Selecting for ‘sustainability’ in Australian beef cattle

Matt Wolcott

Animal Genetics and Breeding Unit[1]

[1] *AGBU is a joint institute of NSW DPIRD and the University of New England.*

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Outline

- ‘Sustainability’ from a selection perspective.
- Can ‘sustainability’ = genetic profitability?
- New research:
  - Cow body composition as a key component of sustainable (& profitable) beef production.
  - Selecting to improve methene emissions.

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What is sustainability ?

- A broad term comprising lots of component traits.
- Importance of traits can vary significantly for different production systems.
- Not all traits are directly related to profitability…… yet.

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What is sustainability ?

- Politicians, policy makers and the public:
  - Social responsibility.
  - Animal welfare.
  - Personnel welfare.
  - Environmental impact (including methane).
  - Profitability.

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What is sustainability ?

- What can we improve by selection?
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What is sustainability ?

- What can we improve by selection?
  - Feed efficiency (NFI), tropical adaptation.
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What is sustainability ?

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  - NFI, cow size & condition, reproduction, CH_4.
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    - Growth & carcass traits, structure, etc.

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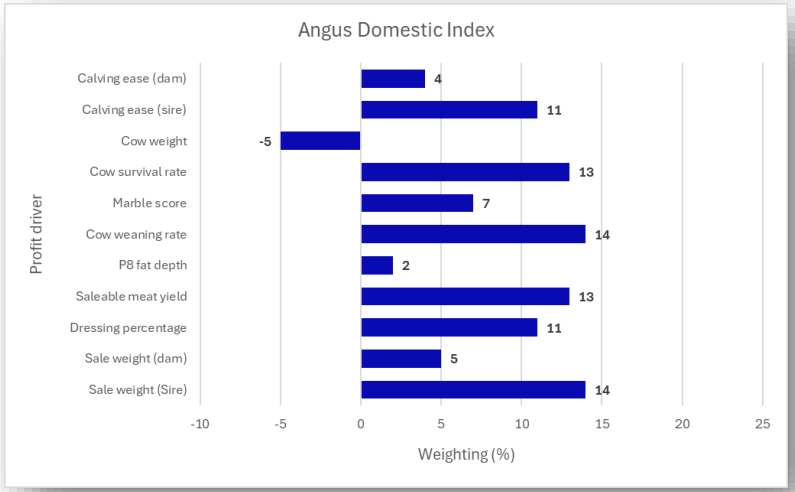
Does profitability = sustainability ?

Well constructed selection indexes

- Currently include descriptors of:
  - Cow size.
  - Temperament.
  - Reproduction & calving ease.
  - Feed efficiency (for some breeds).
  - Polledness is covered by genomic testing.
- What needs to be added?
  - Cow capacity to maintain body composition.
  - Methane emissions.
    - Carbon price already built in if it happens.



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Improving description of genetic sustainability

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Improving description of genetic sustainability

1. Cow body composition

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Improving description of genetic sustainability

1. Cow body composition

- The ability of lactating females to maintain body condition through the annual cycle.

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Improving description of genetic sustainability

1. Cow body composition

- The ability of lactating females to maintain body condition through the annual cycle.

- Key driver of profitability & sustainability:
  - Helps us understand feed requirements for $Indexes.
    - And, therefore, closely associated with feed costs.
  - Associated with survival as conditions get tougher.

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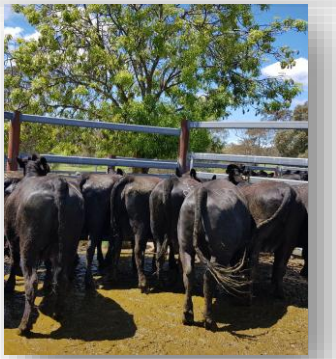
Improving cow productivity by selection

1. New Cow body composition research



- Include objective descriptors of cow condition.
  - In wet first calf cows at Mating 2.
  - When cows tend to be at the lowest condition of their lives.
  - When condition most impacts productivity.

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Improving cow productivity by selection

1. New Cow body composition research

- Requires collection of new data.

Improving cow productivity by selection

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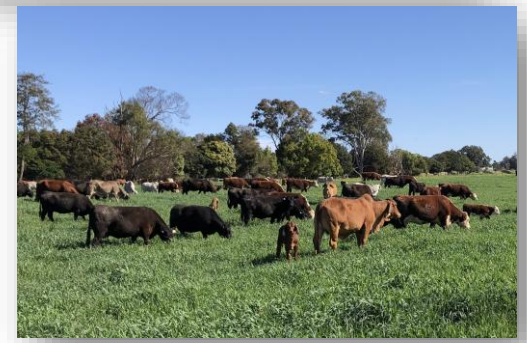
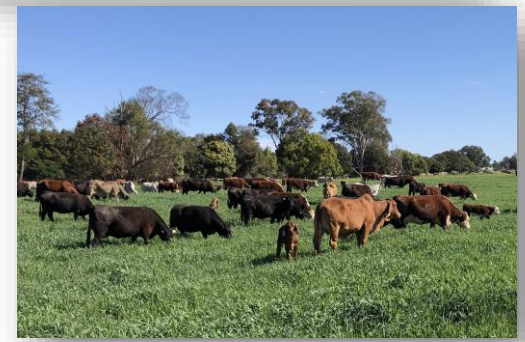
- Requires collection of new data.
    - In seedstock and research herds.



Improving cow productivity by selection

1. New Cow body composition research

- Requires collection of new data.
  - In seedstock and research herds.
  - Scanning wet first calf cows into mating 2.
    - P8 & RIB fat depth.
    - Eye muscle area.
  - While recording weight, hip height and condition score.



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Improving cow productivity by selection

1. New Cow body composition research

- Describe cow condition in wet cows at their second mating.

  Liveweight.

  Hip height.

  Scanned fat depth.

  Scanned EMA.

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Improving cow productivity by selection

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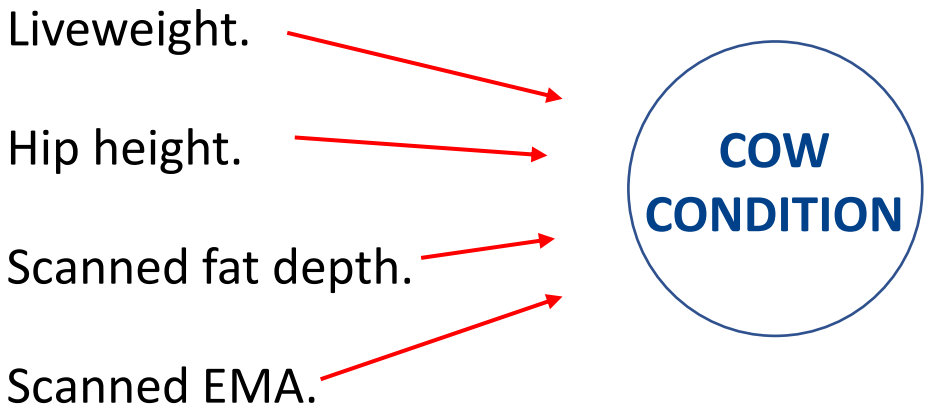

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Improving cow productivity by selection

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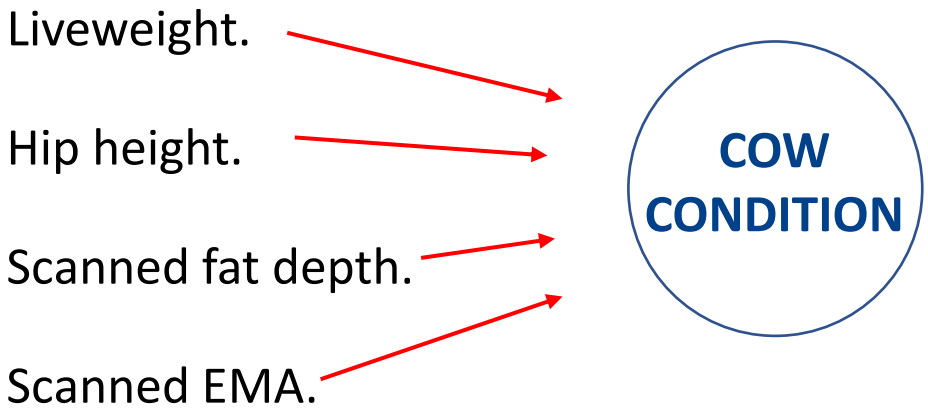

- Expressed in BCS units.
- Includes all information from objective traits.
- ***Should be more heritable***.

