

Risk and decision making in agriculture

David Pannell
Behavioural Science Team, UWA

With Fay Rola Rubzen, Fiona Dempster, Ben White, Jon Sarmiento, Marit Kragt

Much existing research

- Risk (usually including upside and downside)
 - 11,000 papers in economics
 - 1,000 in agricultural economics
- Behavioural science
 - A booming field generally
 - Just getting started in agriculture
 - But about 2,000 papers on adoption of new practices by farmers

RISK IN AGRICULTURE

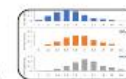
A series of easy-to-read discussions, explanations and examples

Risk in Australian grain farming



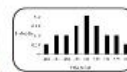
Risk is a pervasive issue in agriculture, arising from many sources and affecting every farm-related decision farmers make.

Risk means probability distributions



Risk is a situation where there is a probability distribution of outcomes.

Farmers' risk perceptions



Risk perceptions are about how risky someone thinks a particular strategy is.

Diversification to reduce risk



Diversification is one of the most effective and widely used ways to reduce risk.

Strategic decision, tactical decisions & Risk



Strategic decisions chart a general direction while tactical decisions are about deviations from that general direction.

Risk aversion and fertiliser decisions



Changing fertiliser rate has little impact on the riskiness of a crop

Farmers' risk preferences



Risk preferences are about how much the person cares about the riskiness of a strategy.

Intuitive vs analytical thinking about risk



Analytical thinking is slow whereas intuitive thinking is quick. Intuitive thinking can lead into biases or misjudgments.

Learning about riskiness



It takes time to learn how risky a new practice is, especially if it is novel.

More articles coming soon

What do we know?

- Most farmers are risk-averse
 - Consider both downside and upside
 - Give more weight to downside
 - Will sacrifice some profit to avoid risk
- But not very risk-averse
- A minority are highly risk averse
- A few seem to be risk seeking

- “Loss aversion” = an extreme form of risk aversion



Risk aversion is not the main game

- Less important than
 - Good information to base decisions on
 - A good decision process
 - Skills
 - Preferences
 - Tactical adjustments

