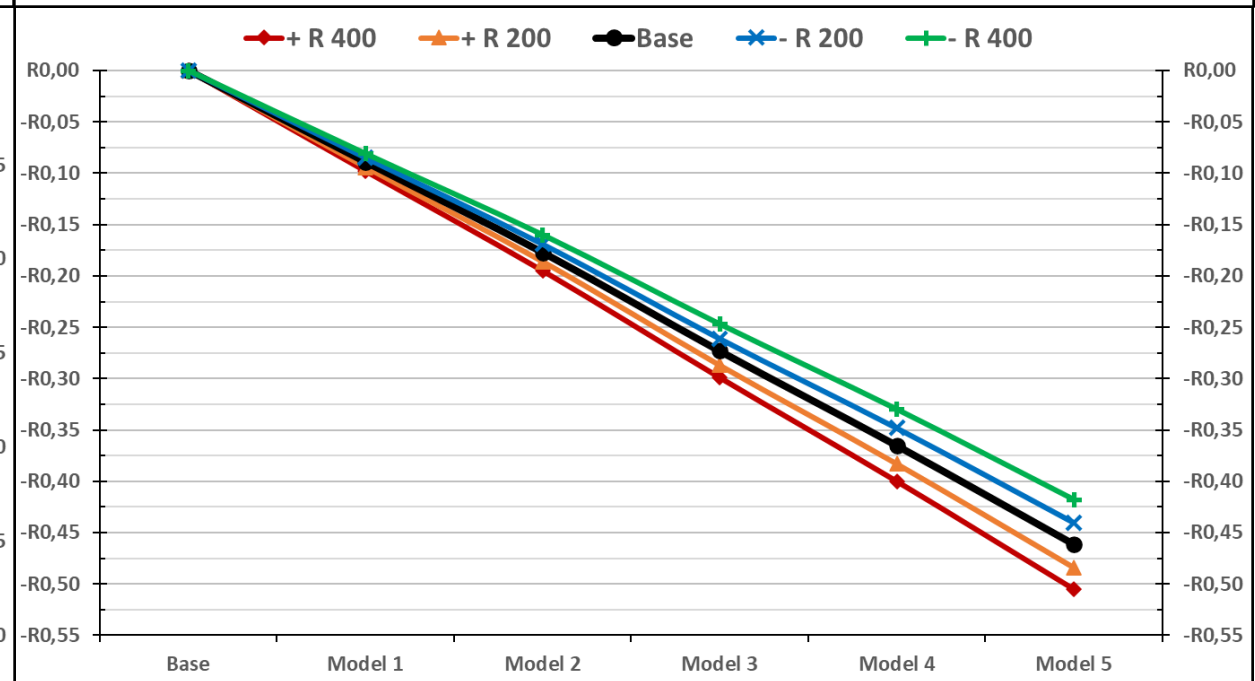
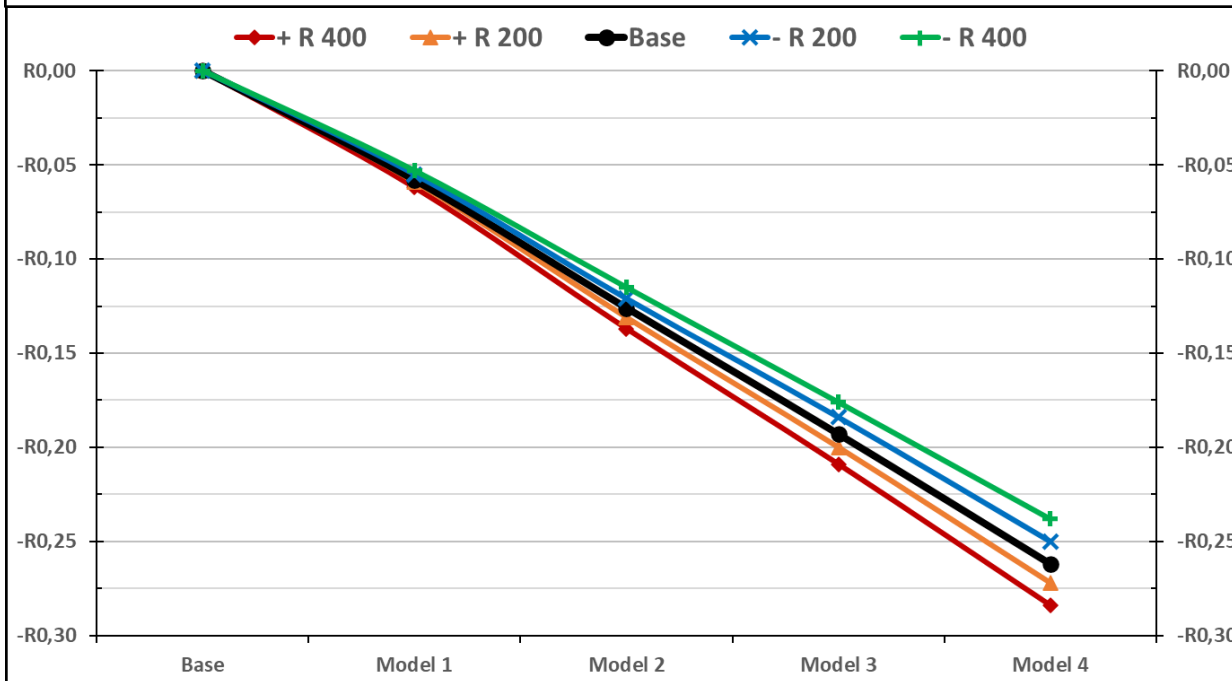
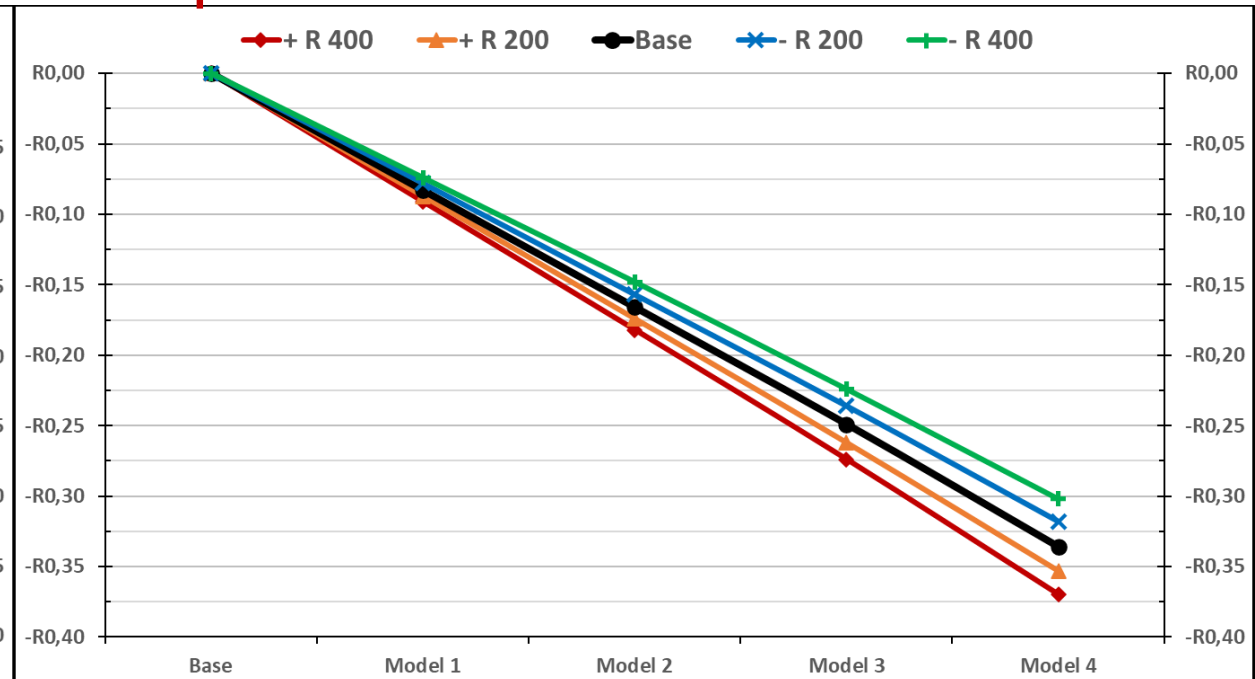
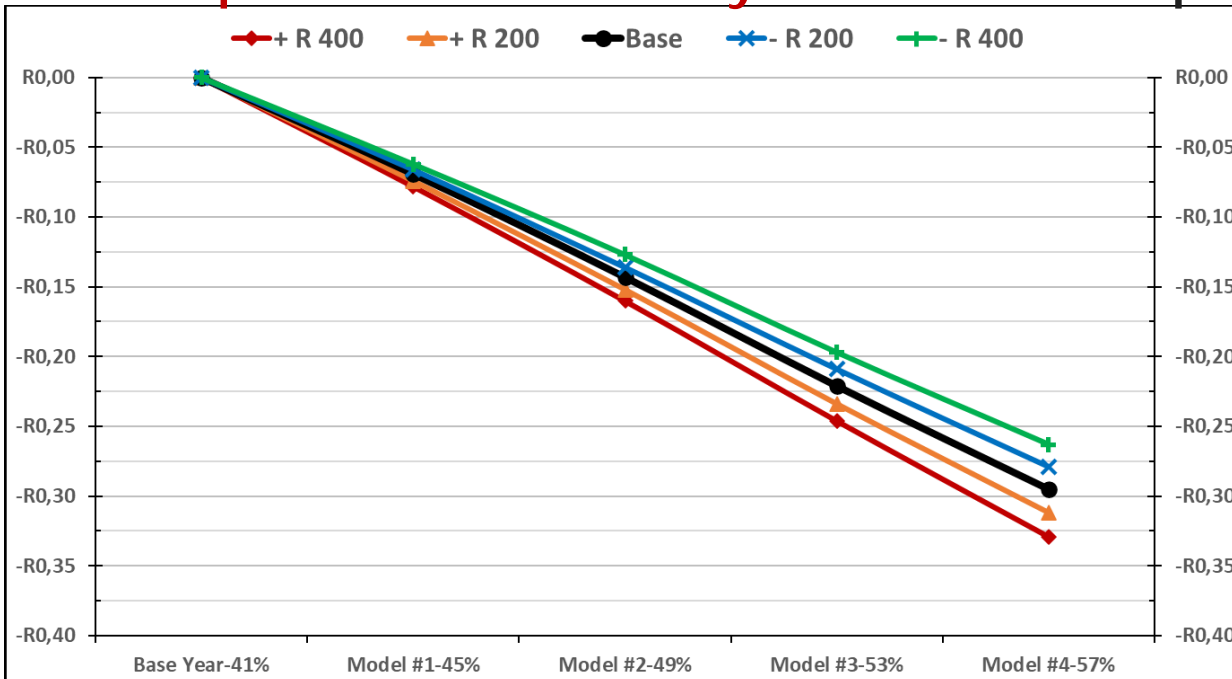
Cost of production (R/litre) sensitivity to concentrate price