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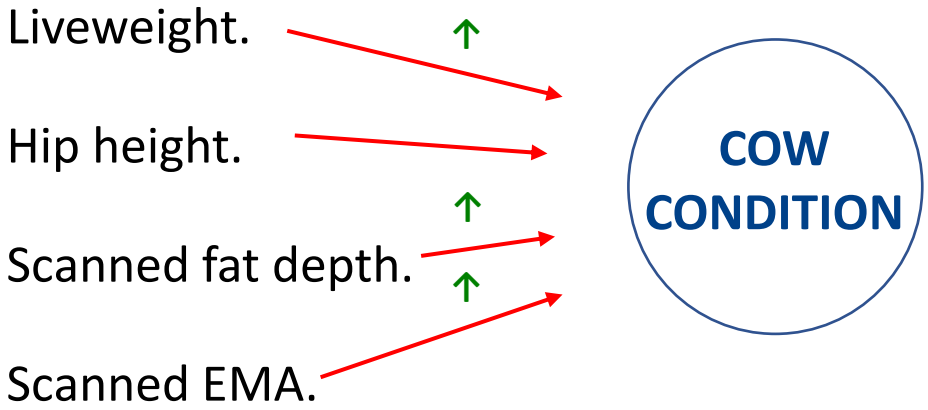
Improving cow productivity by selection

1. New Cow body composition research

- ***When adjusted to a constant level for all other traits.***



Improving cow productivity by selection

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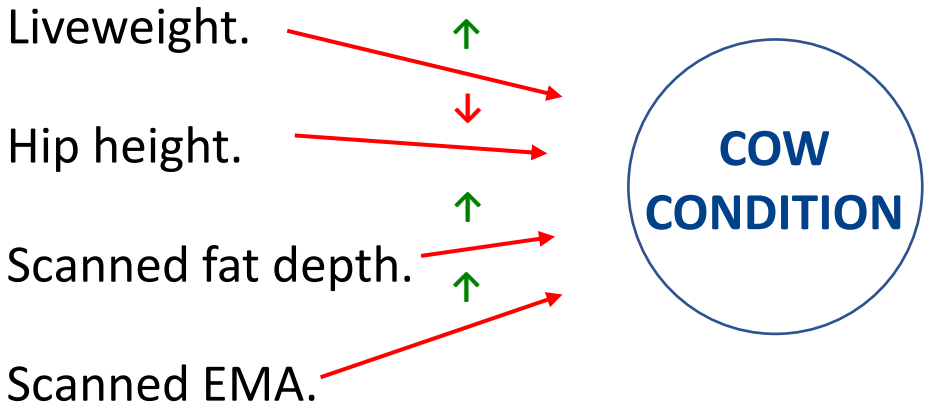
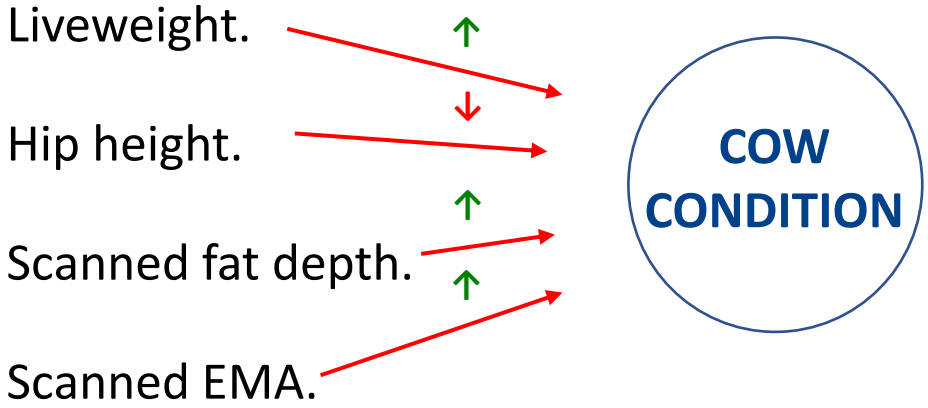


Improving cow productivity by selection

1. New Cow body composition research

- This new cow body composition trait is:



- More heritable (0.3 – 0.5).

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Improving cow productivity by selection

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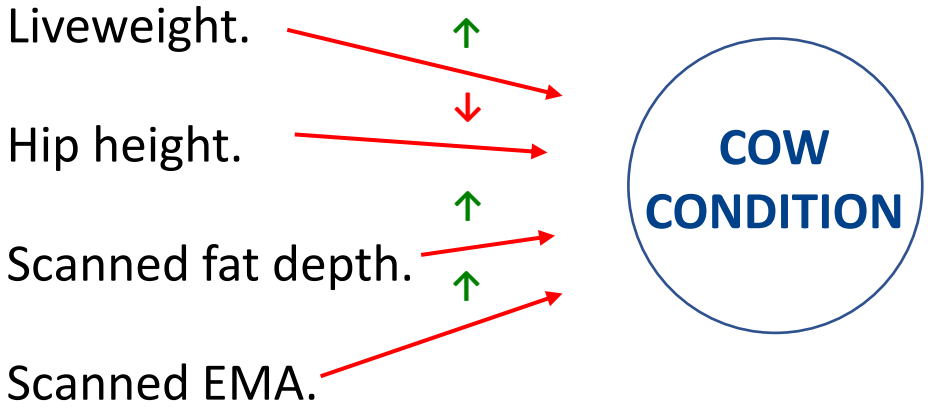
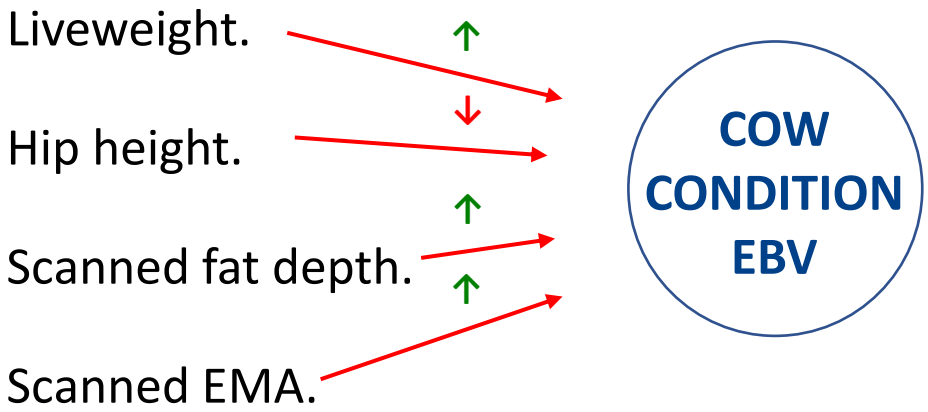


- More heritable (0.3 – 0.5).
- Greater range in EBVs.

Improving cow productivity by selection

1. New Cow body composition research

- This new cow body composition trait is:



- More heritable (0.3 – 0.5).
- Greater range in EBVs.
- Greater opportunity for selection.

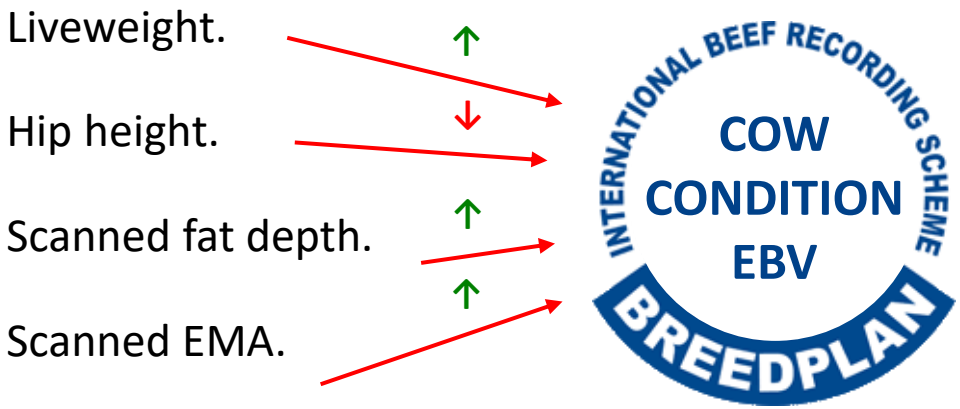
OR

- To monitor cow genetic condition while improving other traits.

Improving cow productivity by selection

1. New Cow body composition research

- Currently working on a BREEDPLAN EBV for CBC.



- Include relationships with other BREEDPLAN traits.
- Better description of cow energy requirements in $Index calculation.

