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A Framework for Modelling Whole-Farm Financial Risk (PowerPoint)

Tom Nordblom [1,2] Tim Hutchings [2] (Economics & Finance)
Richard Hayes [2,3] Guangdi Li [2,3] (Pasture Agronomy)

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Contributed presentation at the 59th AARES Annual Conference,
Rotorua, New Zealand, February 10-13, 2015

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A FRAMEWORK FOR MODELLING WHOLE-FARM FINANCIAL RISK

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AARES 2015 Feb 10-13 Rotorua, New Zealand

GRDC
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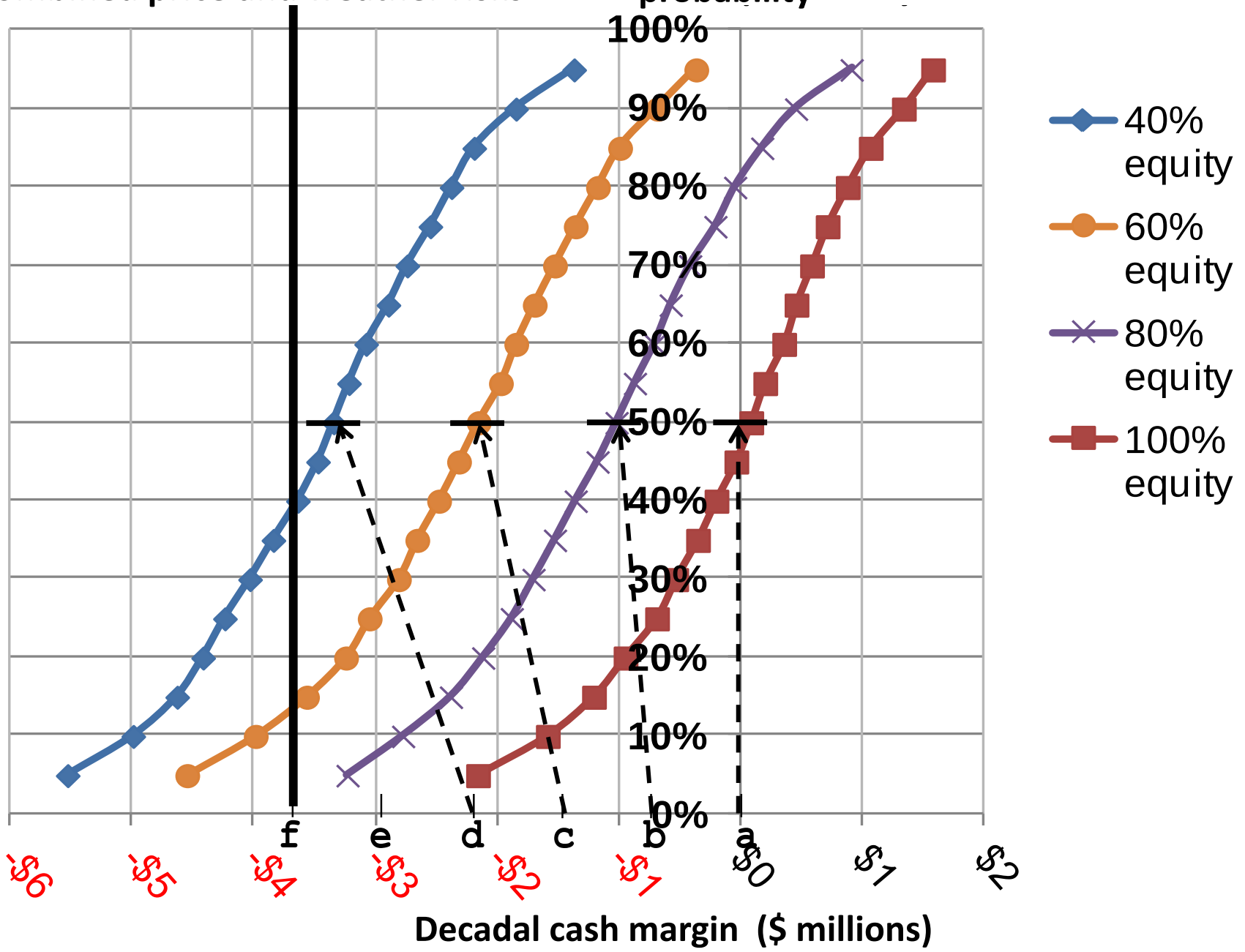
Final slide first: effects of starting equity given combined price and weather risks