Farmers perceive risks differently

- Three farmers predicting wool prices in the late 1990s

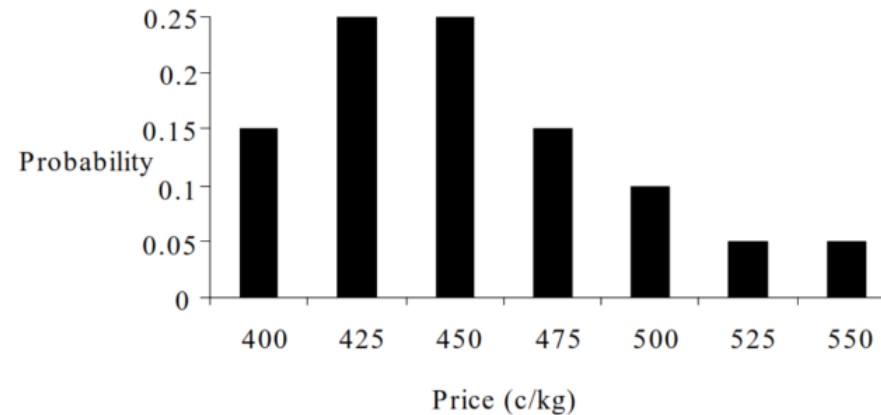


Figure 7.9 (b) Woolgrower number 9 price distributions for 21 micron fibre

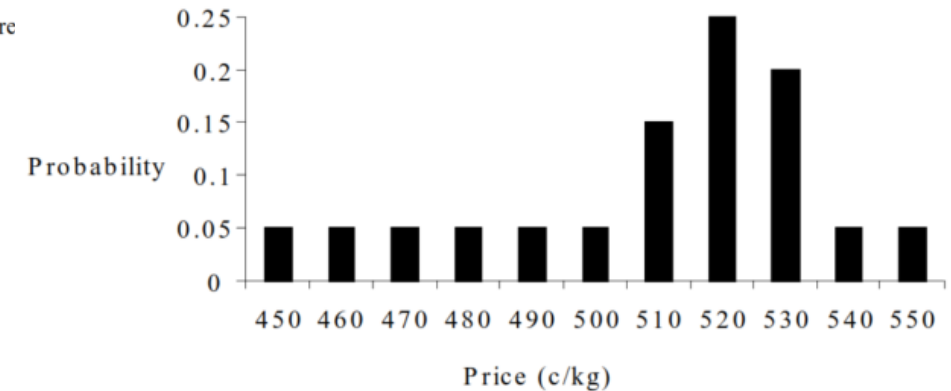
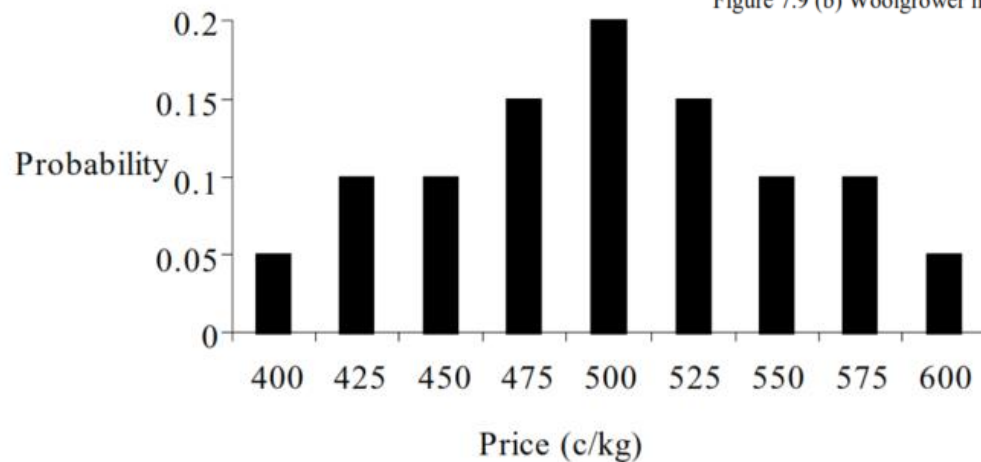


Figure 7.9 (c) Woolgrower number 11 price distributions for 21 micron fibre diameter wool.

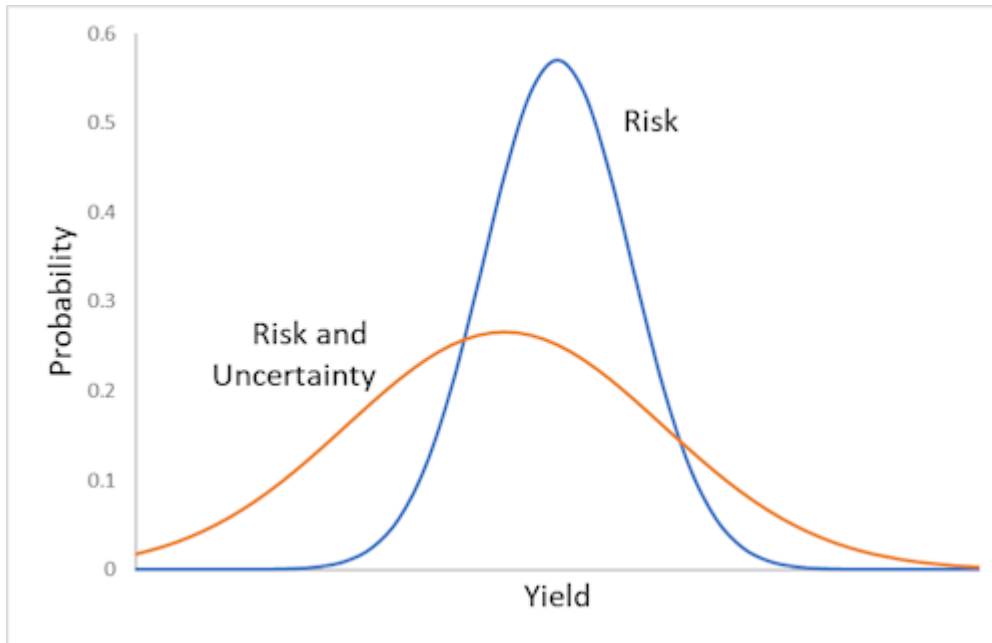
Risk versus uncertainty

- Risk = Randomness but known probabilities
- Uncertainty = Lack of knowledge
- All farming practices have risk
- New/novel farming practices have high uncertainty as well