→ Improved modelling of feed requirements in $Index development.

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Improving cow productivity by selection

1. New Cow body composition research

- Where to next ?
  - Continue to collect records in influential seedstock herds.
  - And in reference population projects.
    - BINs / Sire benchmarking projects.
    - Southern Multi-breed data.
  - PhD student starting in October.

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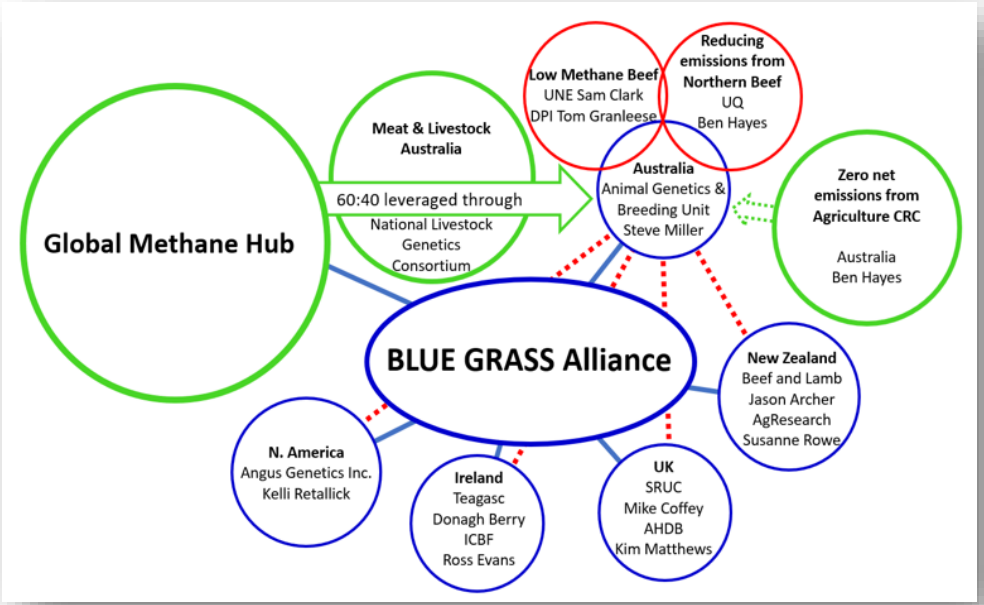
Improving cow productivity by selection

2. Can we select to improve methane emissions in beef ?

Improving cow productivity by selection

2. Can we select to improve methane emissions in beef ?

Major international research effort to reduce agricultural emissions



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Improving cow productivity by selection

2. Can we select to improve methane emissions in beef ?

- How do we measure methane emissions in livestock?

Improving cow productivity by selection

2. Can we select to improve methane emissions in beef ?

- How do we measure methane emissions in livestock?
  - Respiration chambers.
    - Very accurate measure of CH_4 emissions.
    - Extremely expensive.
    - Only capable of measuring low numbers.
    - Provide the gold standard.

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Improving cow productivity by selection

2. Can we select to improve methane emissions in beef ?

- How do we measure methane emissions in livestock?
  - –GreenFeeds™ system.
    - Expensive units (~120K).
    - Two year waiting period.
    - Imperfect estimators of CH_4 emissions.
    - Can generate more records.
      - – Though not as many as we hoped.
      - – Group sampling is an issue.

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2. Can we select to improve methane emissions in beef ?

- Methane production under moderate genetic control
  - Heritabilities range from 0.2 – 0.4 (depending on units & how recorded).

- Is methane production genetically related to other traits?
  - Differences in LWT strongly genetically related to CH_4 production(g/d).
  - Lower NFI moderately genetically related to lower CH_4 intensity.
  - Not a lot of other strong genetic relationships.

Improving cow productivity by selection

2. Can we select to improve methane emissions in beef ?

- Where to next ?
  - NEED more Methane emissions data.
    - Large international research effort (Australia heavily involved).
    - Need gold standard (respiration chamber) data.
    - And investigation of potential indicator traits.
      - Feed efficiency.
      - GreenFeeds style methane samplers.

Improving cow productivity by selection

2. Can we select to improve methane emissions in beef ?

- Where to next ?
  - NEED to analyse Methane data to better understand:
    - How to correctly model environmental factors.
    - To properly describe genetics of this new trait.
    - So we can accurately estimate heritability.
    - And the degree to which we can change CH_4 by selection.

Take home messages

Conclusions

- Genetic profitability provides a basis for selecting to improve many of the factors which impact ‘sustainability’.
- Current research focused on filling gaps:
  - Cow body composition.
  - Methane emissions.

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Flock management, healthy animals and profit

Prof Bruce Allworth

Charles Sturt University

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Take home messages

- Having good animal health is important
- Management decisions influence animal health
  - If make a management change, think about health outcomes
  - If have animal health problem, think about management
- Restricted joining is key to tight management
- Seek good information on animal health

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Why are healthy livestock important?

- Of course

  so they can be productive, and

  decrease costs associated with treatment

- But more importantly,

  so you can increase / maintain STOCKING RATE

Animal health has critical impact on ability to maintain stocking rate and optimize pasture utilisation

Health problems can get magnified at higher SR

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Management and animal health

- Most health issues relate to management

NB this does not mean the management is bad / wrong

Implications:

1. May need to alter management to solve health problem
2. Need to predict what health problems will occur when change management

(Do not want health problem to decrease benefit of change)

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Management and animal health - examples

- Non self-replacing flock- footrot and lice
- *Campylobacter* – rotational grazing, hand feeding late preg ewes
- Calcium issues – grazing crops
- Redgut- lucerne

Late winter / spring Lambing	Autumn lambing
Foot abscess	Preg tox
Weaner illthrift	Lower lamb %, lower productivity
Worms in autumn / winter	Worms in late spring

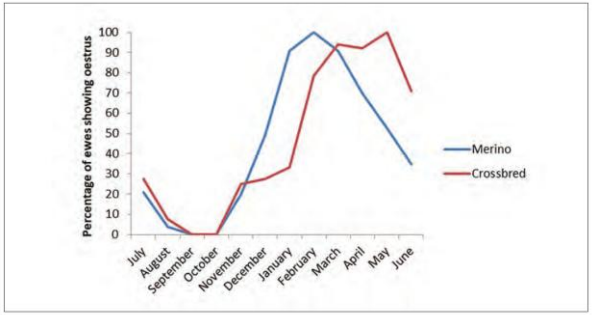
Key management decision - joining

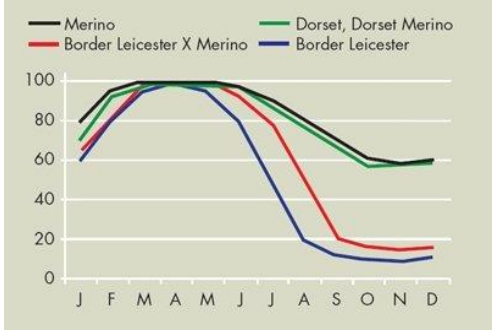
- When and for how long
- Lots of issues around when-
  - sheep are short day breeders
  - need lambs to a certain weight by pasture senescence
  - other farming operations
  - Markets, fodder availability - +/= lucerne etc

- For how long

  Remember, the longer you leave rams in, the more lambs you get AND that is WHY YOU NEED TO TAKE RAMS OUT!!!!!!!

Joining length





When do you take rams out?

Ewes cycle for 24-36 hrs (shorter in maidens /lambs)

Ewes cycle every 16-19 days – 17 days average

Ewes are short day breeders – so naturally cycle in autumn

Merinos are less seasonal than British Breeds

At each cycle expect 60-75% in lamb.