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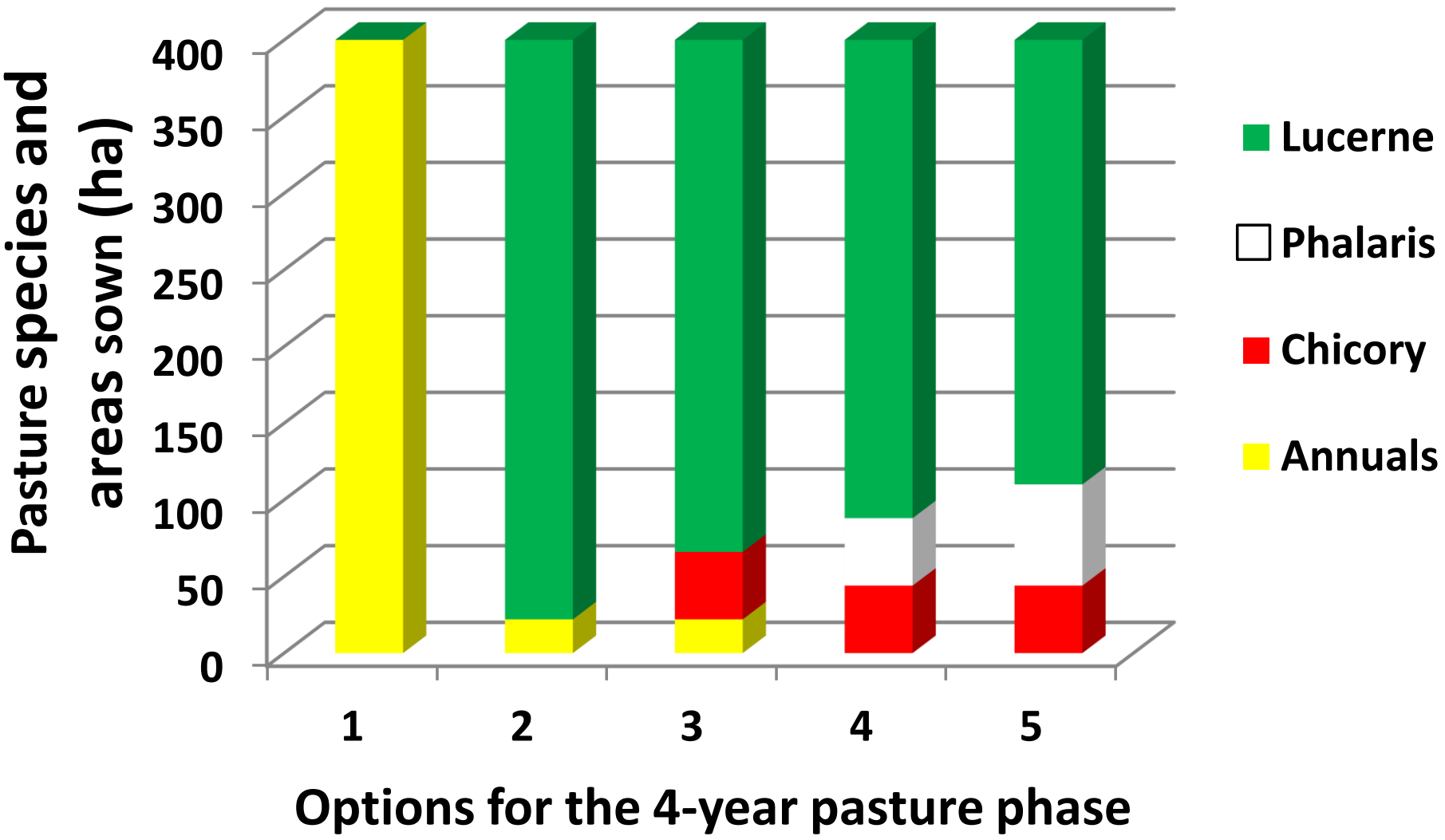
- Case study is a rainfed mixed-farm in Coolamon
- Different farm practices (pasture species & stocking rates) are considered in both analyses

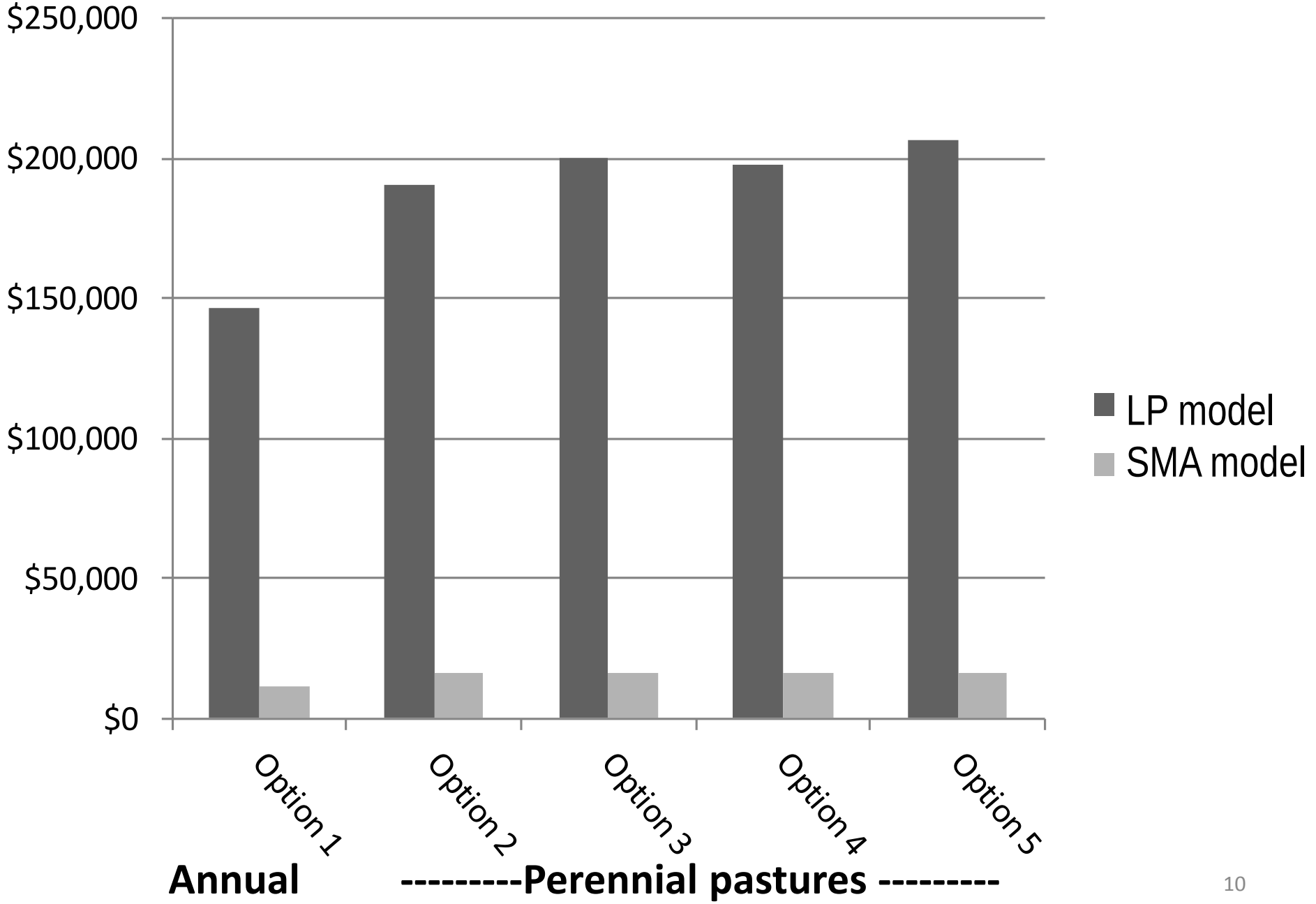
Case study farm rainfed mixed-cropping Coolamon area of NSW

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Prices	↑	↓	→	→	↑	↓	↓	↑	→	→
Weather	→	↑	↓	→	↑	↑	→	↓	↓	↑