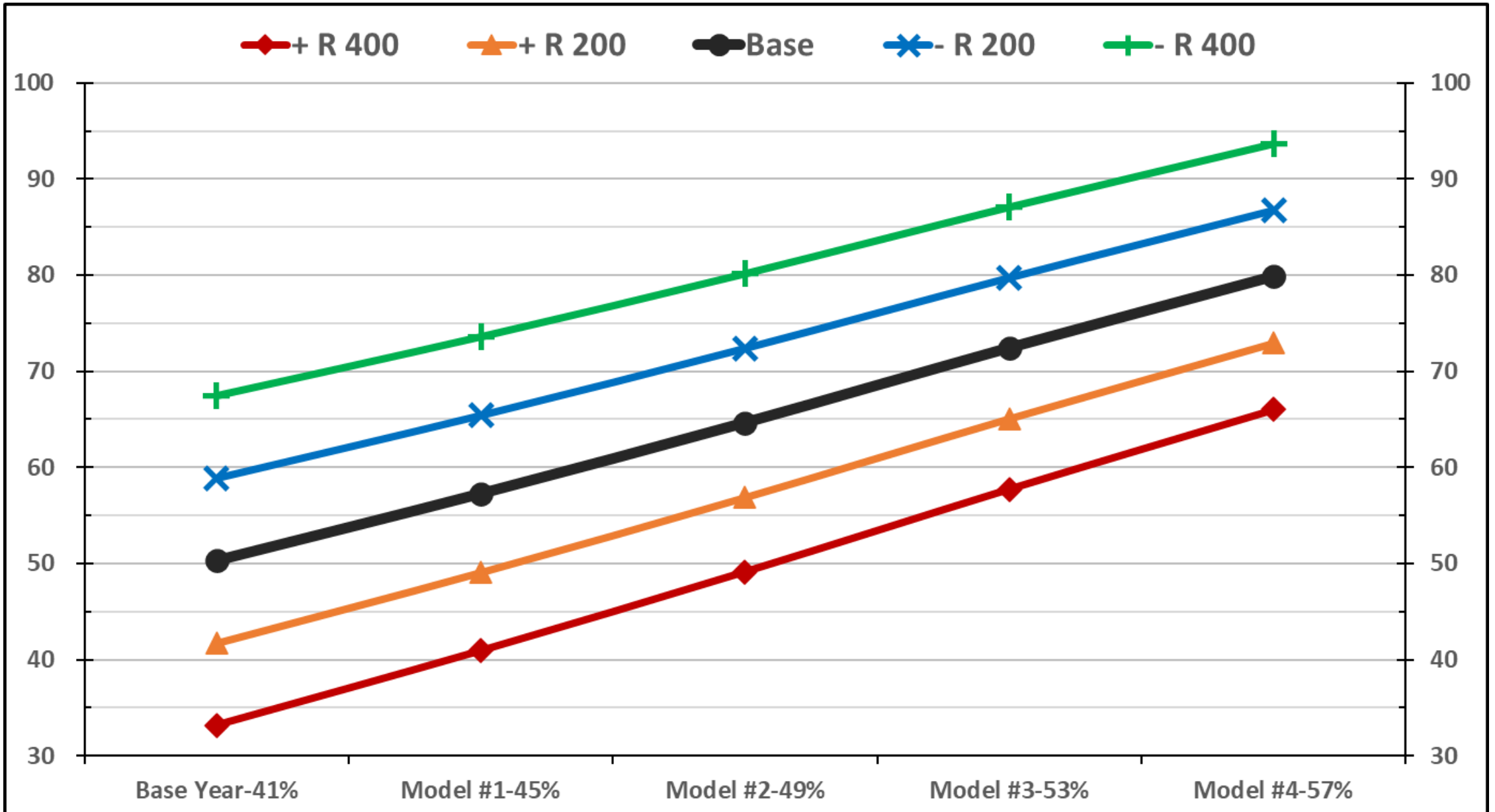
Change in cost of production (R/litre) sensitivity to concentrate price



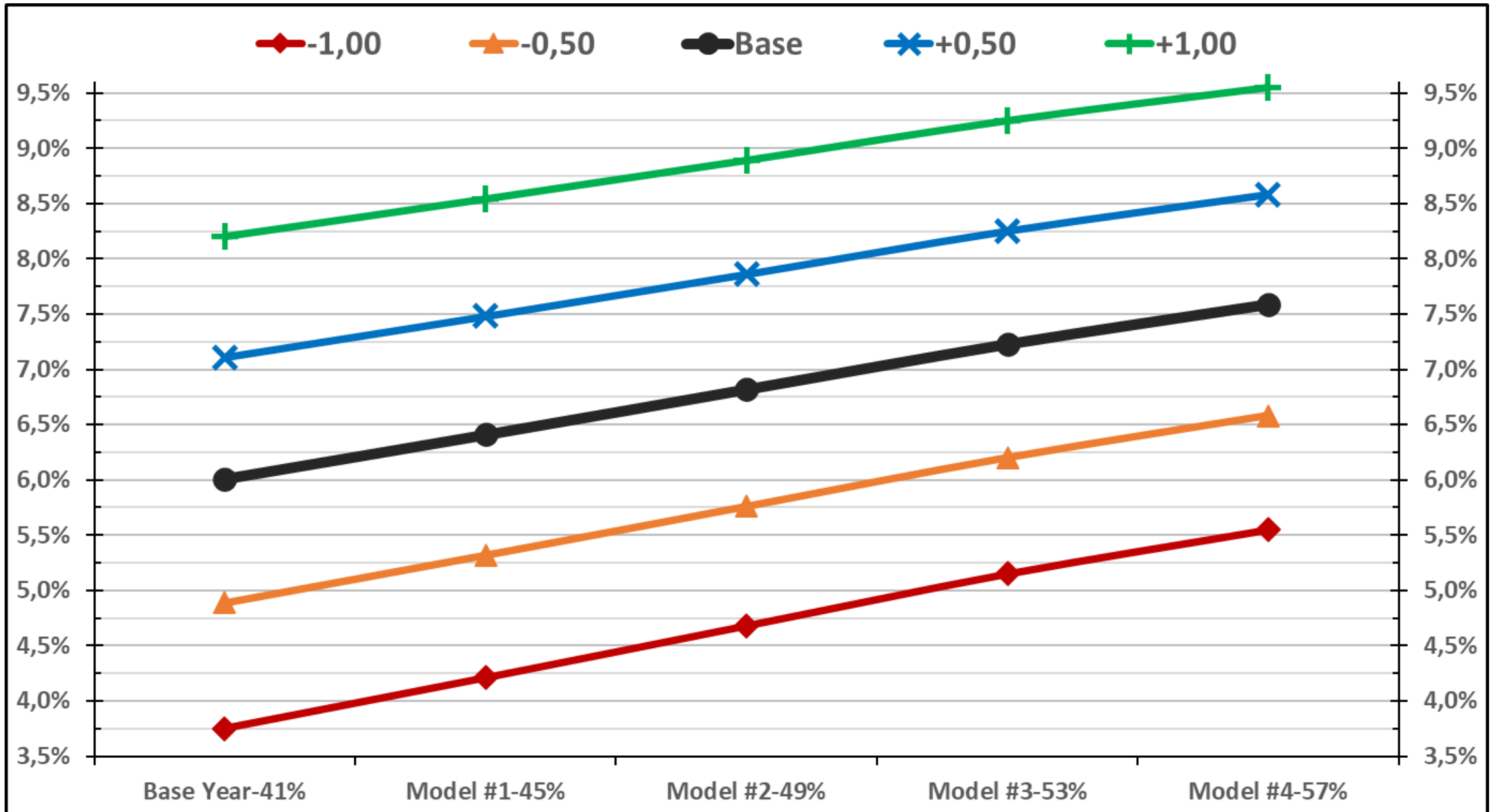
Cost of production sensitivity to concentrate price - impact similar