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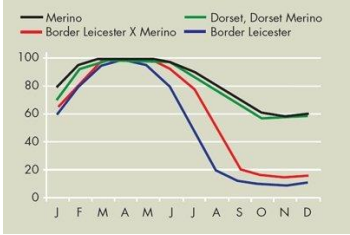
Joining length (cont)



If joining out of season, may get ram effect – two peaks 19 and 25 days post exposure (rams or teasers)

This means need to join for 42 days (6 weeks) to get two cycles 25+17

OR use teasers (14 days) and join for 4-5 weeks

(OR use melatonin)

DEPENDS ON cyclicity of ewes

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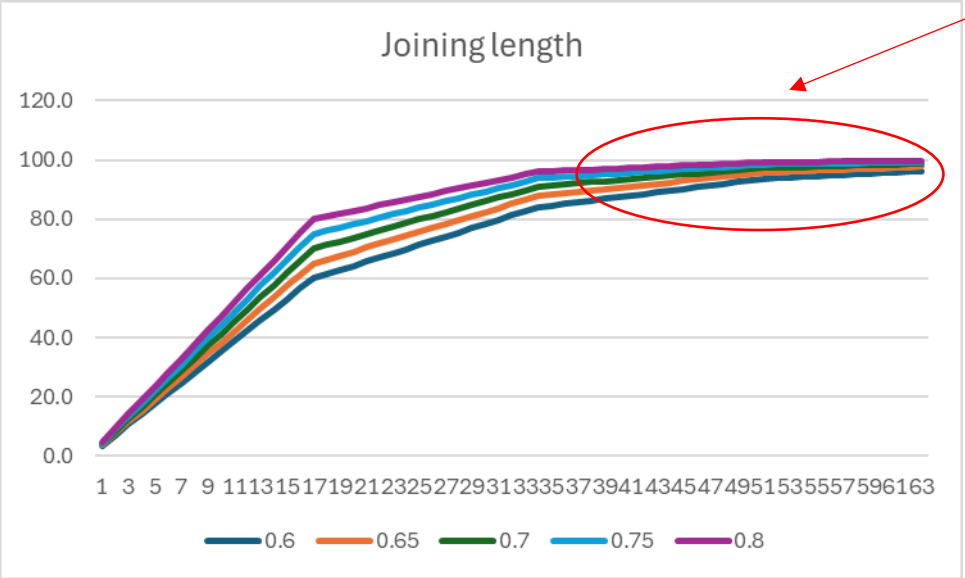
Joining length (cont)



A few extra lighter lambs

	65%	70%	75%
1 (17 days)	65%	70%	75%
2 (5weeks)	88%	91%	94%
3 (7 wks +)	96%	97%	98%

Autumn joining

Later lambs delay management

Tight lambing = tight management

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Joining length- why is it important

The question to ask is: are the extra lambs worth it?

Do you separate at scanning – early and late? How accurate?

Do you delay critical management steps as a result?

WEANING is critical timing for animal health AND next year's lambing %

Ewes need to put on weight for joining, and do that from after weaning

SERMON OVER!

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Animal Health issues

Worms – scour worms +/- Barber's Pole

Lice – new oral lice treatment- need to treat all sheep properly

Grazing crops- add supplements

Feet?

Abortions, Campyvax, *Brucella ovis*

Feeding lactating ewes – add fibre source (but not in late pregnancy)

What issues do you want discussed?

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You've goat this – fill out your M&E form!

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Afternoon tea

25 minutes

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Integrity Systems program updates

Demelsa Lollback

Integrity Systems Company

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Virtual farm tour – AgTech in action: a journey to enhance productivity

Kent Rochester

K & M Farming

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A late break - the risks and rewards

John Francis

Agrista

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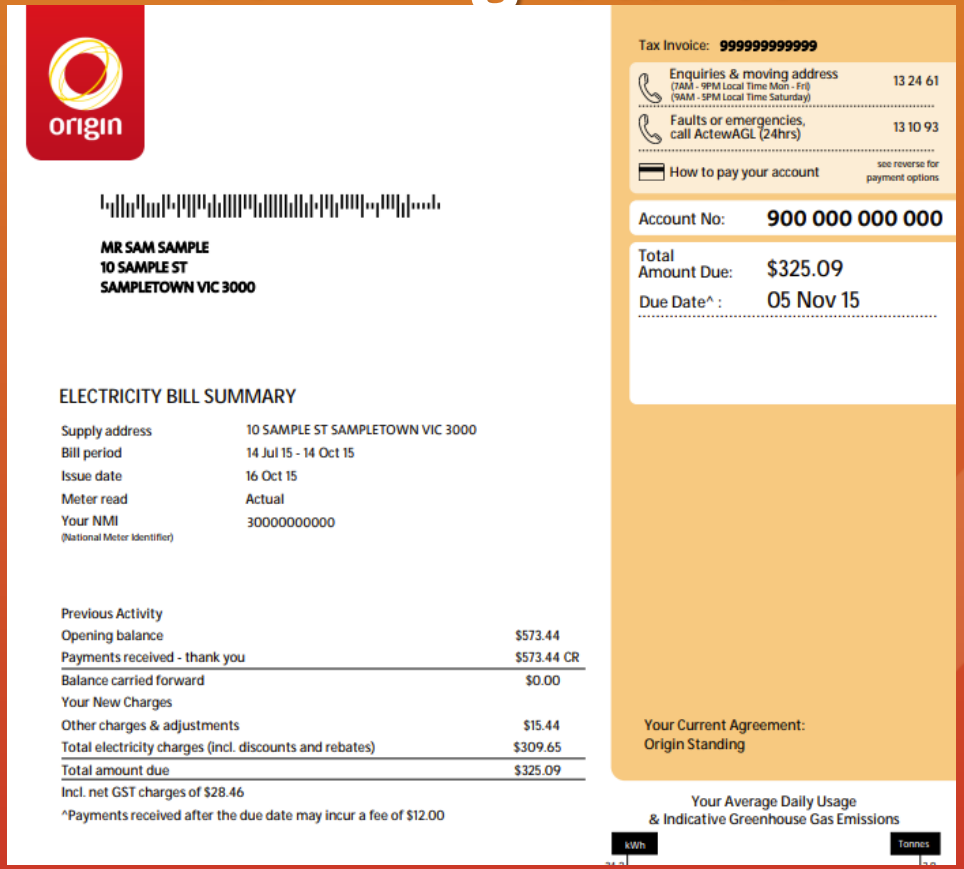
Today is a seed tomorrow the learning starts



origin

MR SAM SAMPLE
10 SAMPLE ST
SAMPLETOWN VIC 3000

Tax Invoice: 999999999999

Enquiries & moving address (7AM - 9PM Local Time Mon - Fri) (9AM - 5PM Local Time Saturday) 13 24 61

Faults or emergencies, call ActewAGL (24hrs) 13 10 93

How to pay your account see reverse for payment options

Account No: 900 000 000 000

Total Amount Due: $325.09

Due Date^ : 05 Nov 15

ELECTRICITY BILL SUMMARY

Supply address	10 SAMPLE ST SAMPLETOWN VIC 3000
Bill period	14 Jul 15 - 14 Oct 15
Issue date	16 Oct 15
Meter read	Actual
Your NMI (National Meter Identifier)	30000000000

Previous Activity	
Opening balance	$573.44
Payments received - thank you	$573.44 CR
Balance carried forward	$0.00
Your New Charges	
Other charges & adjustments	$15.44
Total electricity charges (incl. discounts and rebates)	$309.65
Total amount due	$325.09