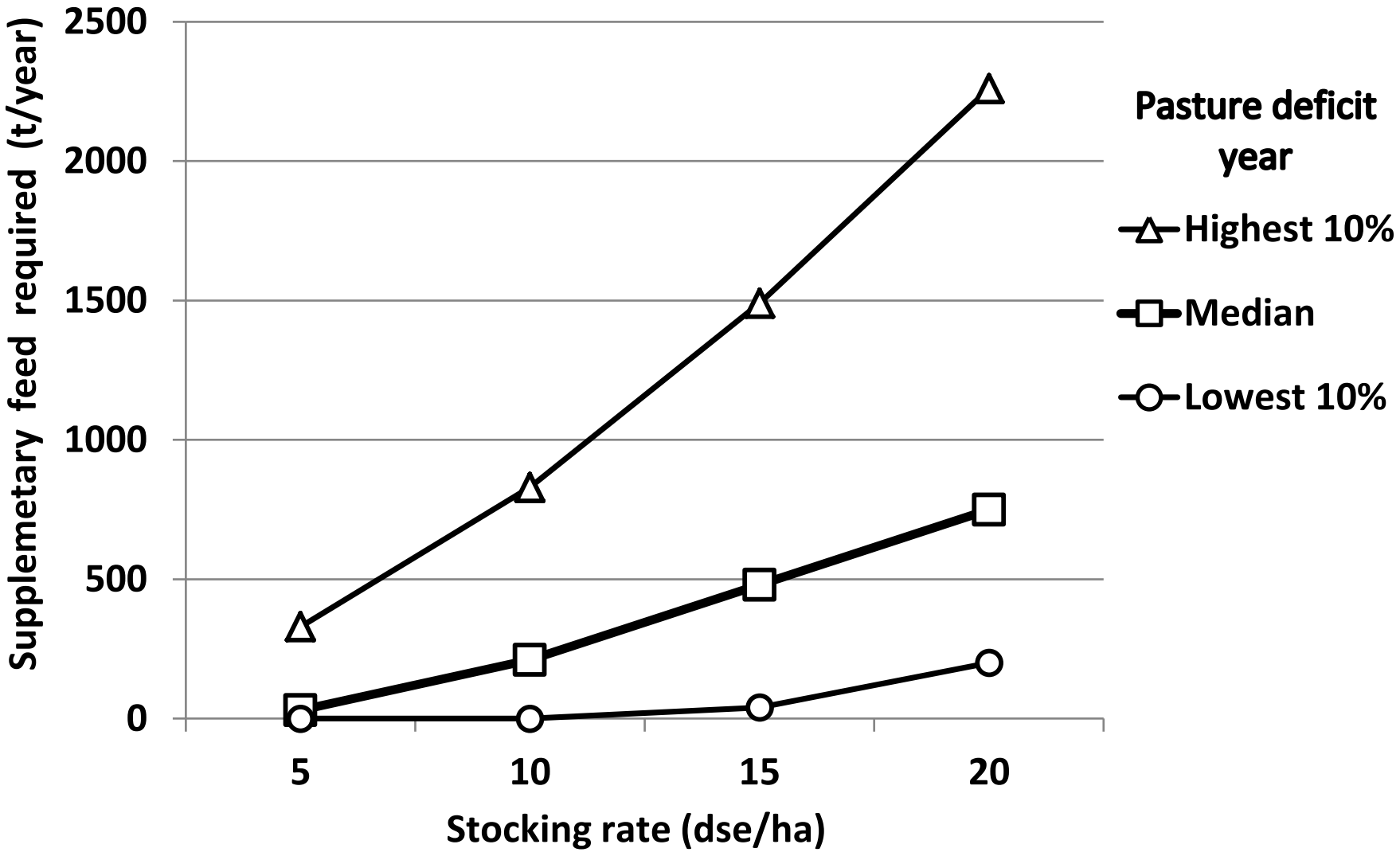
Paddock No.	area (ha)									
1.	100	**B**	P1	P2	P3	P4	W	C	W	C	**B**
2.	100	**C**	B	P1	P2	P3	P4	W	C	W	**C**
3.	100	**W**	C	B	P1	P2	P3	P4	W	C	**W**
4.	100	**C**	W	C	B	P1	P2	P3	P4	W	**C**
5.	100	**W**	C	W	C	B	P1	P2	P3	P4	**W**
6.	100	**P4**	W	C	W	C	B	P1	P2	P3	**P4**
7.	100	**P3**	P4	W	C	W	C	B	P1	P2	**P3**
8.	100	**P2**	P3	P4	W	C	W	C	B	P1	**P2**
9.	100	**P1**	P2	P3	P4	W	C	W	C	B	**P1**
10.	100	**PP**	**PP**	**PP**	**PP**	**PP**	**PP**	**PP**	**PP**	**PP**	**PP**
Total	1,000									


Pasture species and areas sown (ha)
400
350
300
250
200
150
100
50
0
1
2
3
4
5
Options for the 4-year pasture phase
Lucerne
Phalaris
Chicory
Annuals

Average profits, by partial budget (LP) and by SMA considering price & Wx risks



Feed requirements increase with stocking rates and dry conditions



The slides that follow give results from Sequential multivariate analysis (SMA)
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These are in terms of probability distributions of **decadal changes in whole-farm cash balances**, over 1,000 ten-year samples of variable weather and prices.

