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

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A FRAMEWORK FOR MODELLING WHOLE-FARM FINANCIAL RISK

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GRDC  AARES 2015  Feb 10-13  Rotorua, New Zealand
Final slide first: effects of starting equity given combined price and weather risks
Q: Can “best-practice” advice be justified using partial budgeting with average conditions, without including risk?
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- We compare sequential multi-variate analysis (SMA) including @RISK (Hutchings, 2013) with a linear programming (LP) analysis (Bathgate et al, 2010)
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• Case study is a rainfed mixed-farm in Coolamon
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- SMA is a whole-farm multi-period approach, which considers all costs, price & weather variations & equity, over random decades to generate risk profiles of decadal cash balances
- 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

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**Paddock area**

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**Total:** 1,000

**Case study farm:**

- Rainfed mixed-cropping
- Coolamon area of NSW
Options for the 4-year pasture phase

- Lucerne
- Phalaris
- Chicory
- Annuals

Pasture species and areas sown (ha)
Average profits, by partial budget (LP) and by SMA considering price & Wx risks

Annual

Option 1

Option 2

Option 3

Option 4

Option 5

Perennial pastures
Feed requirements increase with stocking rates and dry conditions

Supplementary feed required (t/year)

Stocking rate (dse/ha)

Pasture deficit year

- △ Highest 10%
- ■ Median
- ○ Lowest 10%
The slides that follow give results from Sequential multivariate analysis (SMA) (Hutchings PhD, 2013)
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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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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.

Expressed as **CDFs** (cumulative distribution functions)
Annualised decadal cash-flow reductions due to interest ($'000)
Cumulative probability

Option 1

Annuals

Option 5

Perennials

$ millions

Cumulative probability

dse/ha

Option 1

Annuals

Option 5

Perennials

$ millions

Cumulative probability

dse/ha
Annualised whole-farm decadal cash margins ($ thousands)

Cumulative Probability

Decile 9 decades
Best

Decile 1 decades
Worst

Perennials

Annual av. cash margin
DSE/ha
Option 1 including crop
0.9
0.5
0.1
Probability

Annual av. cash margin
DSE/ha
Option 5 including crop
0.9
0.5
0.1
Probability

Annuals
Perennials

Cumulative Decile
1 decades median decades
Decile 9 decades
Worst
Best

1
1

dse/ha
0 5 10 15 20
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).
Sheep-pasture enterprise, no debt or interest

Main effects are of price and weather variations over time.
Includes supplementary feed costs in dry periods.
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
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• 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

Decadal cash margin ($ millions)

- 40% equity
- 60% equity
- 80% equity
- 100% equity
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