Incl. net GST charges of $28.46

^Payments received after the due date may incur a fee of $12.00

Your Current Agreement:
Origin Standing

Your Average Daily Usage & Indicative Greenhouse Gas Emissions

kWh Tonnes

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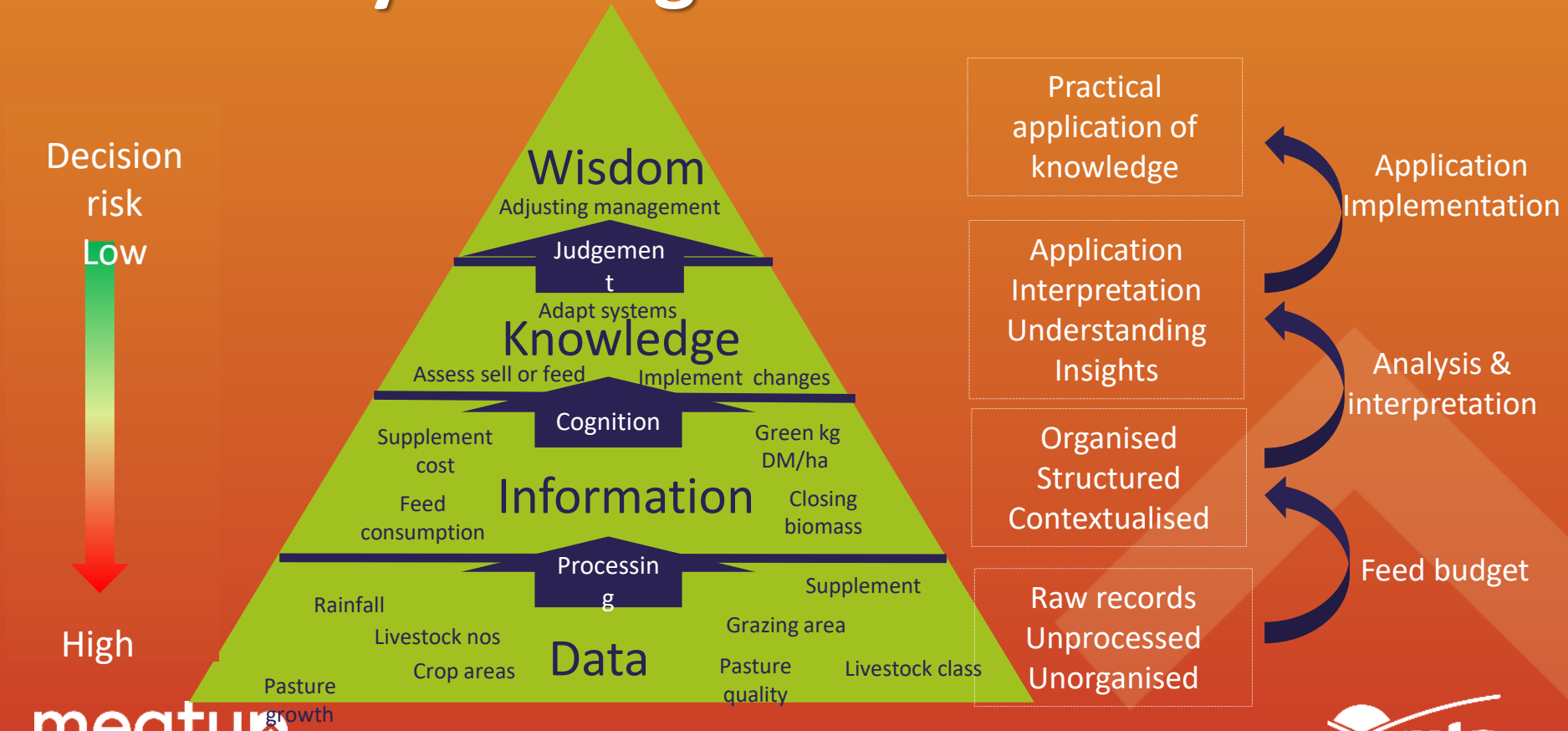
Start by turning data into information



The feed budget - from data to wisdom

Opening pasture inventory

+

Pasture growth

-

Pasture consumed

-

Pasture wasted

=

Closing pasture inventory

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Let's play a game – Choose between:

A certain $40

OR

You can flip a coin where:

Heads wins $100

Tails wins $0

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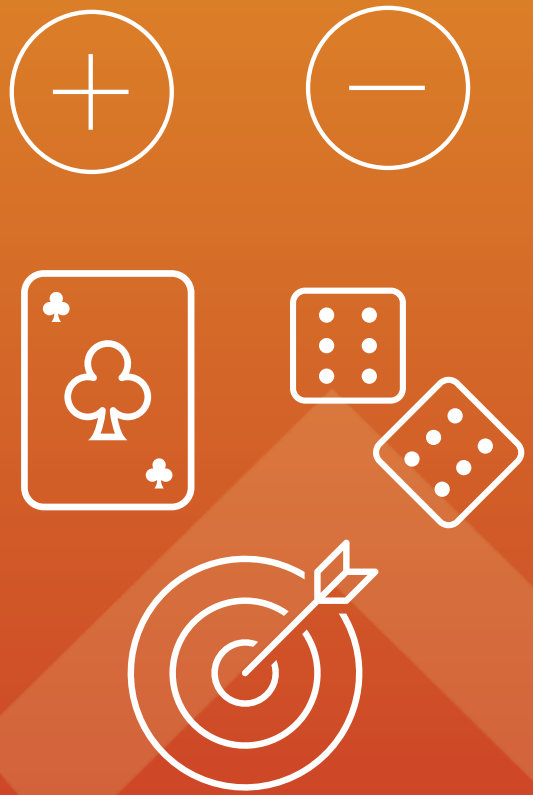
Risk - effect of uncertainty on objectives



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Source: ISO 31000:2018

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$1 million

Loss aversion bias is one of the biggest risks in livestock businesses

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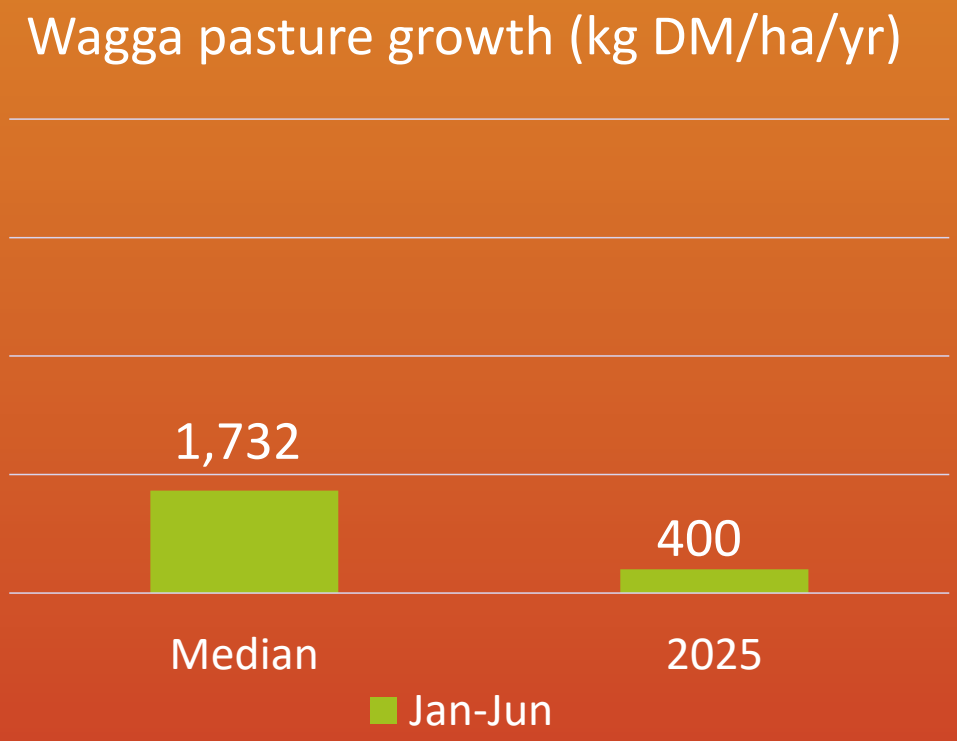
Quantifying the situation



Certain: Jan-Jun (end May)
Shortfall 1,300 kg DM/ha
27% DM produced

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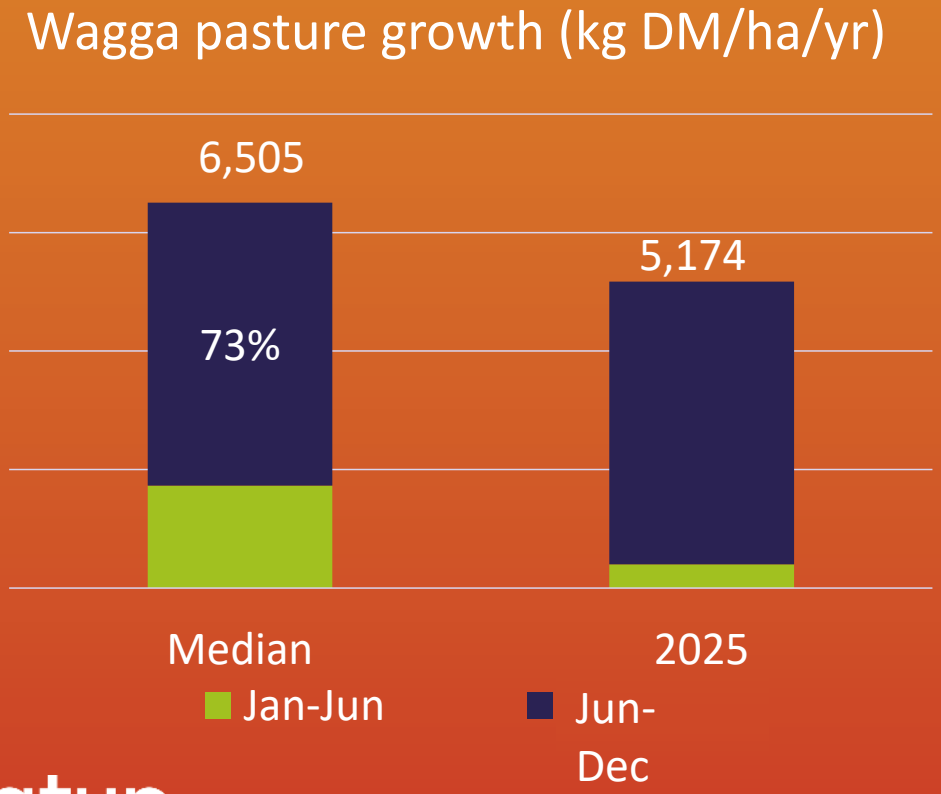
Quantifying the situation



