Objective carcass measurements to improve lean meat yield and eating quality in Australian beef, sheep and pork


Speaker: Daniel Brown
Objective Carcass Measurement to Improve Lean Meat Yield and Eating Quality in Australian Beef, Sheep and Pork

Daniel Brown, David Pethick, Peter McGilchrist, Christian Ruberg, Wayne Pitchford, Richard Apps and Graham Gardner

This project is supported by funding from the Australian Government Department of Agriculture and Water Resources as part of its Rural R&D for Profit programme in partnership with Research and Development Corporations, Commercial Companies, State Departments and Universities.
Precision measurement from paddock/pen to plate

• Predict quality and amount of final product

Massive variation is quantity and quality of carcasses at all points

Potential Gross Benefit of objective measurements ~$420M/ann by 2030, with 65% LMY <DEXA>, and equally shared between producer / processor.
Current trading in beef and lamb

- Traded largely on carcass weight
- Fat penalties only at the extremes

P8 Fat Depth

GR tissue depth
Extra precision gives more accurate (and wider) differentiation of carcase value

What does extra precision mean for the carcase calculator?

![Graph showing the differentiation of carcase value with different precision levels, with values of $12.20, $39.70, $76.15, and $31.91.]
Trading on Eating Quality

Meat Standards Australia eating quality model

*Doesn’t exist for lamb!*

<table>
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<tr>
<th>Description</th>
<th>Format</th>
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</table>

Doesn’t exist for lamb!
Loin Eating Quality and HSCW

Model: Overall Liking = Sex + Siretype + HCWT
The Genetics Business Case

LAMBPLAN Genetic Trends (April 2017)

- CWT
- DRESS%
- LMY%
- IMF%
- ShearForce5
- Overall Liking

Year of Birth

Average ASBV

Breeding for yield and eating quality: Sheep Genetics

- Animal performance
- Carcass measurements
- Consumer eating quality
- Genomic testing
- Actively using LMY, SF and IMF data in ASBVs and Indexes

Resource flocks and ram breeders
Advanced Livestock Measurement Technologies

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2D X-Ray for driving robots
Scott Technology
# DEXA – Technology, Algorithm and LMY Correlation

<table>
<thead>
<tr>
<th></th>
<th>Beef</th>
<th>Lamb</th>
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<tbody>
<tr>
<td>Sides</td>
<td>&gt; 1,500,000 sides</td>
<td>&gt; 3,000,000 carcasses</td>
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<tr>
<td>Sides</td>
<td>104 sides</td>
<td>600+ carcasses</td>
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<tr>
<td>R²</td>
<td>R² &gt; 0.88</td>
<td>R² &gt; 0.90</td>
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\[(x + a)^n = \sum_{k=0}^{n} \binom{n}{k} x^k a^{n-k}\]
DEXA predicting CT Fat% in lamb

$R^2=0.88$, RMSE=1.54
Predicting CT Composition in Beef

- **CT Lean%**
  - $R^2 = 0.73$, RMSE = 3.49

- **CT Fat%**
  - $R^2 = 0.88$, RMSE = 3.21

- **CT Bone%**
  - $R^2 = 0.93$, RMSE = 0.81
On-Farm Yield Prediction

- 3D Red, Green, Blue, + Depth (RGBD - xbox) camera technology
- TRIaled to show great ability to assess body condition score
What about quality - Hyper MIJ Camera
What about quality - Hyper spectral imaging

What we think it can grade:
- Eye muscle area
- IMF (marbling scores)
- Meat / Fat colour
- Subcutaneous fat
- Ossification

Other Technologies
- NIR
- CT / Cone Beam / Flat Panel CT
- NMR/MRI
- Aviation CT
Others Characteristics

• Rib count
• Dimensions
  • Muscularity
  • Shape
• Age / Maturity
Other Factors being studied

• Slaughter factors
  • Spray chilling
  • Carcass orientation (180 degree turn)
  • Carcass temperature
  • Time post mortem

• Fixed effects
  • Sex, breed, age, finishing system
Producer feedback Meat:Fat:Bone Carcass

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Processor utilisation

- Carcass calculators (Beef and Sheep)
  - Retail cut value
  - Value based marketing
- Predict processing costs / wastage
- Optimise carcass usage and market volumes

Optimised profit
AUSMEAT, Calibration & Industry Standardisation

DEXA inside™ (industry standard) + Algorithm (Beef & Sheep) (Industry std. & Industry IP) + Calibration block (industry standard) +

AUSMEAT Mobile CT scanner

industry data/trait/identification standards vital

\[(x + a)^n = \sum_{k=0}^{n} \binom{n}{k} x^k a^{n-k}\]
Genetic Carcass Data from Commercial Slaughter

Requirements

• Valid groups (true contemporaries)
• Animals must not been “harvested” from the feedlot pen or grass finished mob
• Must have relevant fixed effects (birth dates, litter size, sex etc?)
• Pedigree (DNA)
• Sires randomly mated
• Effective progeny numbers
Industry data flow

**Eartag (NLIS/RFID)**

- New Devices
  - LMY
  - IMF
  - Health
  - Compliance

**Hook tracking**

- Supply Chain
  - Existing feedback systems

**GE ID**

- MLA
  - LDL
  - NLIS

- Genetic Evaluation
  - BREEDPLAN
  - LAMBPLAN
Conclusions

• Existing carcass measurement is poor
• DEXA lamb carcass composition
• Beef DEXA promising
• EQ important but not yet clear
• ALM Tech will accelerate development
• Beef, lamb, pork industries
• ICAR guidelines
Supporting partners