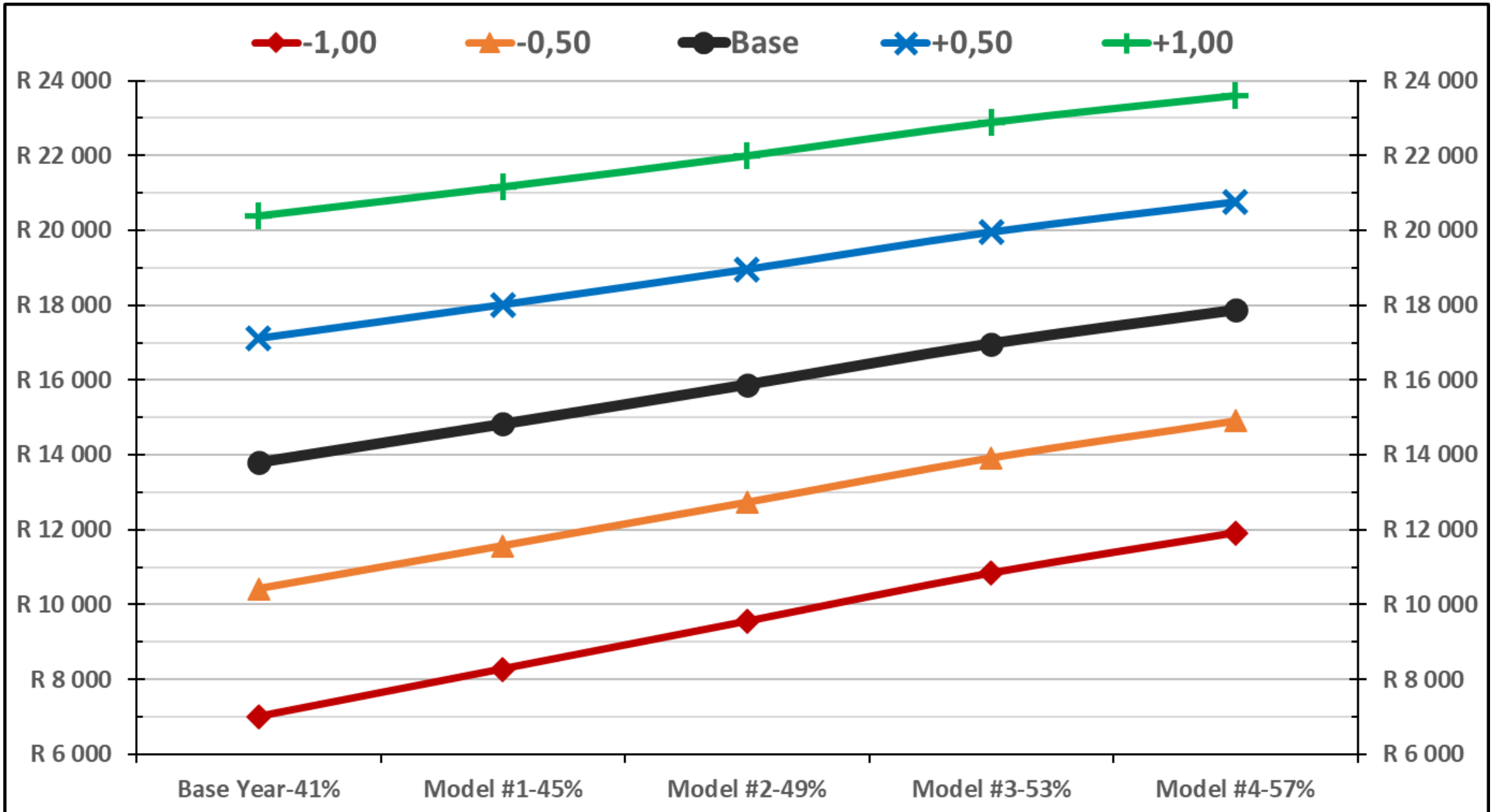
Profit per litre (cents) sensitivity to concentrate price

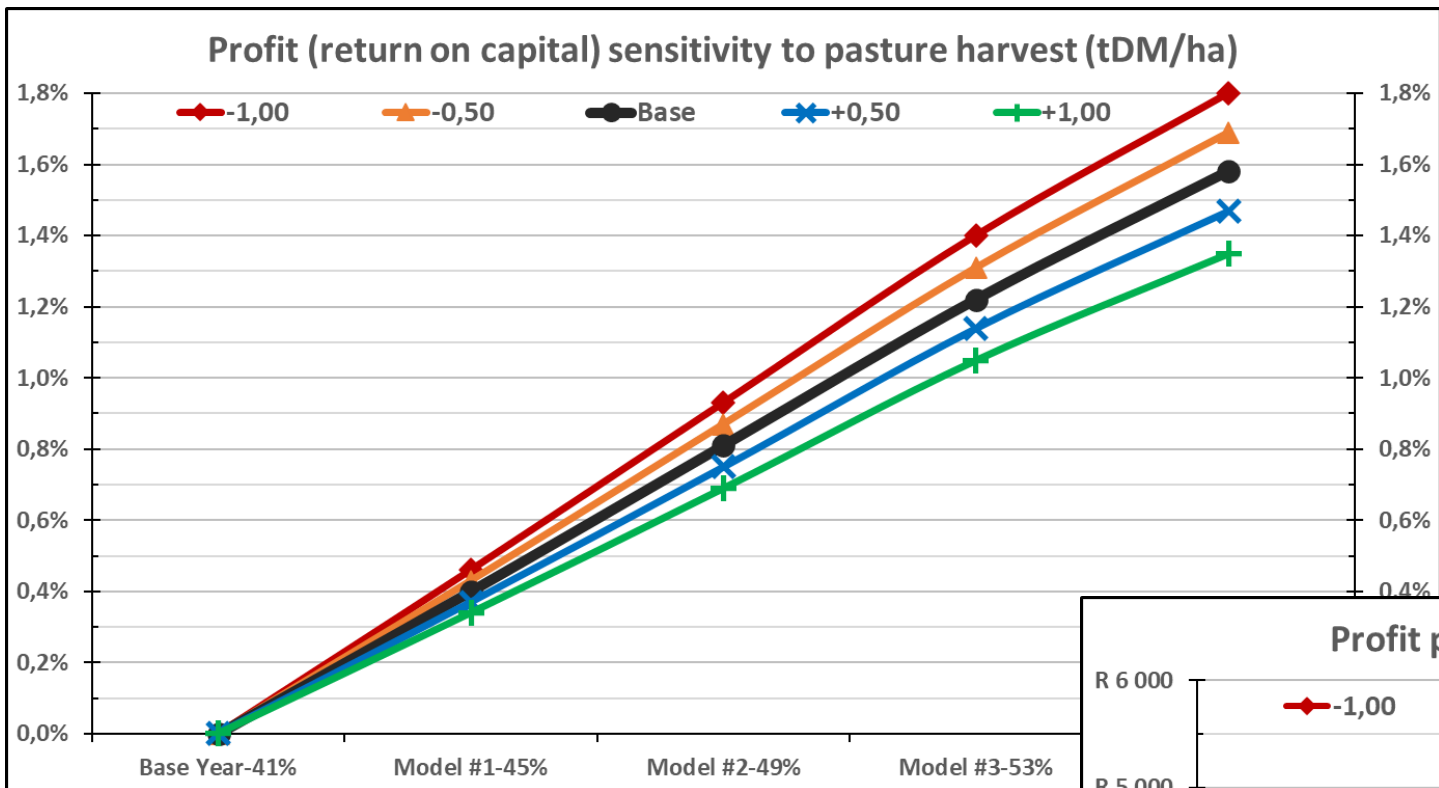


Profit (return on capital) sensitivity to CLIMATE / PASTURE HARVEST (tDM/ha)

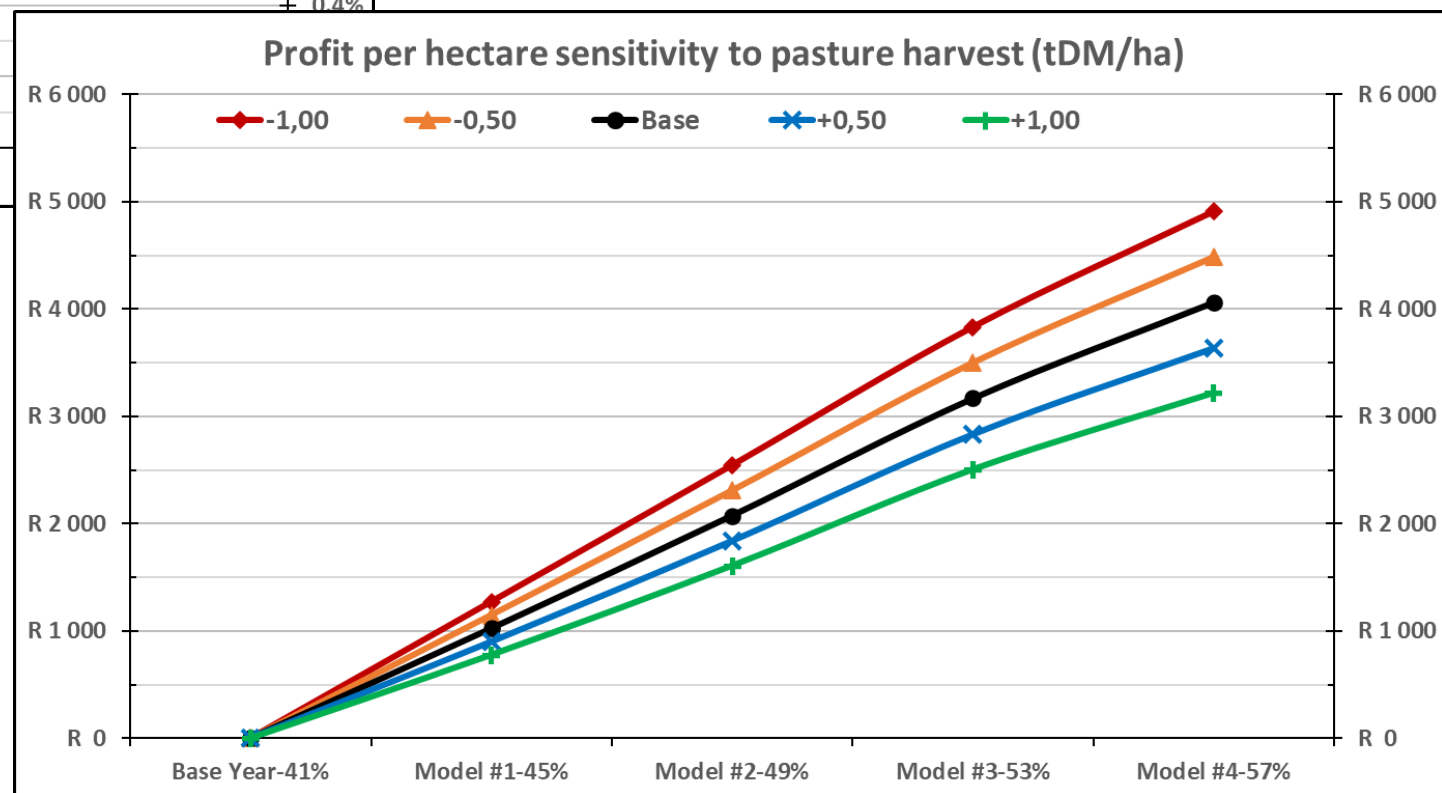


Profit per hectare sensitivity to climate/pasture harvest (tDM/ha)