Uncertain: Jun-Dec
50% probability of producing more than 4,774 kg DM/ha

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The price of certainty

Sell early
secure
certainty

Retain & feed
Uncertain
future

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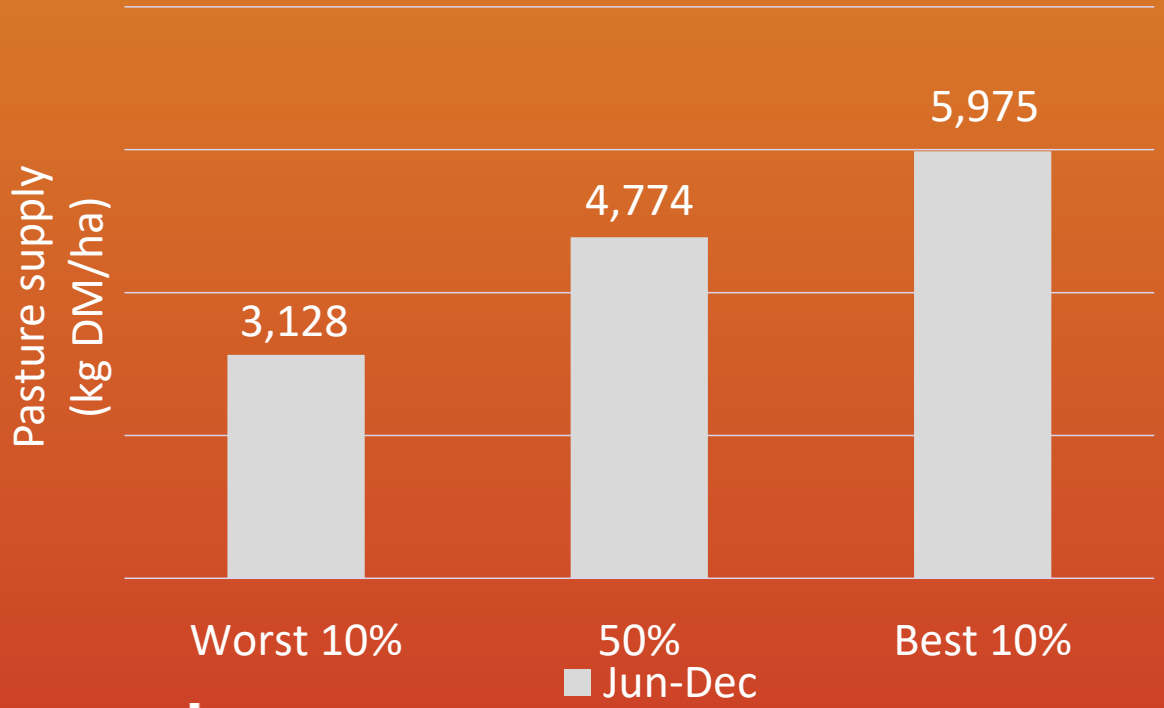
What does the uncertain future look like?



Locality: Wagga Wagga NSW

Source: Aussie grass

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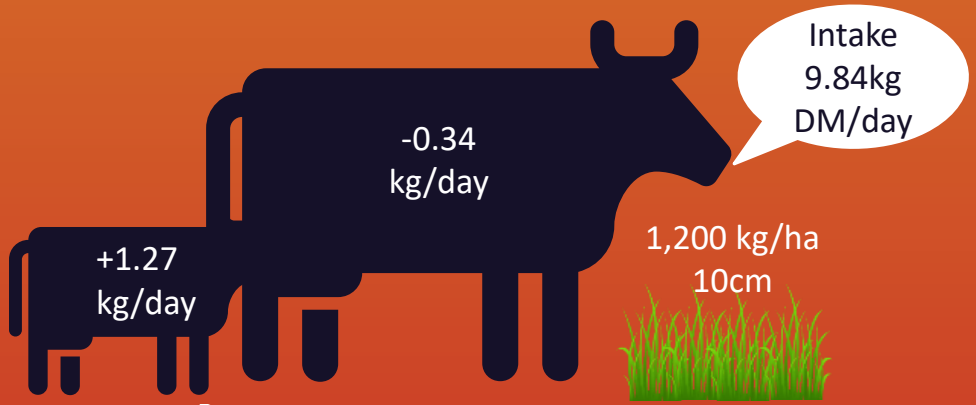
The value of alternative feed supplements eg Gibberellic acid



$82/ha

@

15 DSE/ha

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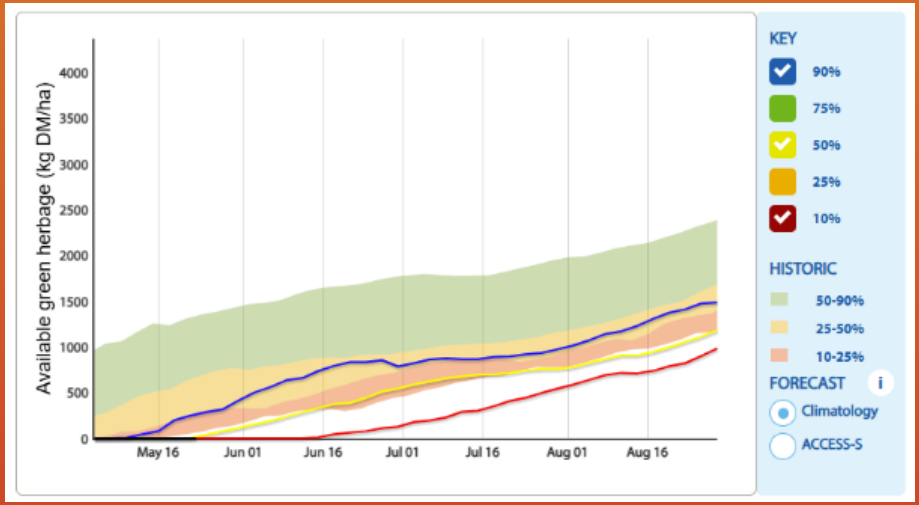
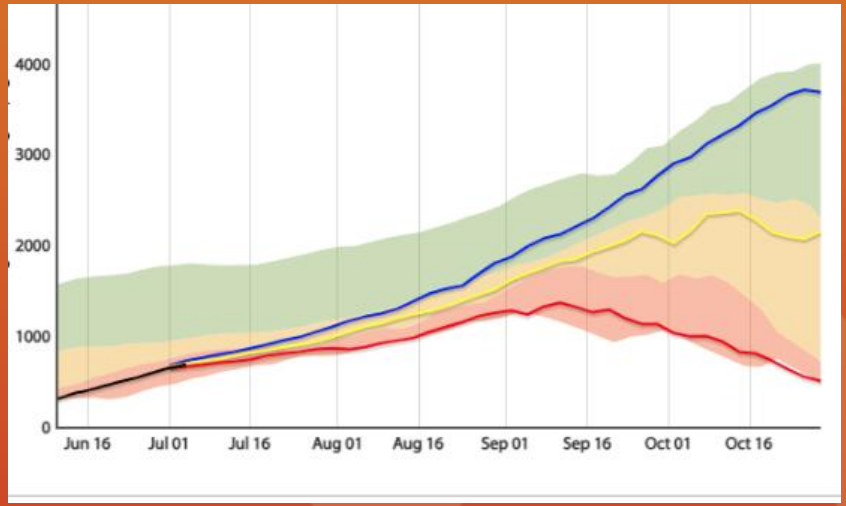
Things change – watch the indicators