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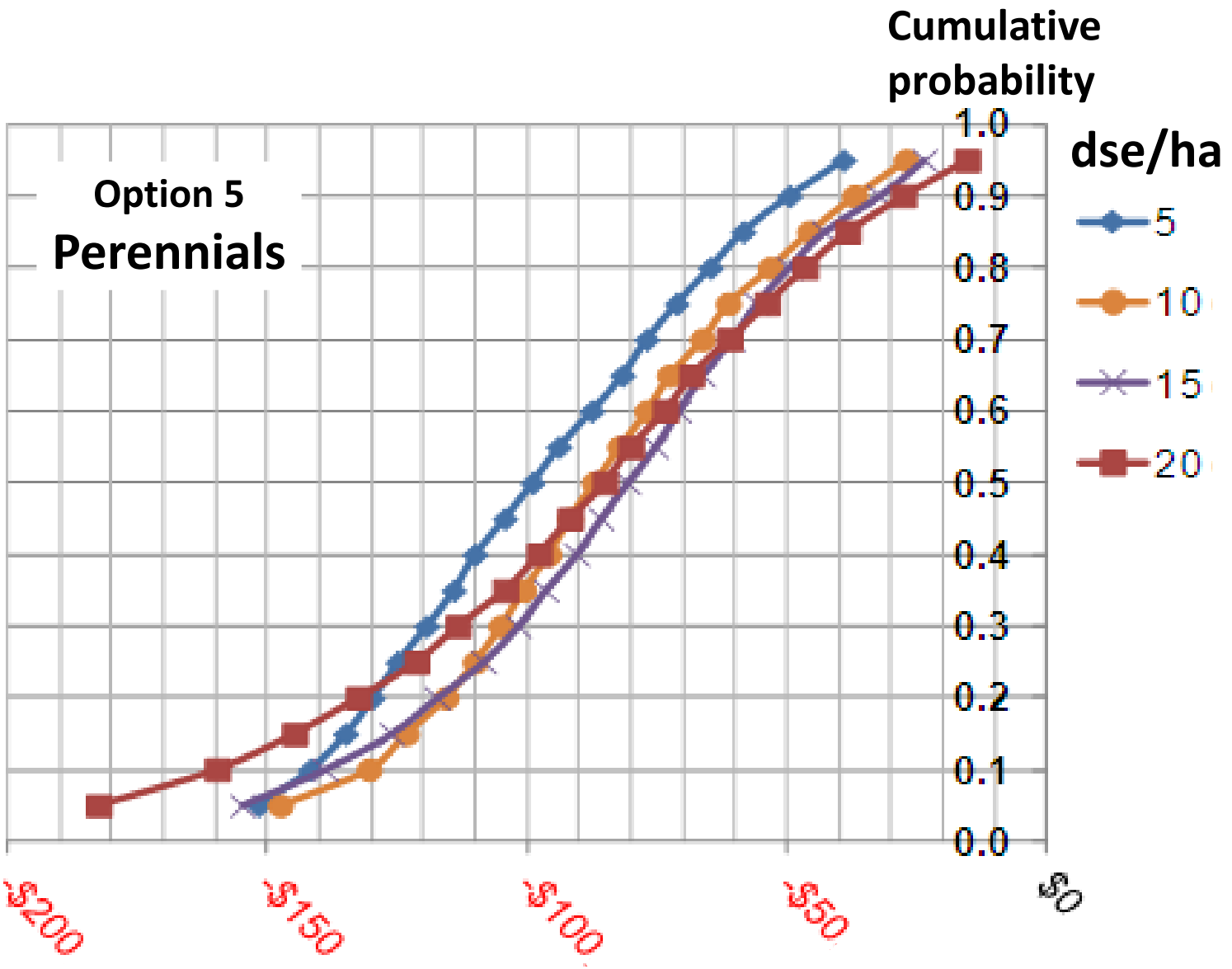
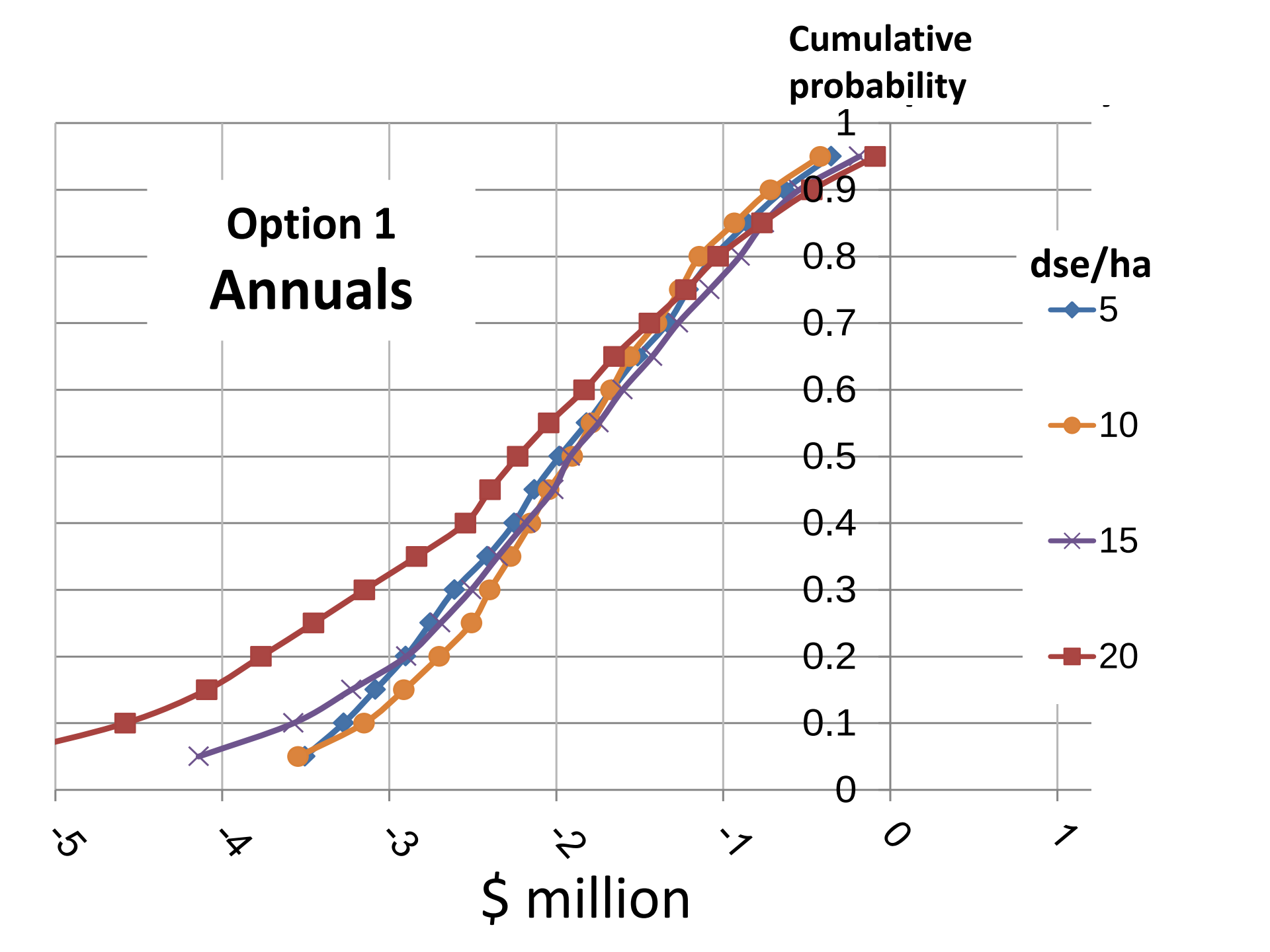