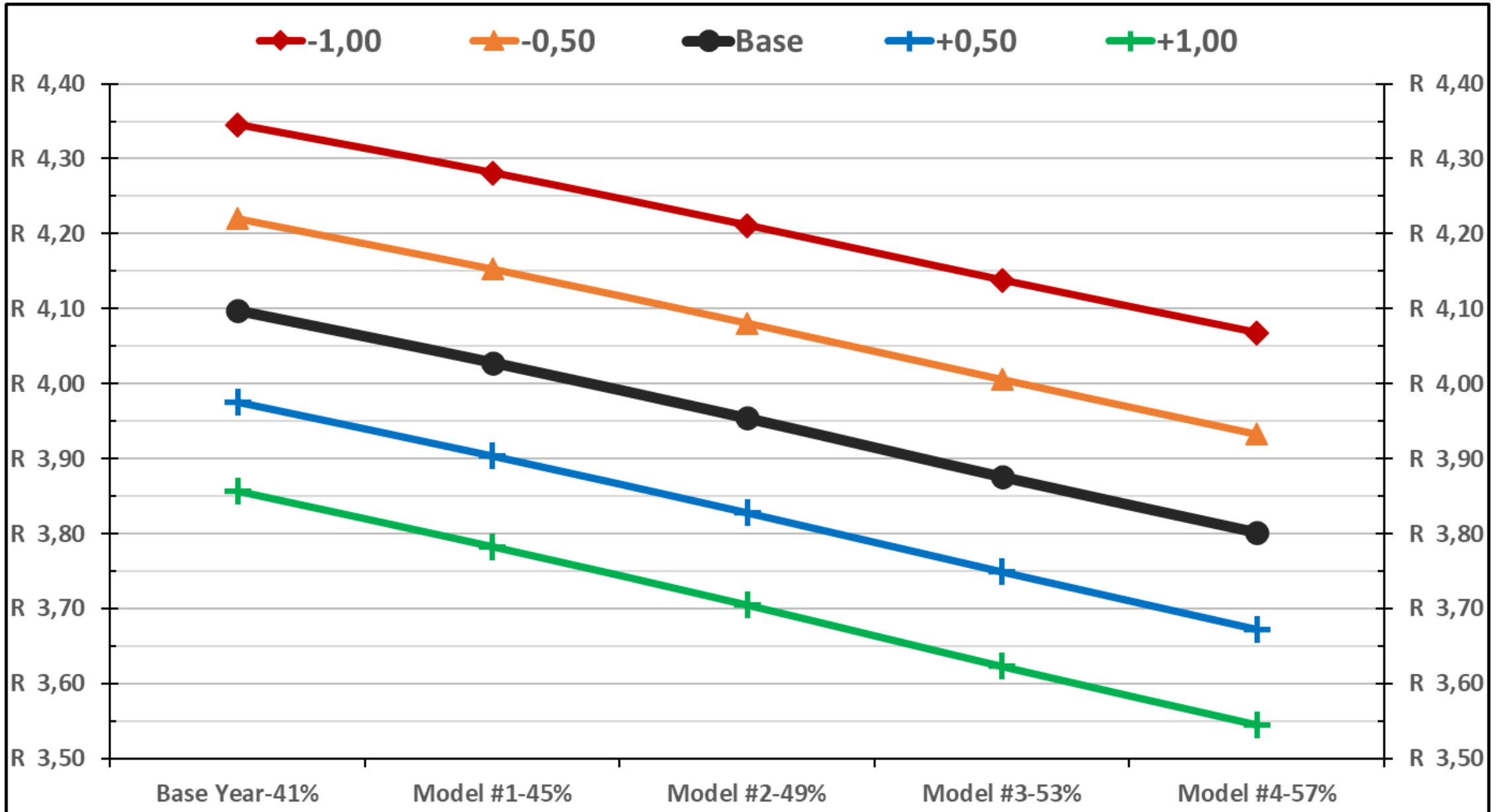




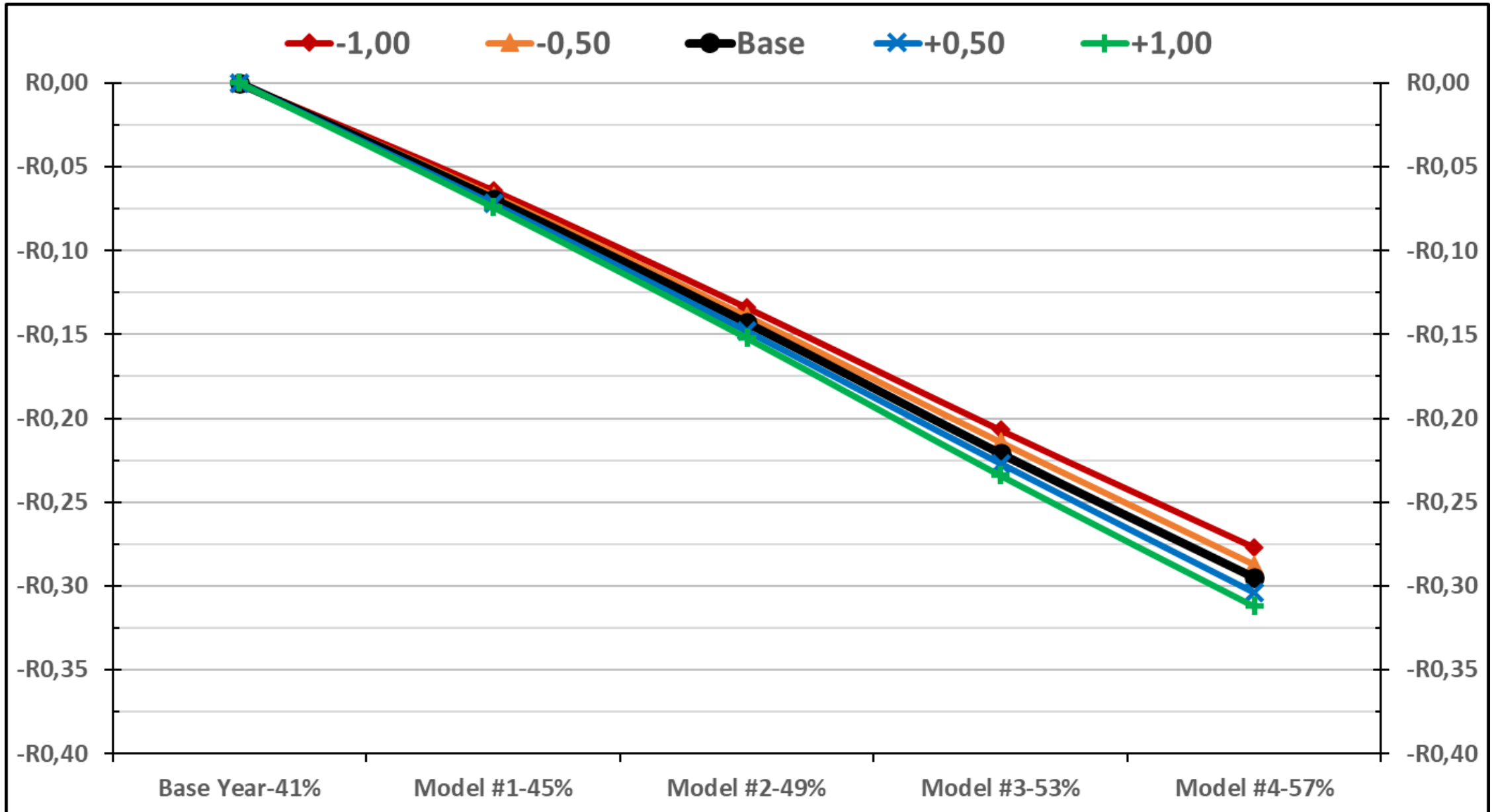
Change in profit sensitivity to climate / pasture harvest