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Source: Farming Forecaster

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Current - Borambola

Soil Moisture

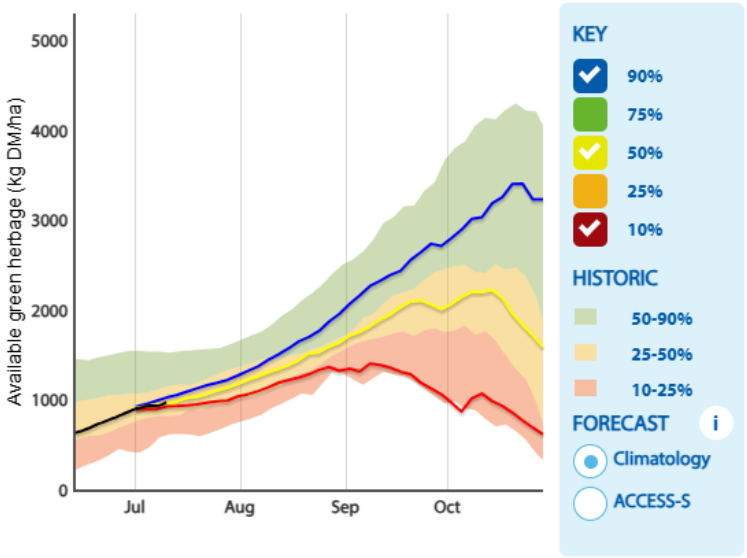
20cm	98%
30cm	100%
40cm	100%
50cm	100%
60cm	100%

Change

7 days ▲ 3%

30 days ▲ 5%

Projected green herbage available relative to historic variation



Rainfall

Since 9am	Yesterday
0mm	1mm

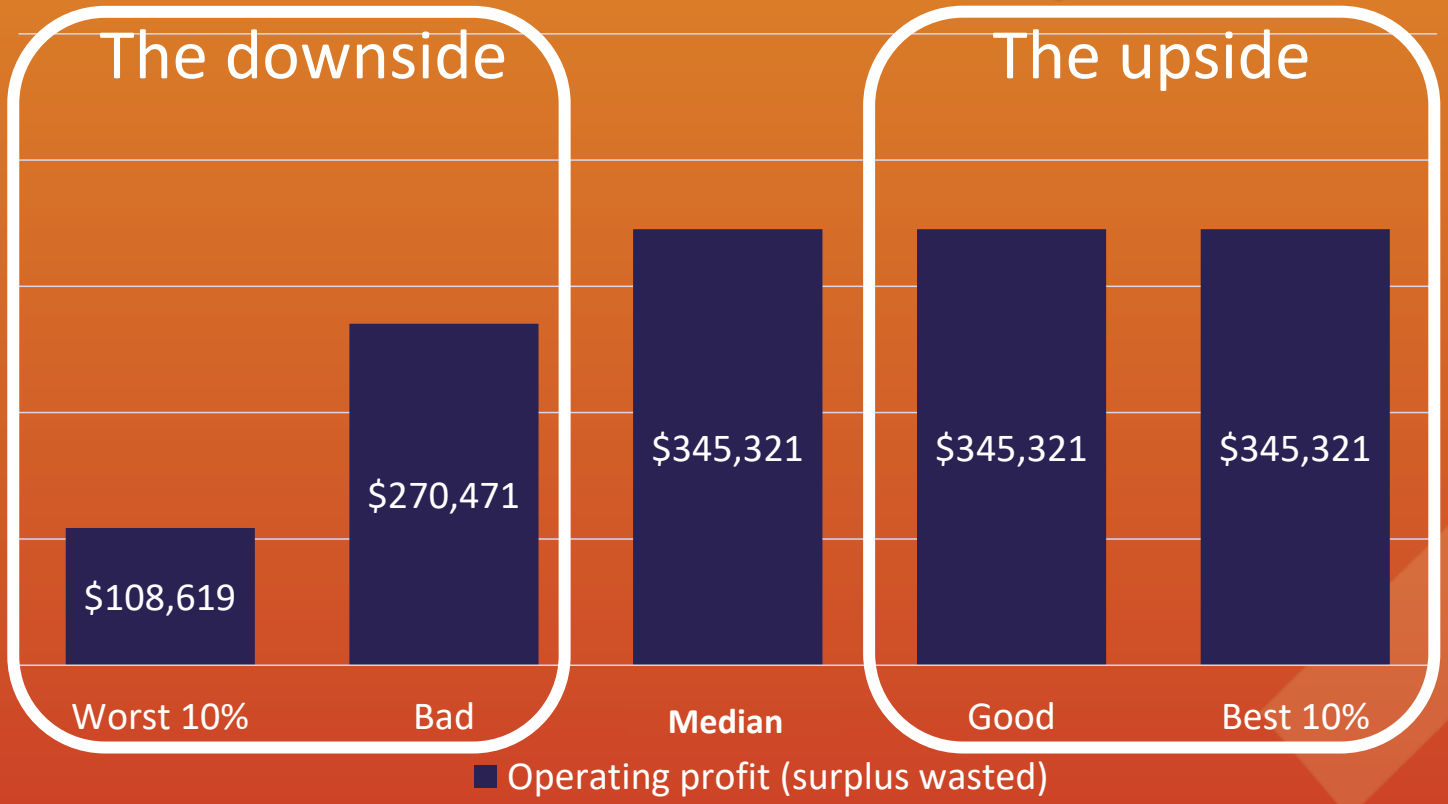
Soil Temperature

@ 20cm
9.3°C

Current Growth (modelled) 14 kg/ha/day

Source: Farming Forecaster

Profits over 15,000 DSE



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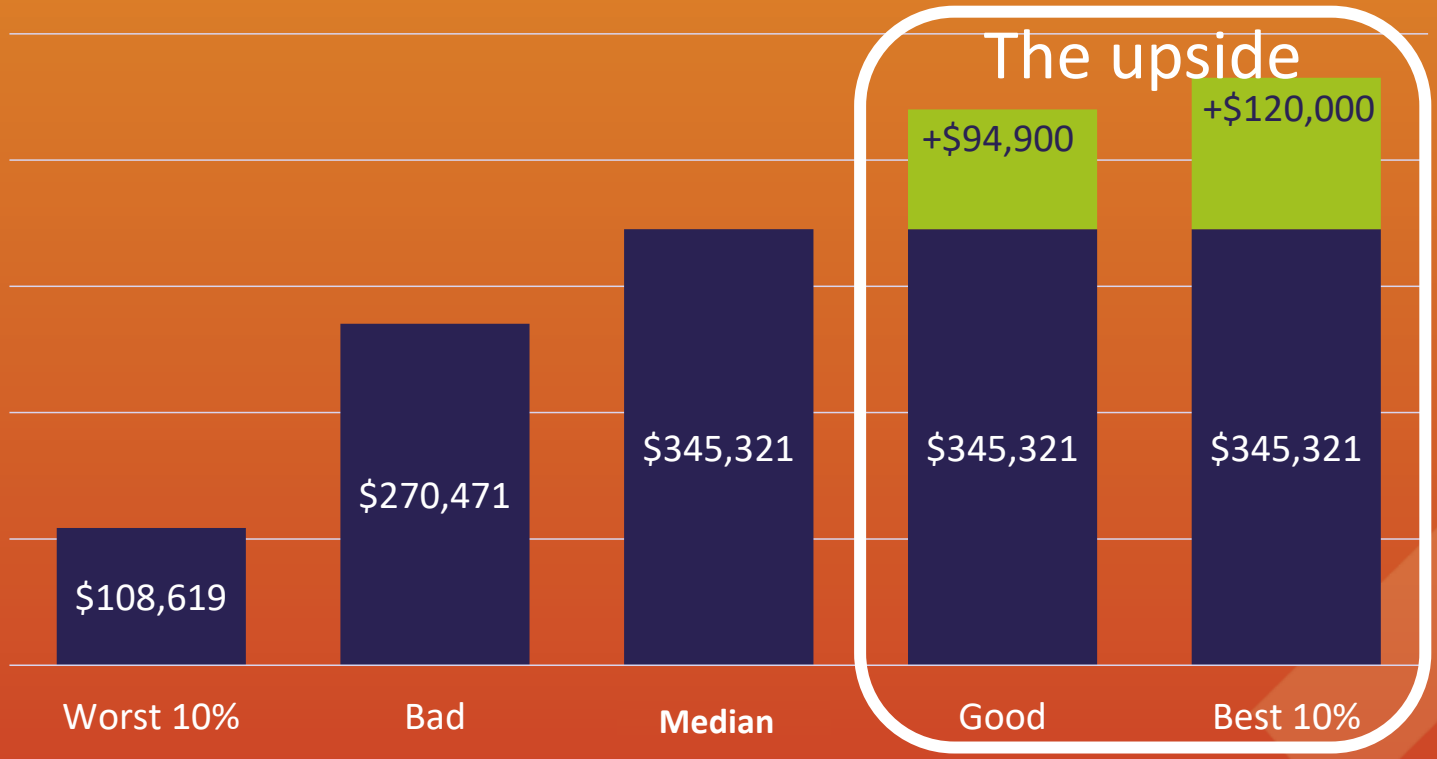
Have you planned for the upside?