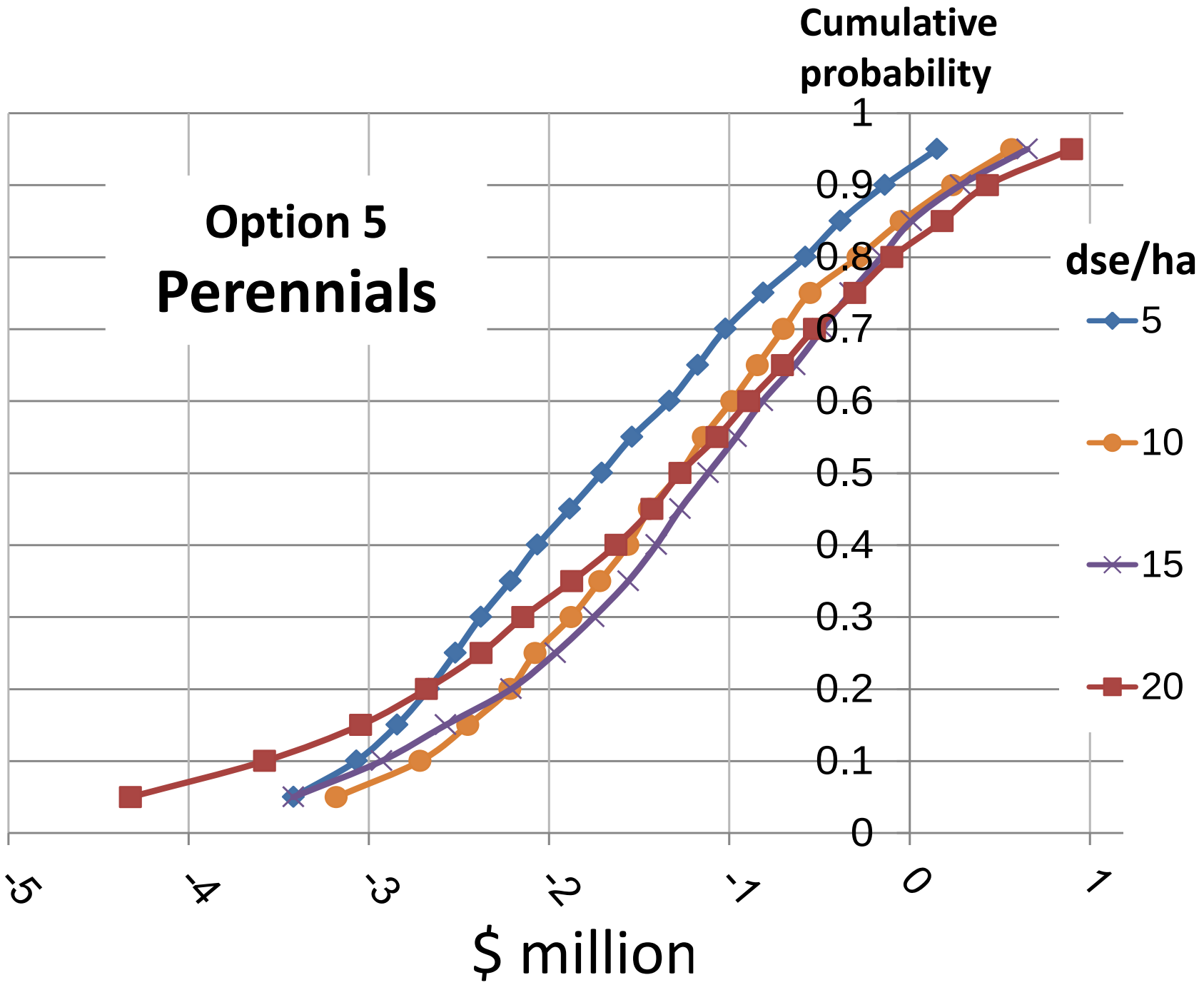
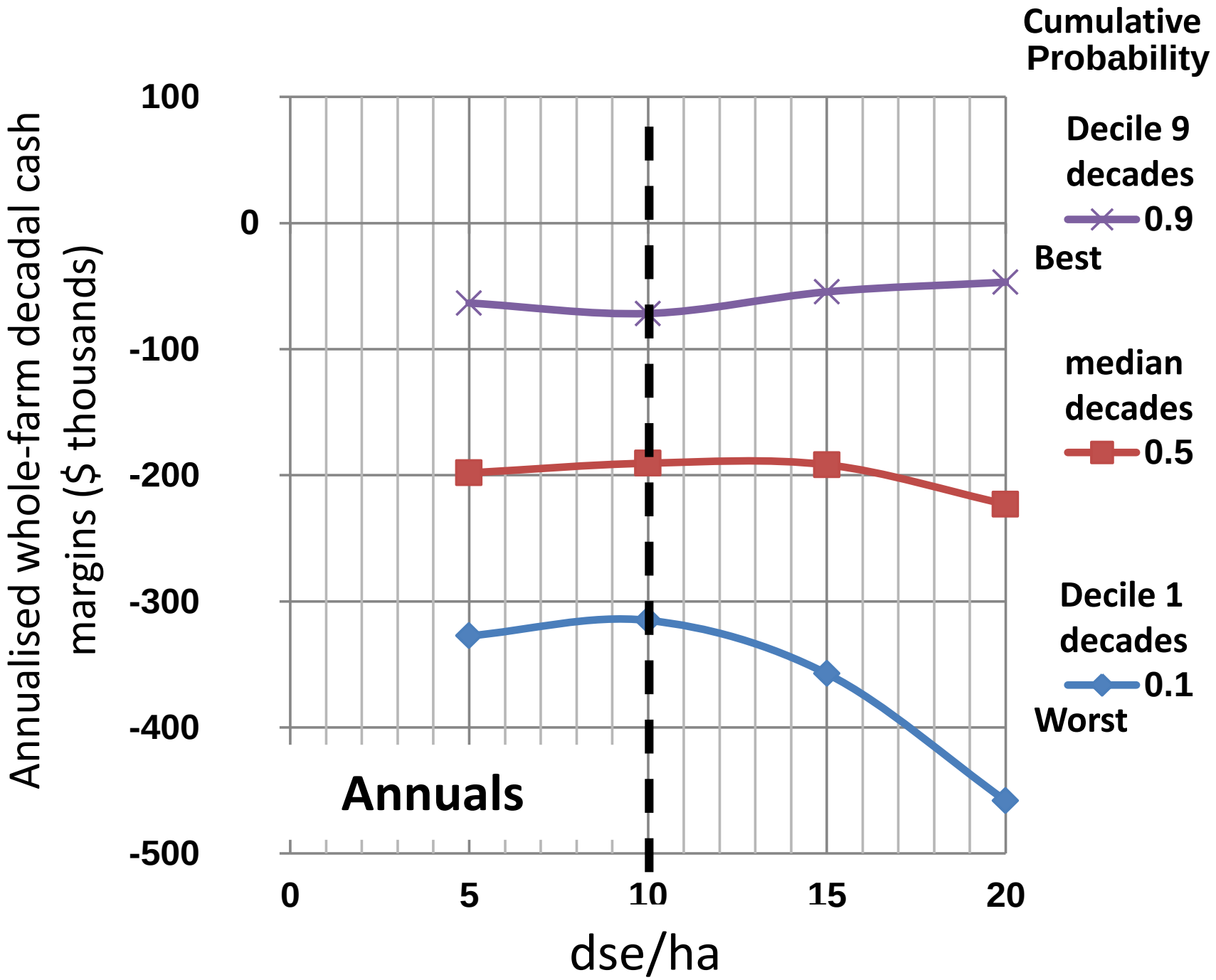
Expressed as **CDFs**
(cumulative distribution functions)