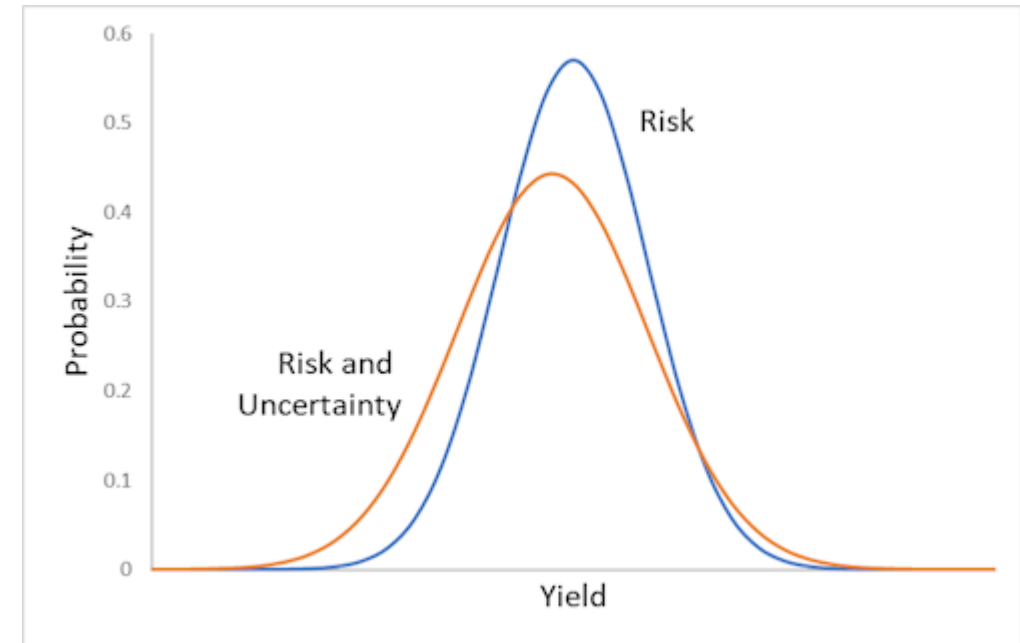


Learning reduces uncertainty

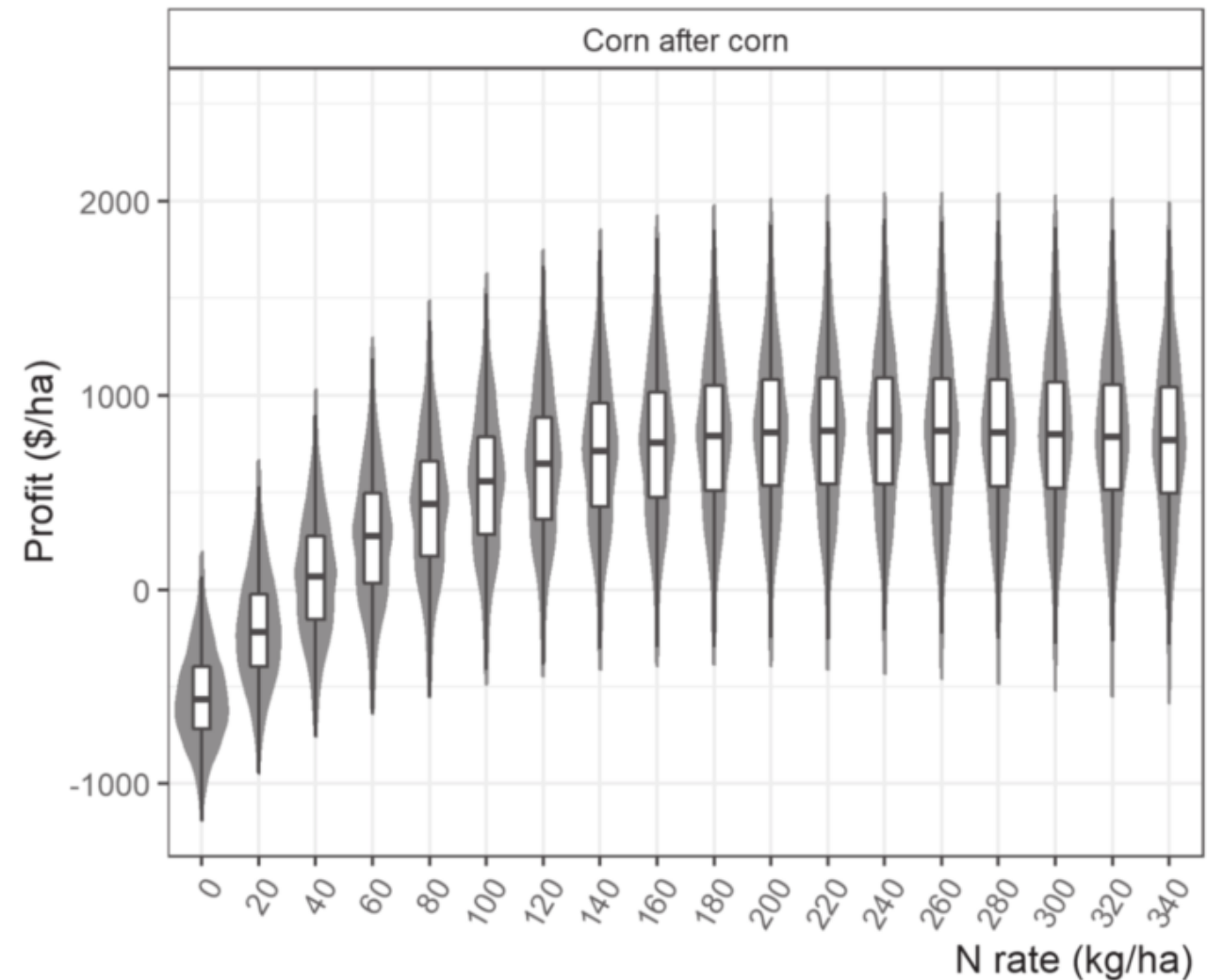
New/novel practice



Old/established practice



- Risk can be hard to pin down
- Getting a good read takes time (e.g. US farmers)
- It can change
- Even if production is risky, it may not matter much in a decision