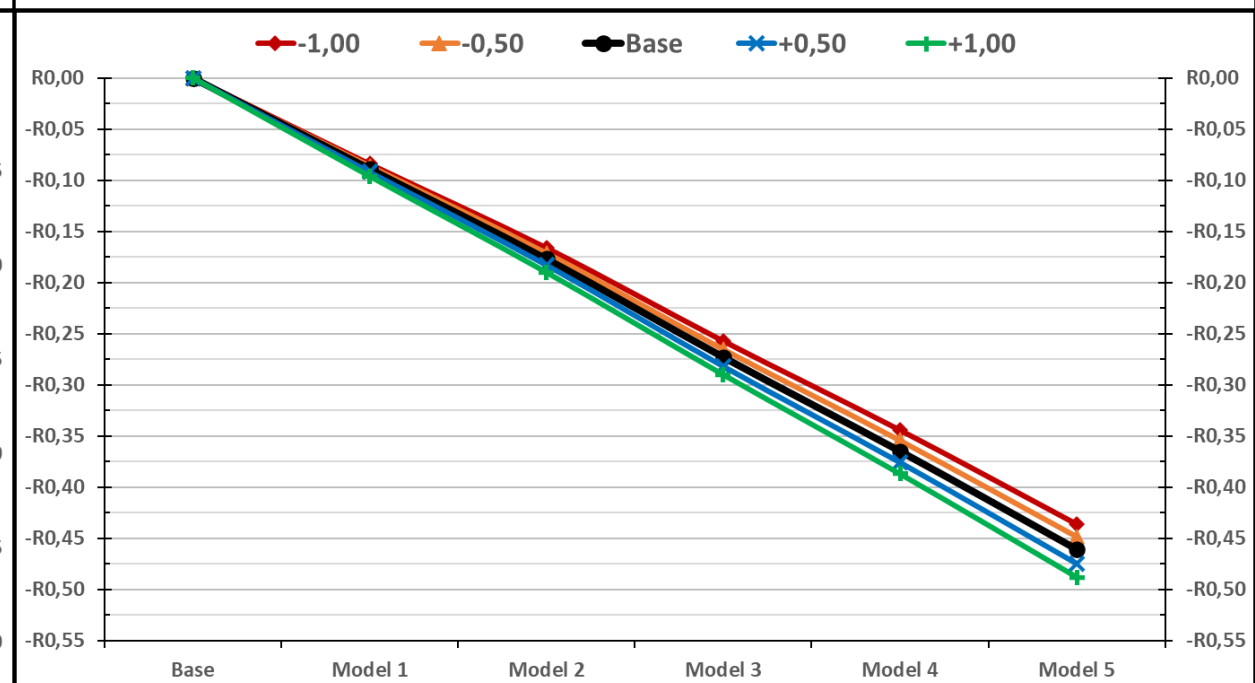
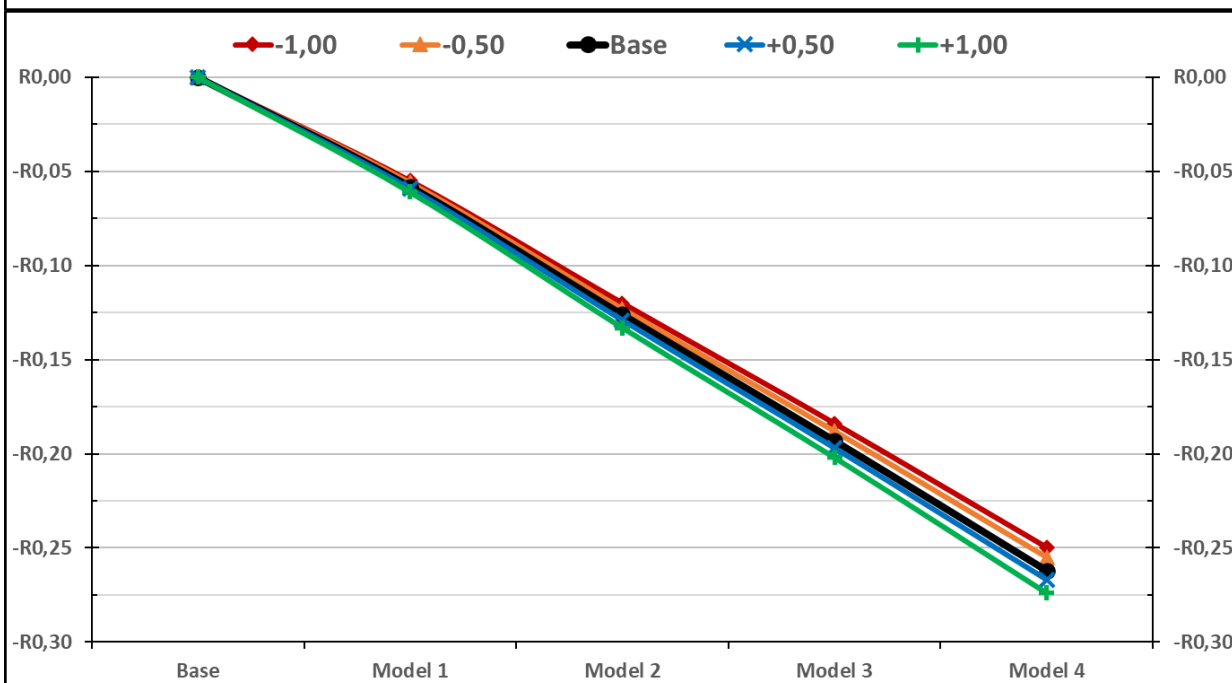
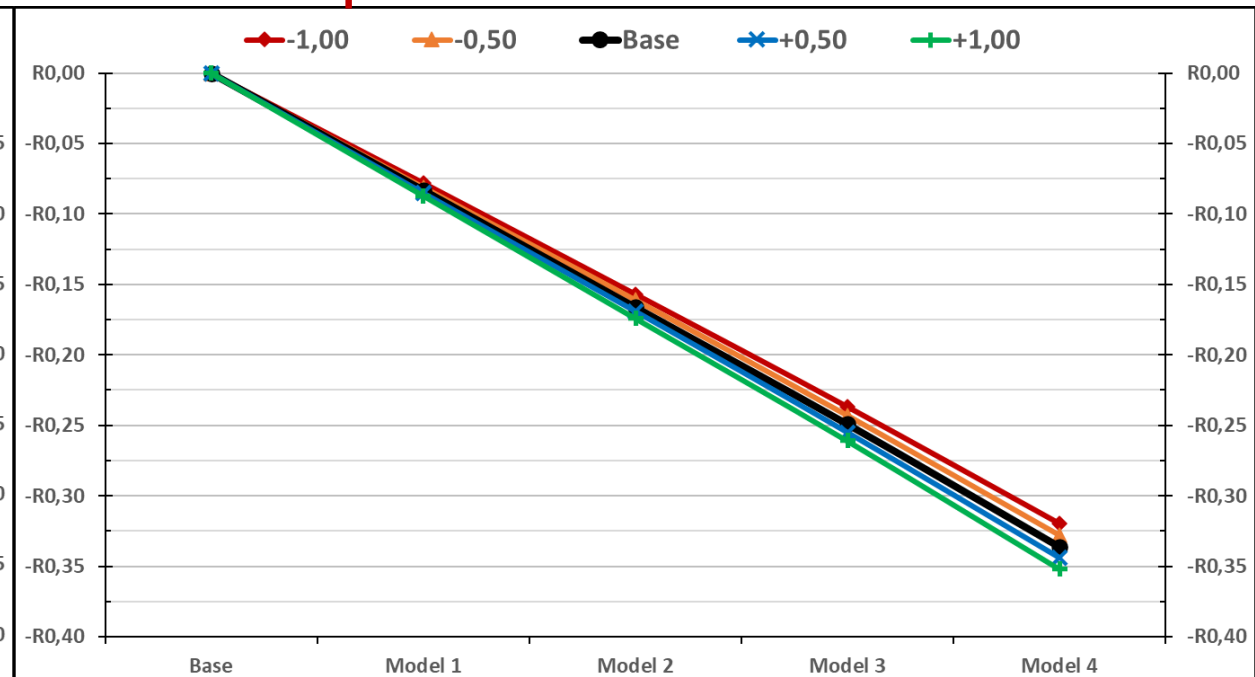
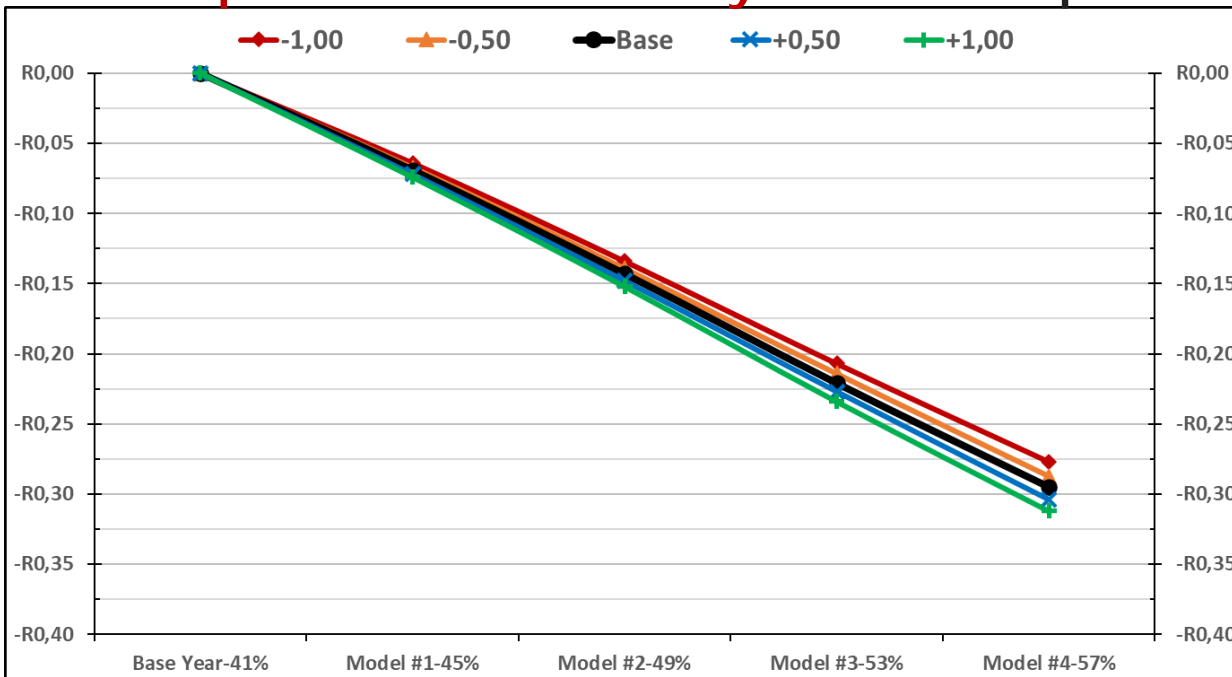
Cost of production (R/litre) sensitivity to climate/pasture harvest



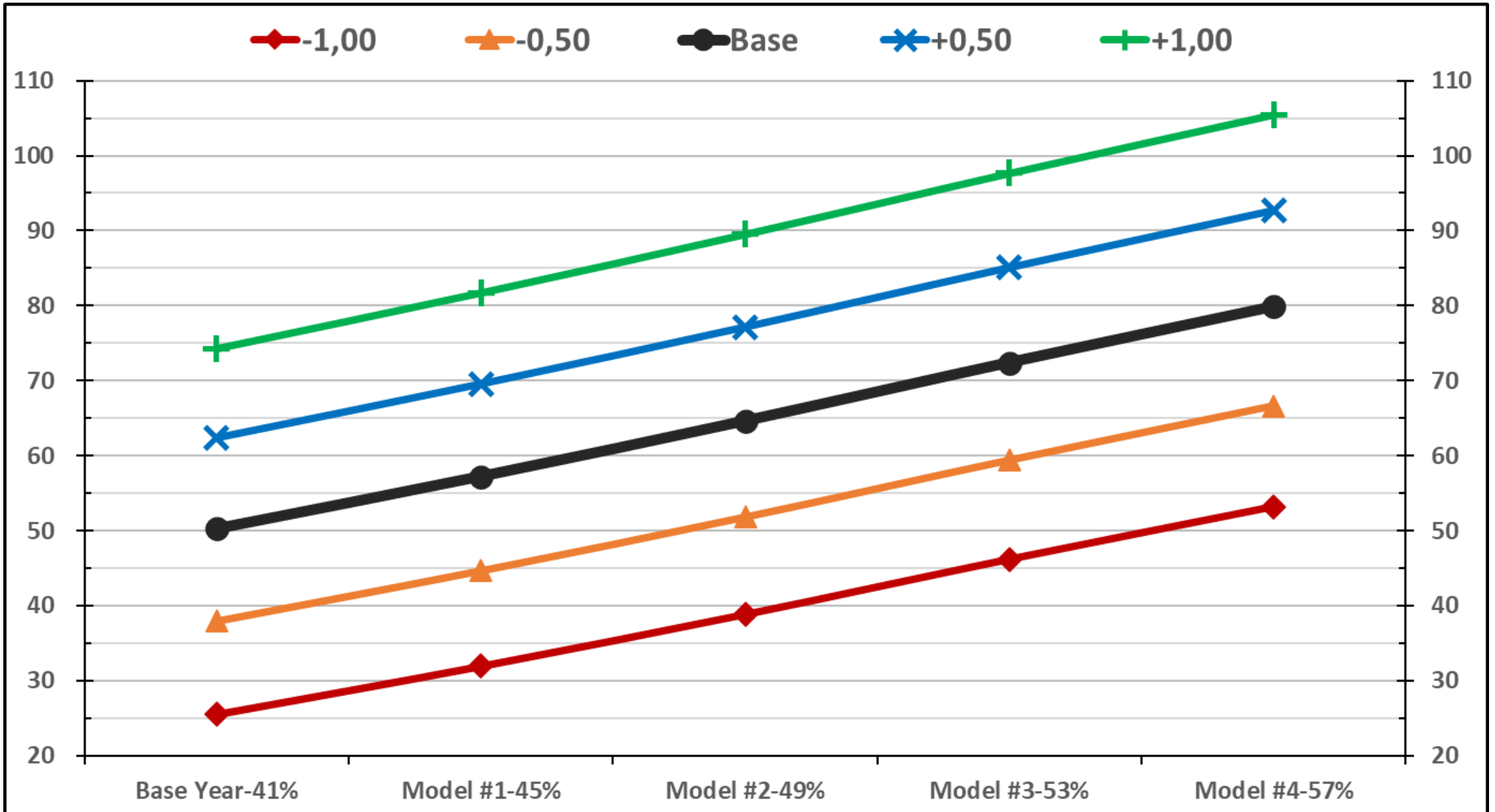
Change in cost of production sensitivity to climate/pasture harvest