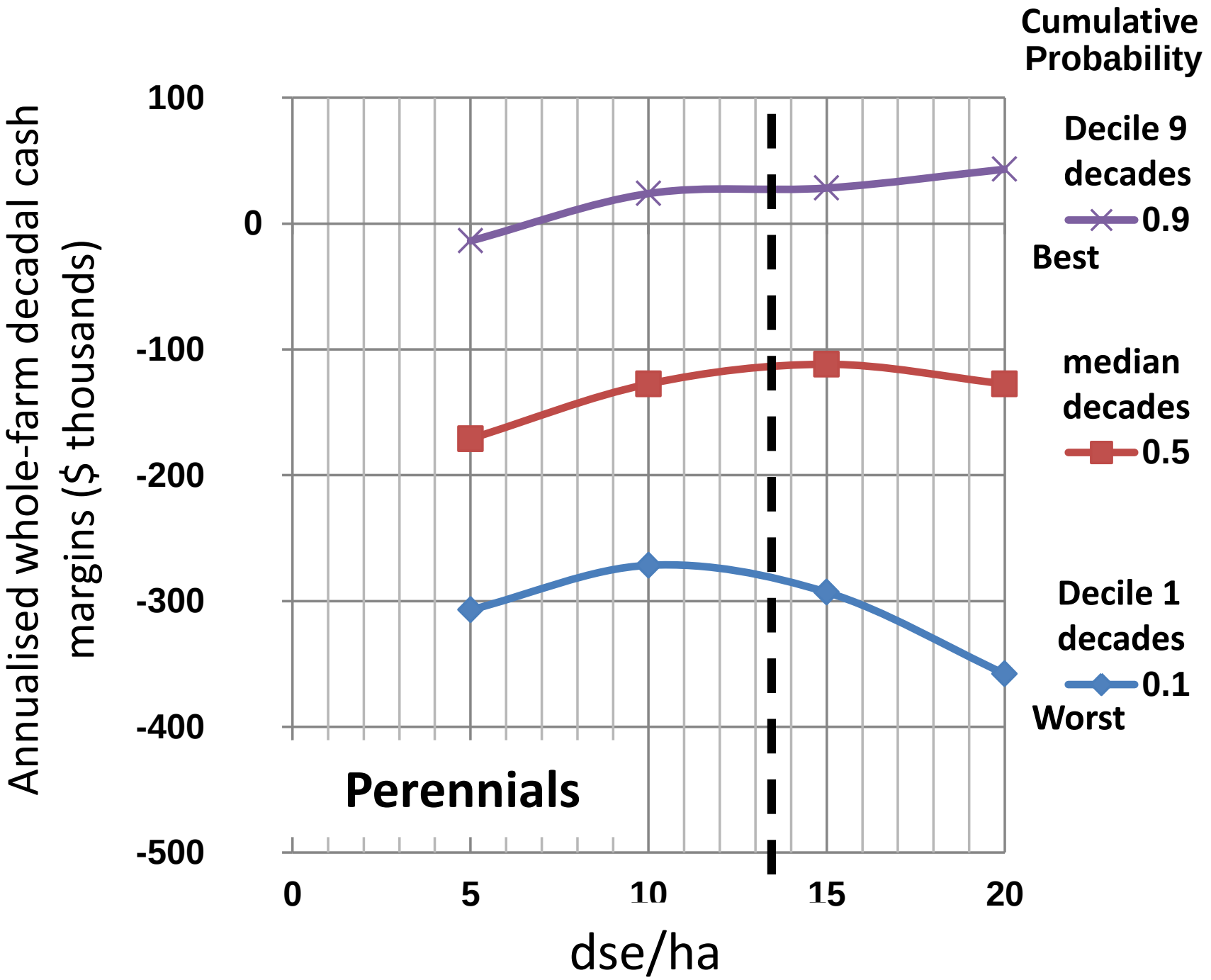


Annualised decadal cash-flow reductions due to interest **($'000)**

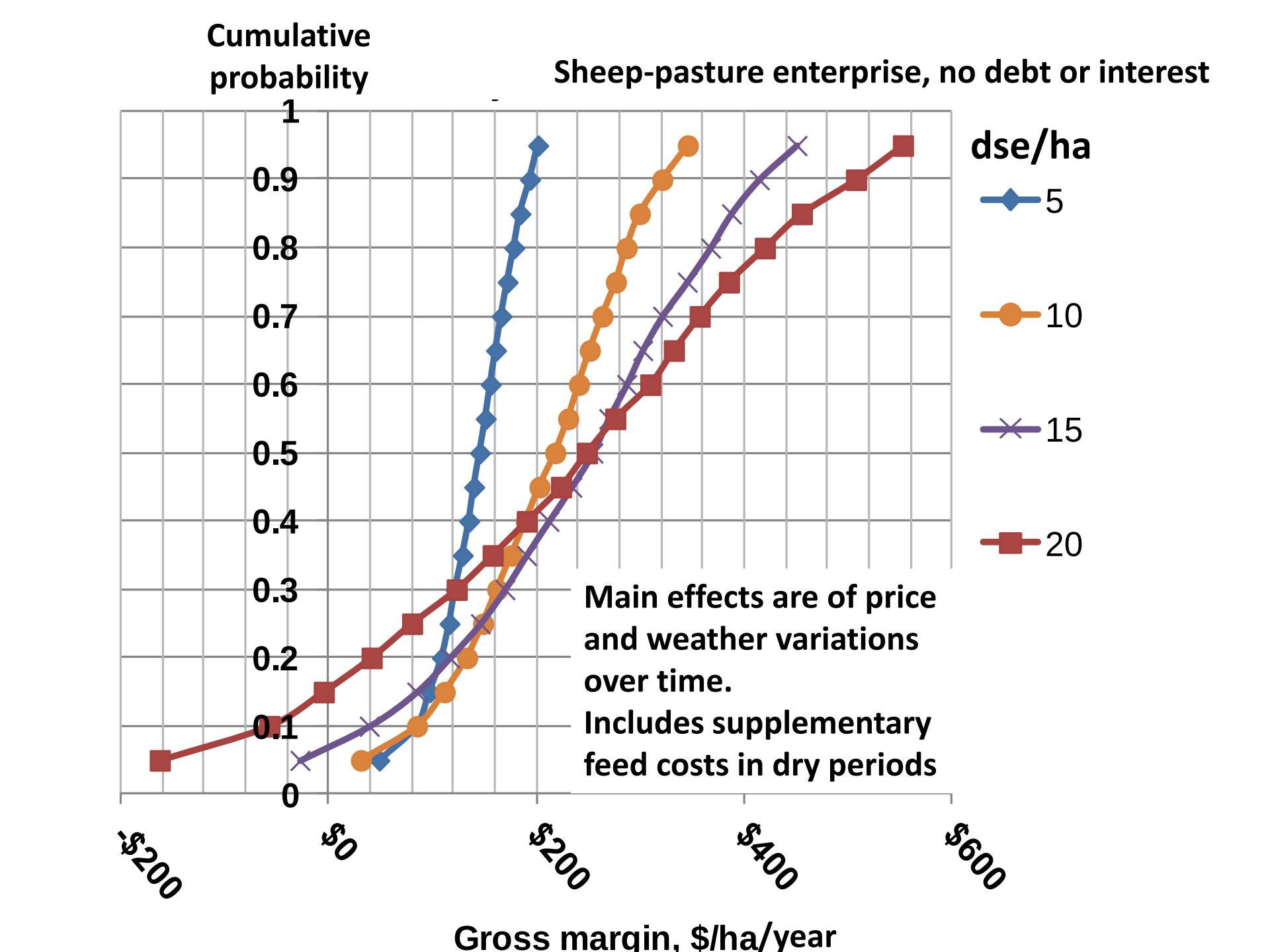

Cumulative probability
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Option 1