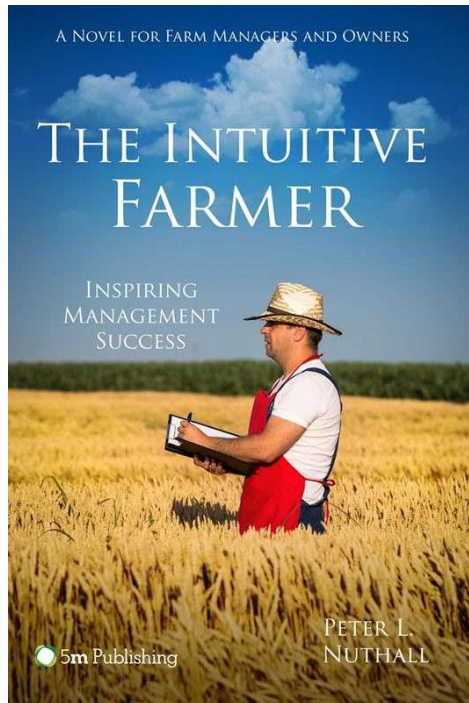
Approaches to decision making

- Fast

- Intuitive

- Slow

- Analytical, reflective



Microsoft Excel - ANOVA_CMFACTOR_thesis

ANOVA CM FACTOR (10% ADDITION LEVEL)					
	MDMS	MDLS	LDMS	LDLS	HDSS
1	0.63	0.61	0.53	0.58	0.44
2	0.62	0.58	0.52	0.63	0.47
3	0.63	0.59	0.54	0.49	0.43