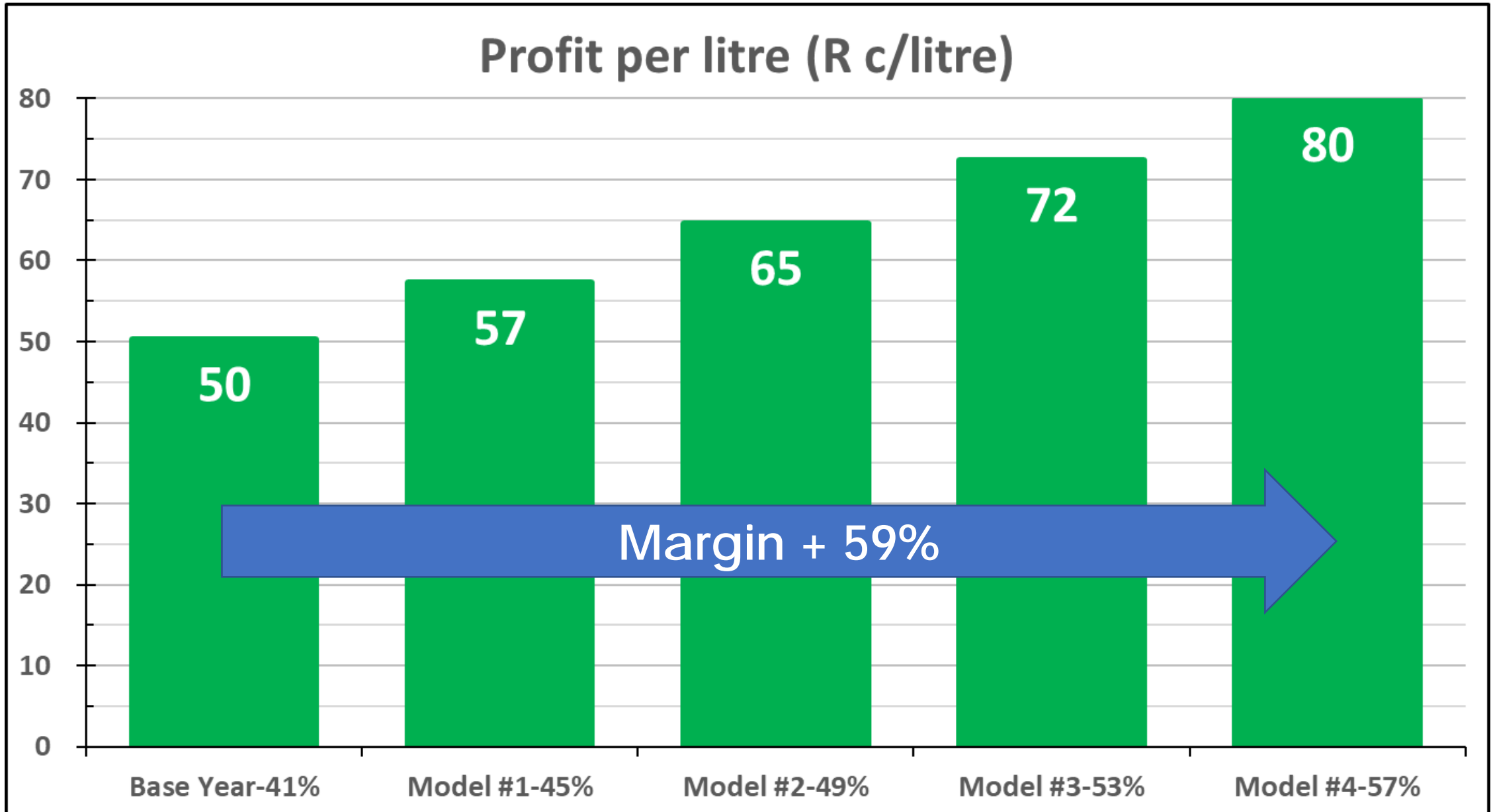
Cost of production sensitivity to climate/pasture harvest – impact similar



Profit per litre (cents) sensitivity to climate/pasture harvest (tDM/ha)



Economic RESILIENCE – higher profit margin per litre



Management benefits with increasing pasture % of diet

1. Lower cost of production → higher profit margin per litre
2. So...a more resilient and sustainable business
 - Fewer years when profitability 'squeezed' or unprofitable
3. Most years more profitable (potential exceptions when milk price high)
4. Less complex business so easier to manage on a daily basis and easier to grow the business (easier to replicate)
 - More time available to be away from the business
5. Financial advantages are potentially greater for average and below average performing farms than for the highest performing farms

Management challenges with increasing pasture % of diet

1. Lower revenue from fewer cows (lower stocking rate) producing less milk per cow
2. Can “efficient” cow performance be maintained with less concentrate fed per cow
 - ❑ Does cow type match the production system with higher pasture per cent

Estimated change in cow concentrate feeding rate (kg/cow/day) for 15% absolute increase in pasture as per cent of cow's diet					
Present	10,0	9,0	8,0	7,0	6,0
Future	6,0	5,5	5,1	4,8	4,5
Difference	-4,0	-3,5	-2,9	-2,2	-1,5

Step-by-step planning for change

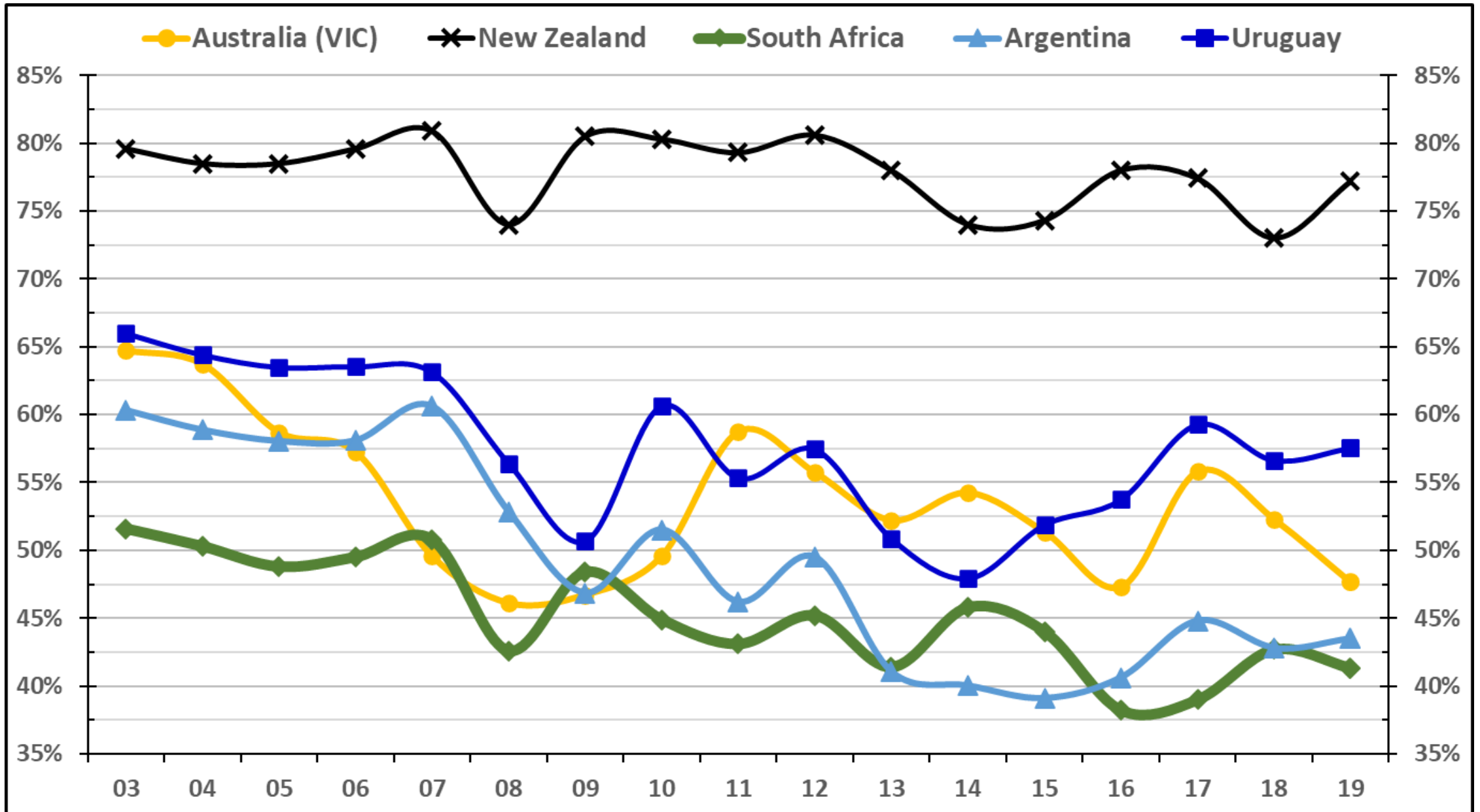
“Managing the transition challenges”

1. Develop multi-year budgets and cash flows
 - ❑ Confirm and convince yourself what “the prize” will be
2. Determine what the key outcomes are for the years of transition
 - ❑ Numbers of cows in herd AND milk production per cow
 - ❑ Annual and daily feeding rates of supplements (concentrates and forages)
 - ❑ Review cow breeding program to match cow traits with production system
3. Recheck that immediate cash flow impacts can be managed
4. Establish clear goals for all key members of your team
5. Establish a regular schedule for monitoring and reviewing the results
6. Get started...!