Annuals
dse/ha
5
10
15
20
5
4
3
2
1
0
1
$ million

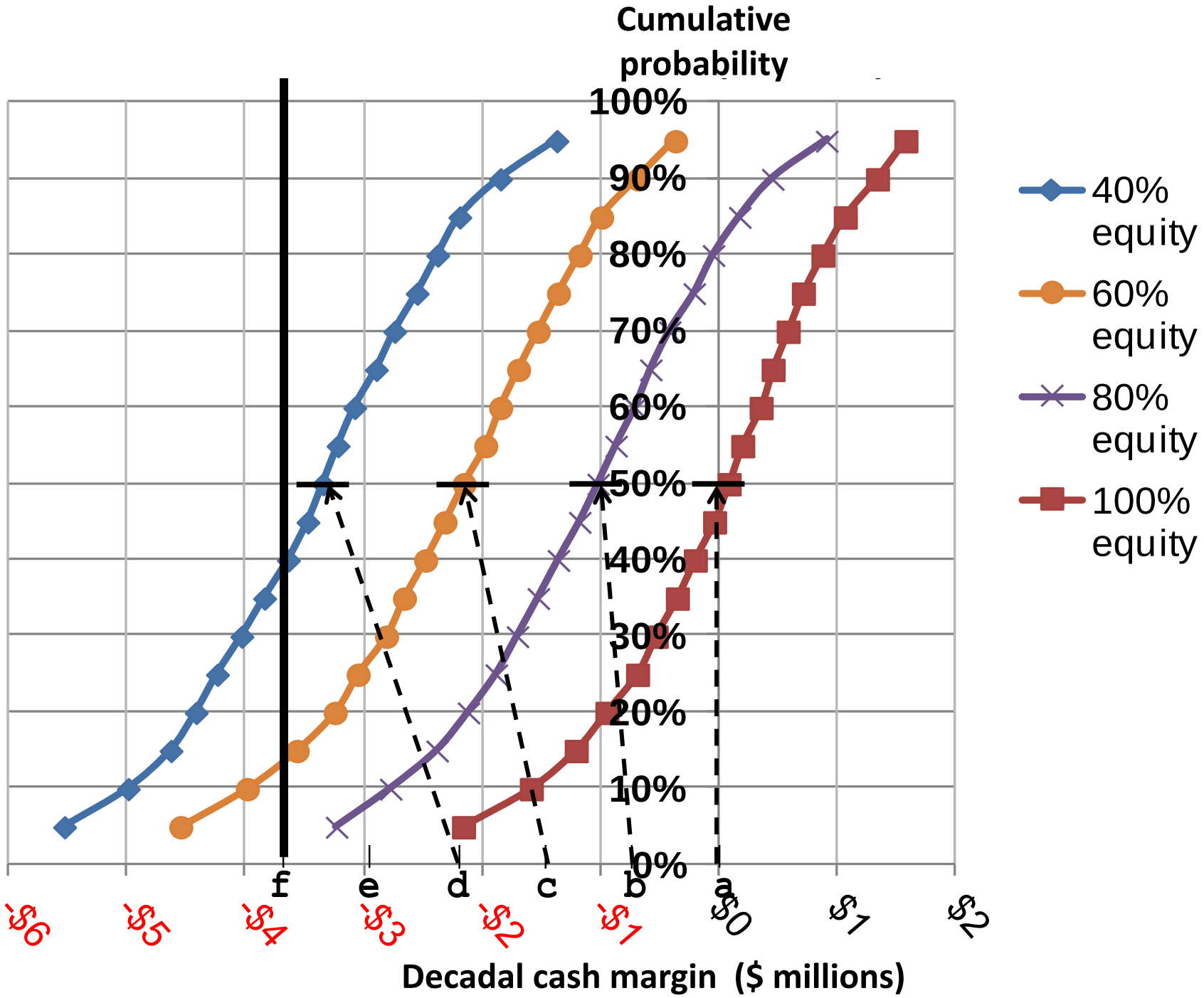

Cumulative probability
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Option 5
Perennials
dse/ha
5
10
15
20
5
4
3
2
1
0
1
$ million