Source of Variance	SS	df	MS	F	P-value	Fcrit
Between Groups	0.0555386	4	0.013884639	13.39004194	0.0005026	3.4780498
Within Groups	0.0104441	10	0.001044406			
Total	0.0662828	14				

Treatment	Treatment	Difference	Critical value		Conclusion
			LSD	Omega	
31	MDMS	0.0238	0.0345	0.0888	-
32	MDLS	0.0971	0.0345	0.0888	Sign. Diff.
33	LDMS	0.0637	0.0345	0.0888	-
34	LDLS	0.1777	0.0345	0.0888	Sign. Diff.
35	HDSS	0.0652	0.0345	0.0888	-
36	MDLS	0.0339	0.0345	0.0888	-
37	LDLS	0.1459	0.0345	0.0888	Sign. Diff.
38	HDSS	-0.0334	0.0345	0.0888	-
39	LDMS	0.0806	0.0345	0.0888	-
40	HDSS	0.1140	0.0345	0.0888	Sign. Diff.

Conclusion: MDMS and LDMS are significantly different, but MDLS and D are not. However, E is significantly different with all at 10% level except with LDMS. Particle size does not make effect, except if it becomes powder, density may make difference at medium size.

'A lifetime's worth of wisdom'
Steven D. Levitt, co-author of *Freakonomics*

The International
Bestseller

Thinking,
Fast and Slow



Daniel Kahneman
Winner of the Nobel Prize



Farmers often intuitive ($\approx 33\%$)

- Gut feel, based on experience, judgement, and personal preferences
- Often results in good decisions
 - Repeated decision
 - Clear feedback on results
 - Learning has occurred
- But not always
 - One-off decisions
 - Novel situations
 - Poor feedback (underground or long term)



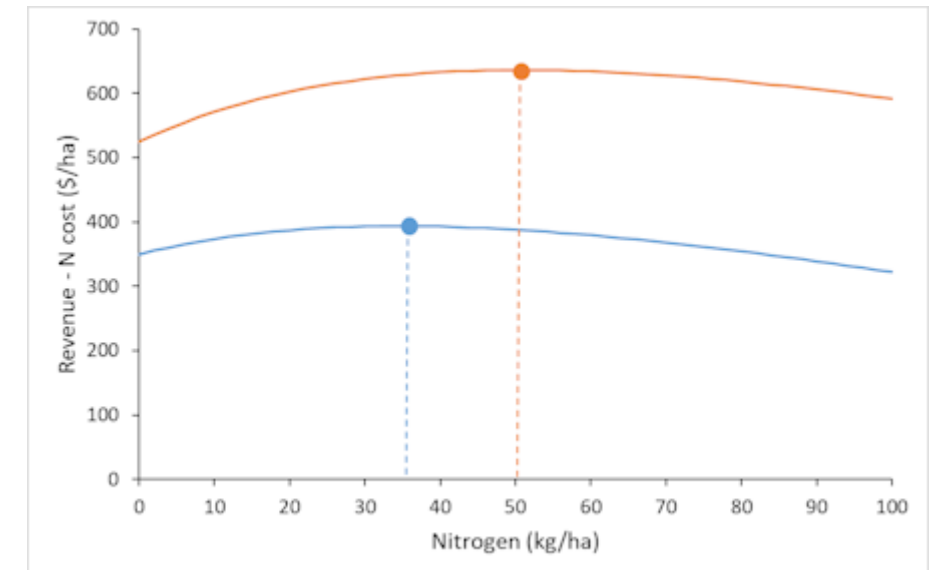
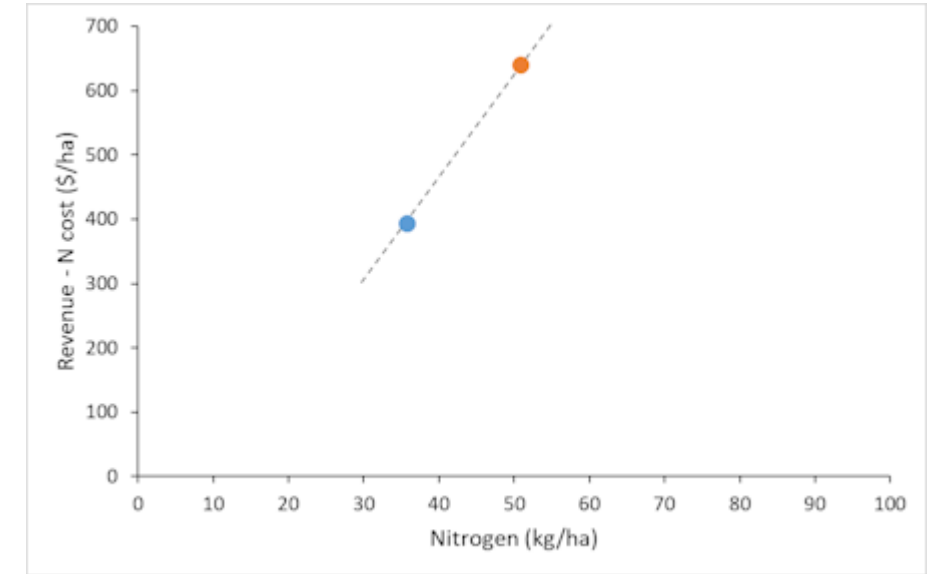
Our brain has various quirks/biases