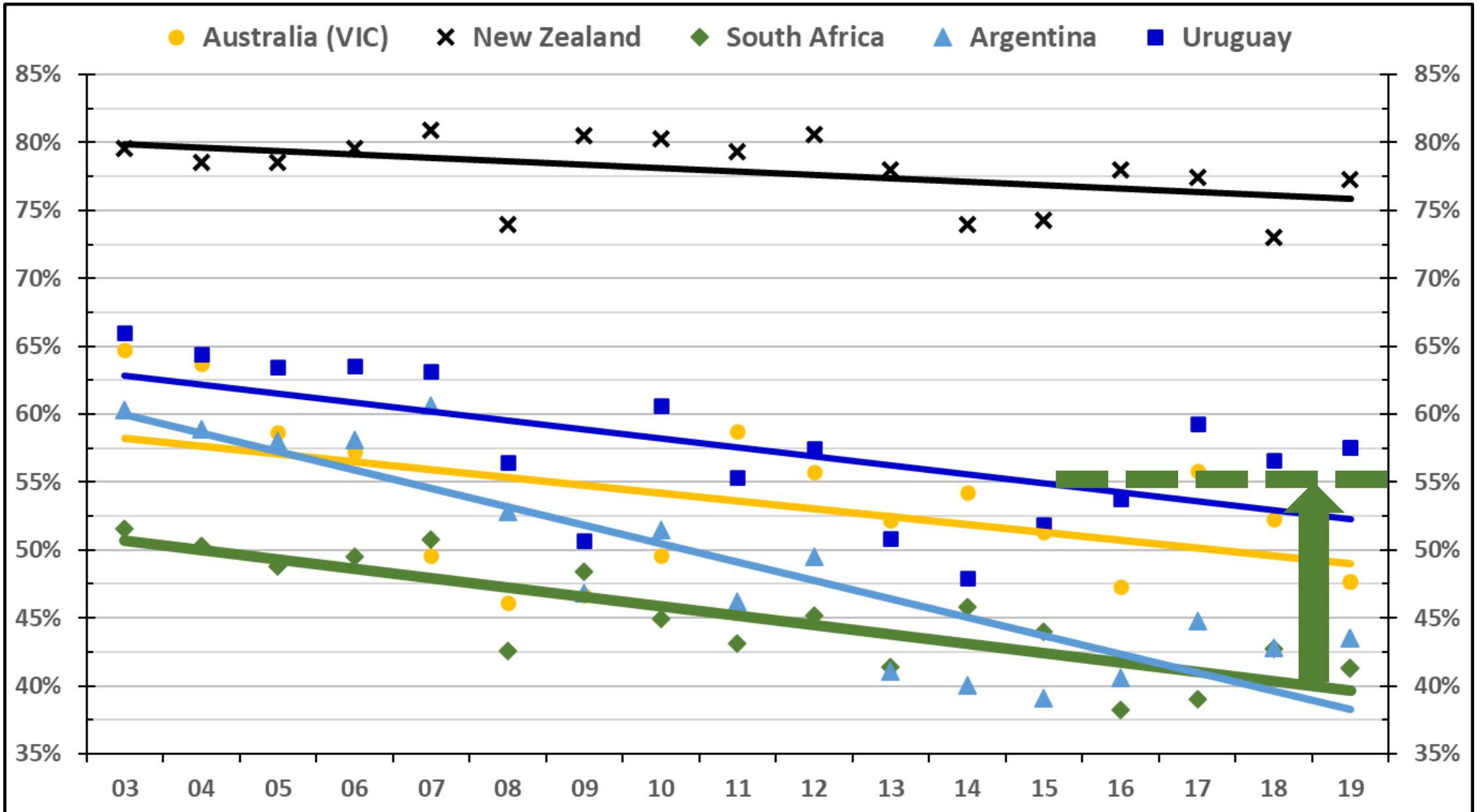
What could this mean for the South African dairy industry

The change in production system would improve the position of SA compared to all other countries

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



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



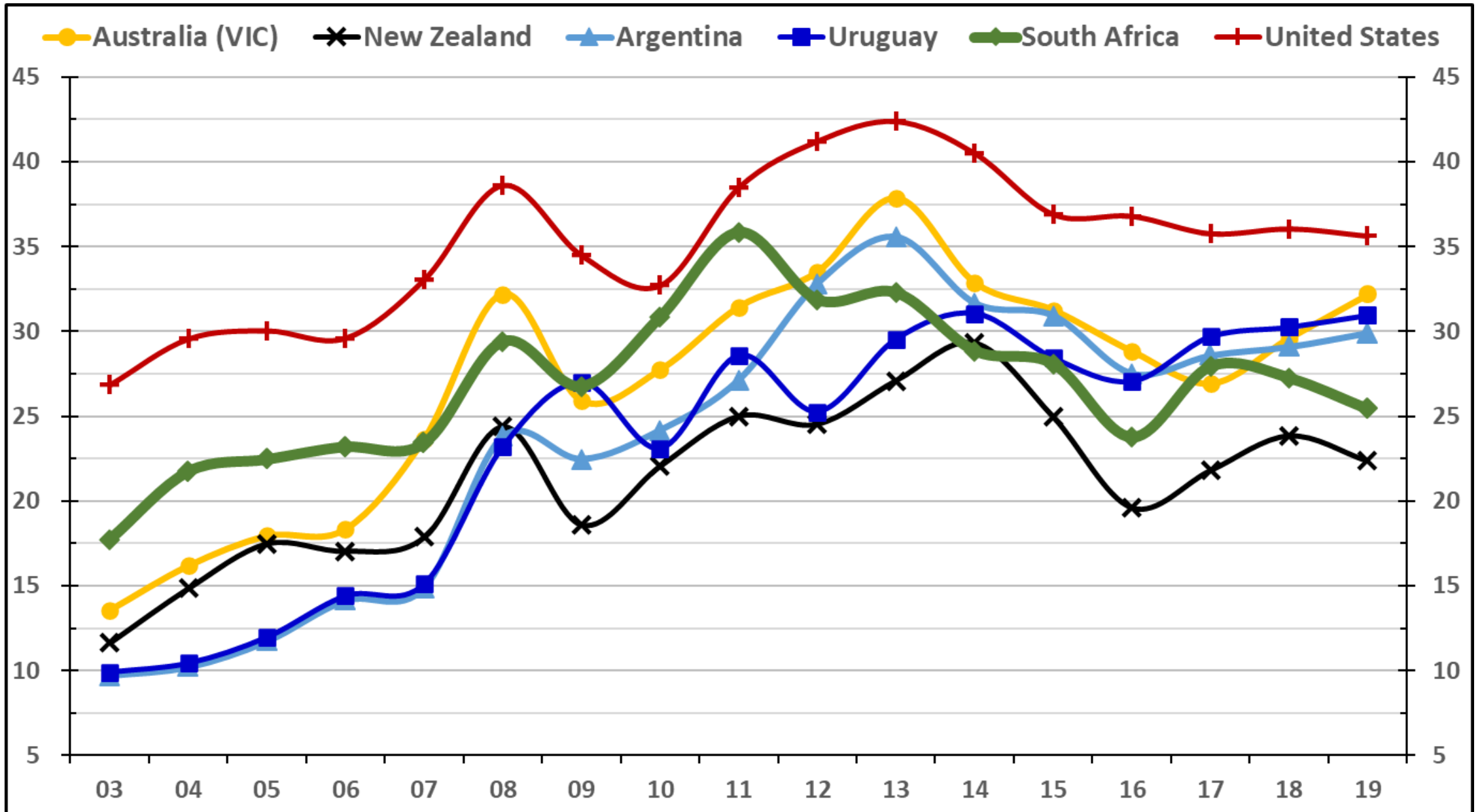
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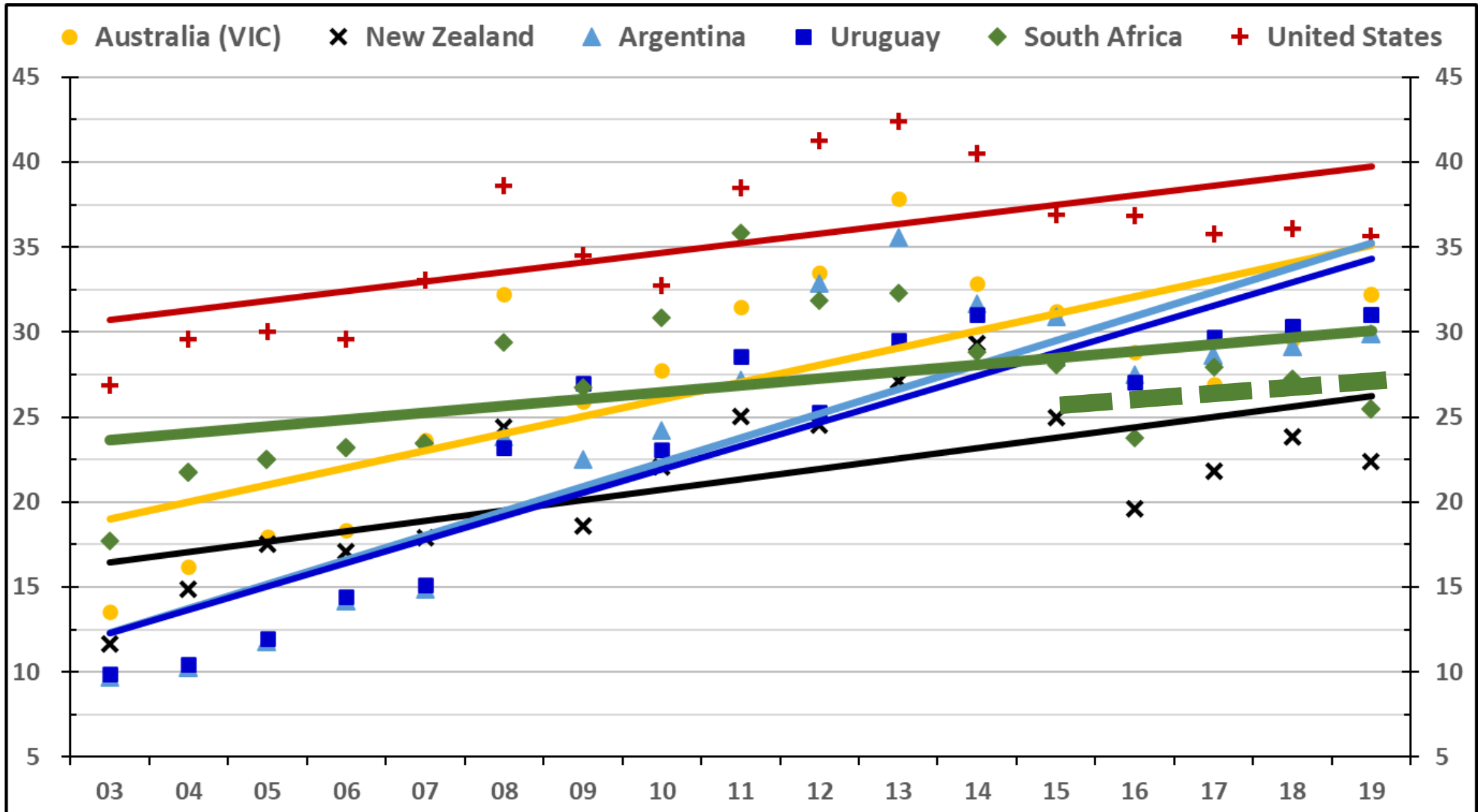
It would decrease the cost of production and ensure only New Zealand and maybe Ireland are in a better position