Profit without a dry Autumn $665,000

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Buy 320 Steers

Buy 410 Steers

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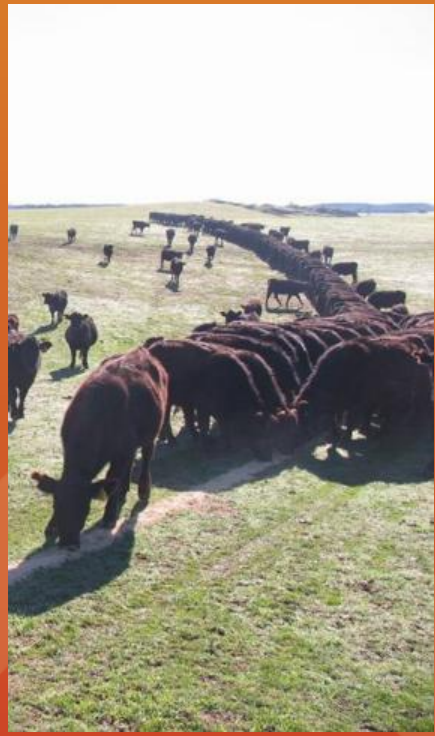
Key messages

Start with the feed budget

Watch the indicators

Are you overvaluing certainty?



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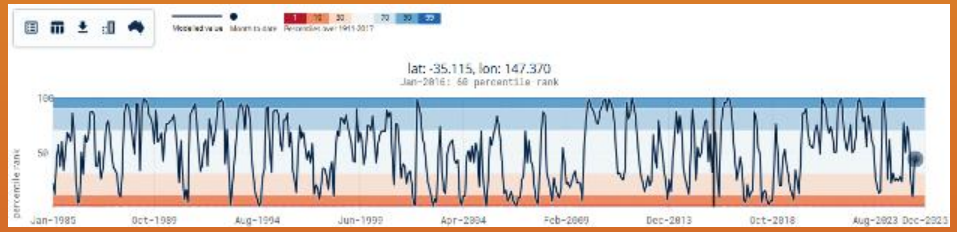
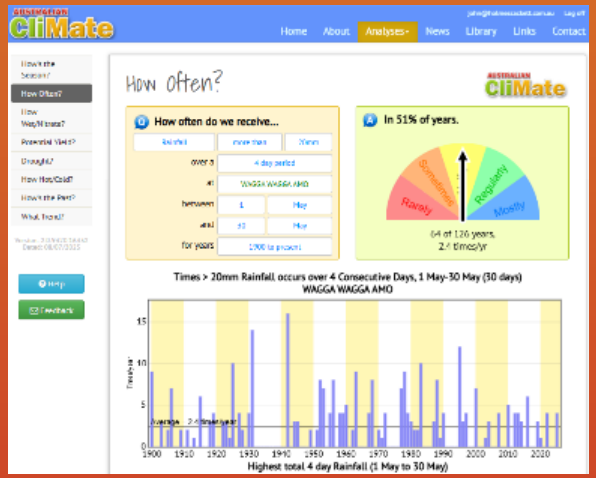
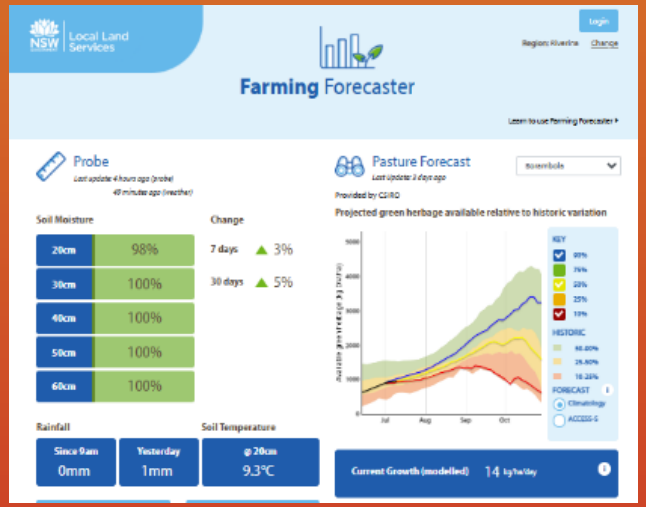
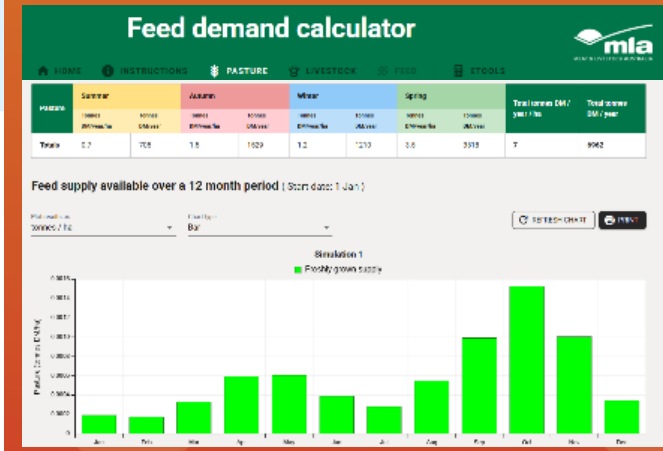
Tools to assist









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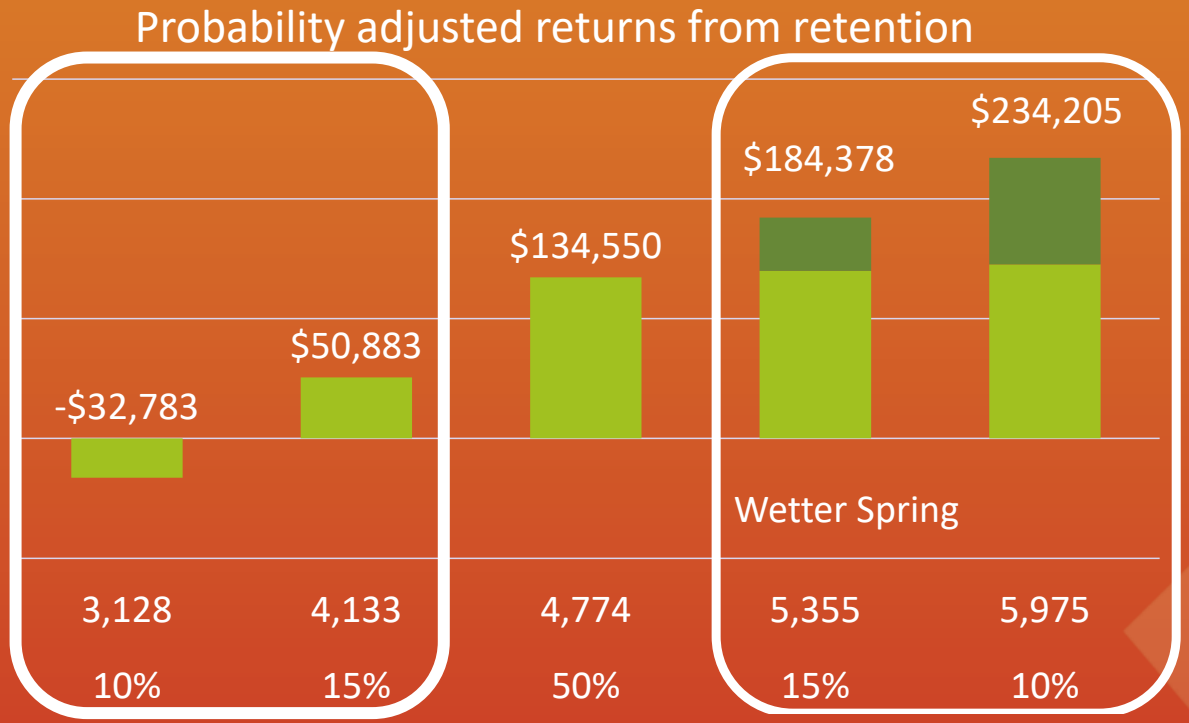
How do I capture value?



Expected value of retention $123,000

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Wrap-up

Elizabeth Thelander

Meat & Livestock Australia

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Don’t be sheepish – submit your M&E today

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Networking, canapes and drinks

60 minutes

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