Cumulative Probability
Annualised whole-farm decadal cash margins ($ thousands)
100
0
-100
-200
-300
-400
-500
0
5
10
15
20
dse/ha
Annuals
Decile 9 decades 0.9
Best
median decades 0.5
Decile 1 decades 0.1
Worst


Cumulative Probability
Annualised whole-farm decadal cash margins ($ thousands)
100
0
-100
-200
-300
-400
-500
0
5
10
15
20
dse/ha
Perennials
Decile 9 decades 0.9
Best
median decades 0.5
Decile 1 decades 0.1
Worst

Because the whole-farm SMA results with perennial pasture options (all mainly lucerne) appear to dominate those for annual pastures, we simplify the remaining discussion by focusing only on perennial Option 5 (75% lucerne).


Cumulative probability
Sheep-pasture enterprise, no debt or interest
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
dse/ha
5
10
15
20
Main effects are of price and weather variations over time.
Includes supplementary feed costs in dry periods
-$200
$0
$200
$400
$600
Gross margin, $/ha/year


Cumulative probability
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
f
e
d
c
b
a
-$6
-$5
-$4
-$3
-$2
-$1
$0
$1
$2
Decadal cash margin ($ millions)
40% equity
60% equity
80% equity
100% equity

CONCLUSIONS

- We have shown how whole-farm modelling with SMA , considering all costs, price & weather variations and equity, can generate risk profiles of decadal cash balances for different farm practices (e.g., pasture species & stocking rates)

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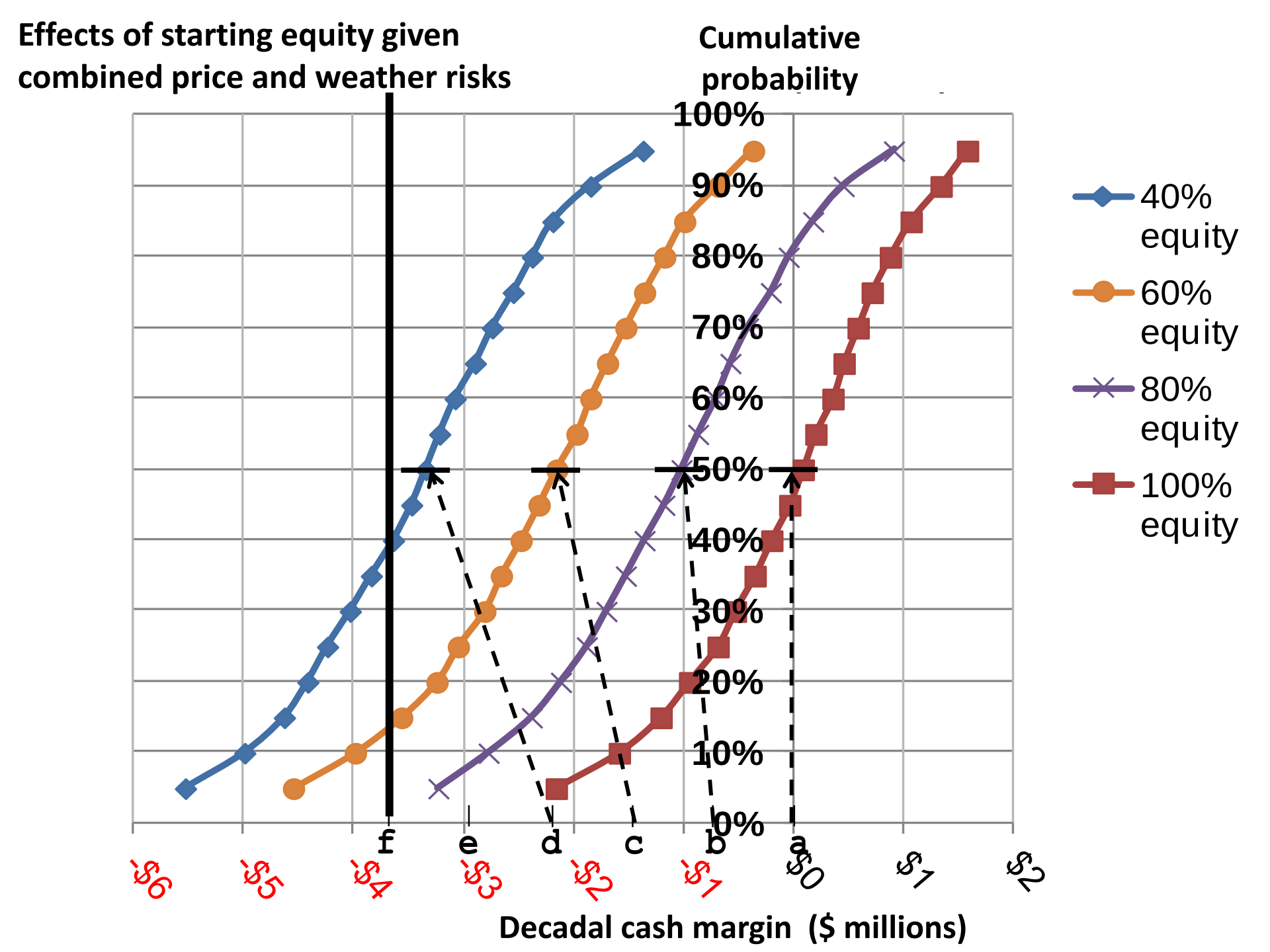
- Advice based only on partial budgeting (e.g., LP) can be misleading

CONCLUSIONS

- We have shown how whole-farm modelling with SMA , considering all costs, price & weather variations & equity, can generate risk profiles of decadal cash balances for different farm practices (e.g., pasture species & stocking rates)

- Advice based only on partial budgeting (e.g., LP) can be misleading

- Farm debt can accumulate rapidly by following advice to increase income based simply on gross margins under average conditions, without regard for price and weather variability.


Effects of starting equity given combined price and weather risks
Cumulative probability
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
f
e
d
c
b
a
-$6
-$5
-$4
-$3
-$2
-$1
$0
$1
$2
Decadal cash margin ($ millions)
40% equity
60% equity
80% equity
100% equity

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