- Further enhance South Africa's position as a potential milk exporter
- Provide the opportunity for much higher growth in national milk production (dependent on the export of milk products)

Cost of production (USD c/litre ECM)



Cost of production (USD c/litre ECM)



What could this mean for the South African dairy industry

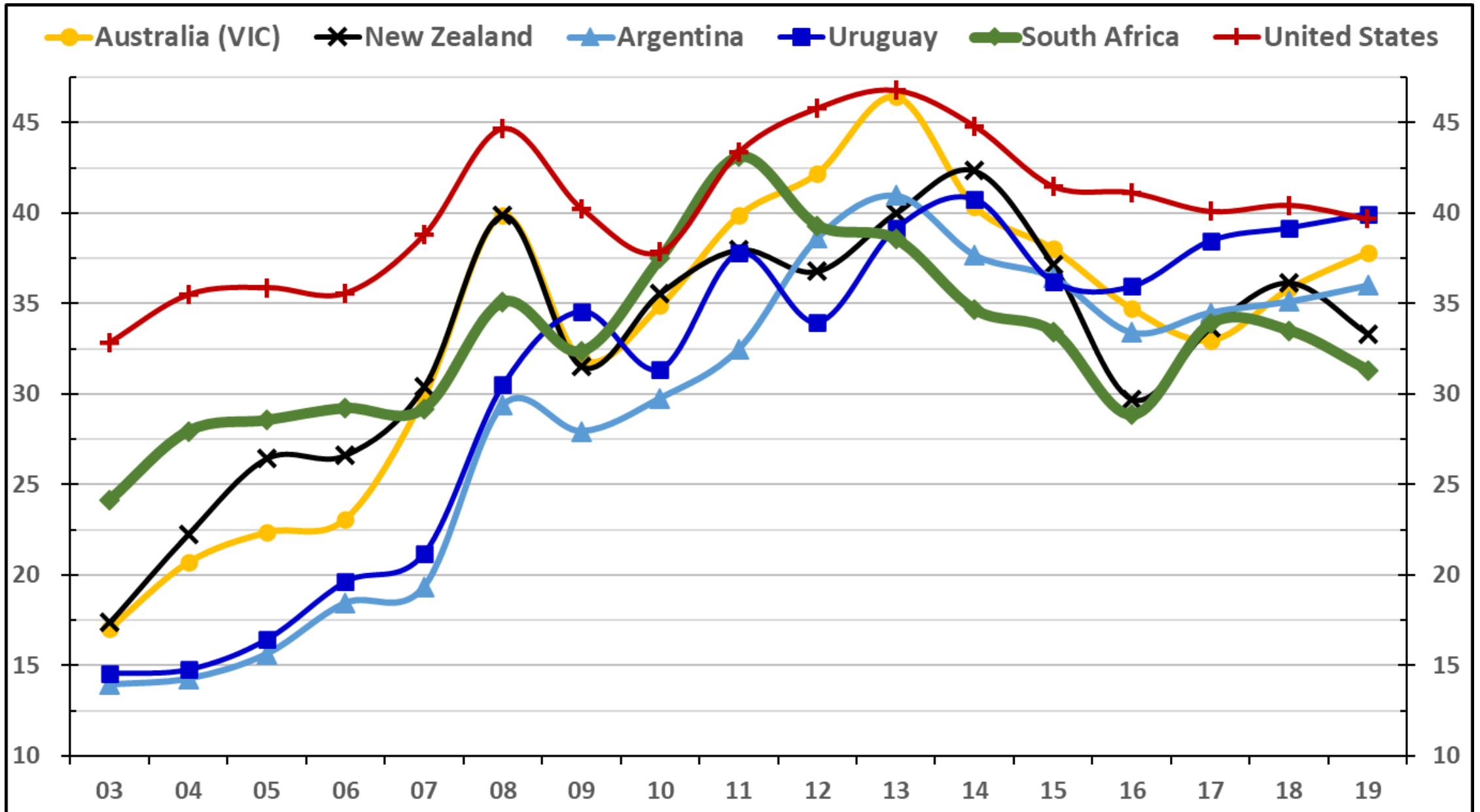
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It would decrease the cost of production and ensure only New Zealand and maybe Ireland are in a better position

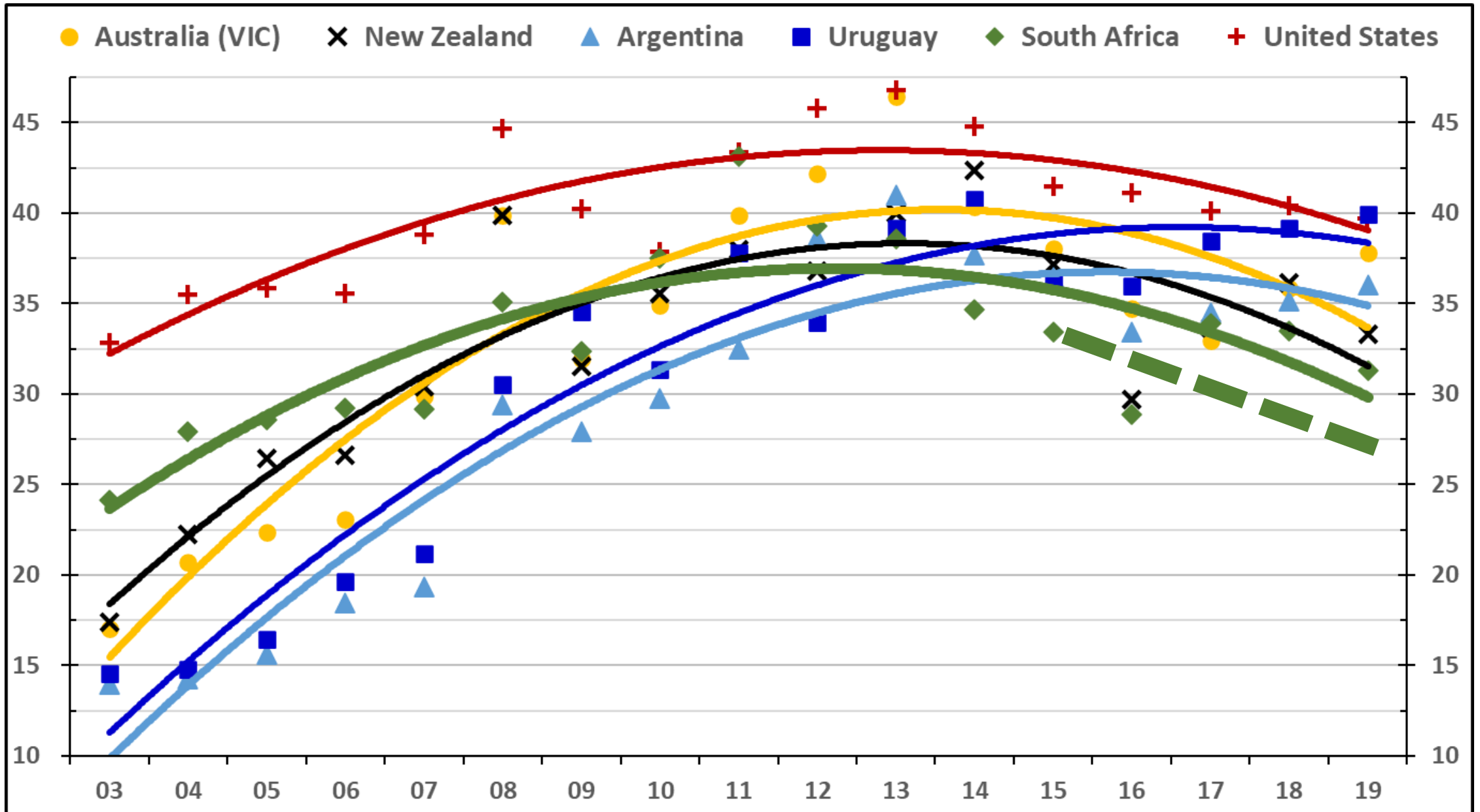
- Further enhance South Africa's position as a potential milk exporter
- Provide the opportunity for much higher growth in national milk production (dependent on the export of milk products)

Create the opportunity for significant wealth creation through higher land prices and larger, more valuable businesses

Economic Cost of production (USD c/litre ECM)



Economic Cost of production (USD c/litre ECM)



Summary

Huge opportunity to lower cost of production and improve industry financial resilience and sustainability

Requires careful and comprehensive planning to address the challenges from production system changes

Creates the opportunity for the dairy industry to compete with ALL countries on the world 'stage'

Offers the opportunity for industry and individual business growth plus substantial additional wealth creation

...so what's stopping you?

Thank you



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