- It looks for patterns and causes
- It likes a coherent story
- It remembers some things more easily than others



Example

- N expensive → Dave applies less
- Poor yield
- It was mainly due to short season
- Biases kick in
 - There's a clear pattern
 - There's a coherent story
 - Low N rate is salient
- Feels like low N rate played a role
- Influences later decisions



We may neglect risks in big investments

- 30 years of rail projects, world-wide
 - Over-estimated passengers by 100%
 - Costs were 100% more than estimated
- New Scottish parliament building approved for construction in 1997
 - Initial budget £40 million
 - Final cost £431 million
- Seems to be a problem for large one-off investments (in ag??)
- Strategies: evidence, analysis, review



Analysis

- Analysis can be highly complex
- Or relatively simple
 - Be clear about the options
 - Collect evidence
 - Do some sums
 - What-if analysis
 - All-things-considered judgement

RiskWi\$e 100-farmer panel

● Benefits of participation

- Understand their decision making relative to others
- Understanding decision traps to avoid
- Learn strategies for risky decision making
- Priority access to RiskWi\$e outputs

● Benefits to RiskWi\$e

- Captive audience
- Test out ideas (e.g., communication, graphs)
- Measure changes in thinking/approach in more depth than the simple survey

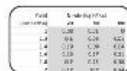
Other activities of Behavioural Science team

- Specific research/analysis: price risk
- Identifying decision tools that address risk
- Brief videos: Barry and Dave
- Pannell Discussions

RISK IN AGRICULTURE

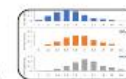
A series of easy-to-read discussions, explanations and examples

Risk in Australian grain farming



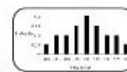
Risk is a pervasive issue in agriculture, arising from many sources and affecting every farm-related decision farmers make.

Risk means probability distributions



Risk is a situation where there is a probability distribution of outcomes.

Farmers' risk perceptions



Risk perceptions are about how risky someone thinks a particular strategy is.

Diversification to reduce risk



Diversification is one of the most effective and widely used ways to reduce risk.

Strategic decision, tactical decisions & Risk



Strategic decisions chart a general direction while tactical decisions are about deviations from that general direction.

Risk aversion and fertiliser decisions



Changing fertiliser rate has little impact on the riskiness of a crop

Farmers' risk preferences



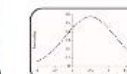
Risk preferences are about how much the person cares about the riskiness of a strategy.

Intuitive vs analytical thinking about risk



Analytical thinking is slow whereas intuitive thinking is quick. Intuitive thinking can lead into biases or misjudgments.

Learning about riskiness



It takes time to learn how risky a new practice is, especially if it is novel.

More articles coming soon