Can we use MSA to keep Australian lamb the best in the world

Dave Pethick

Murdoch University, Sheep CRC and MLA

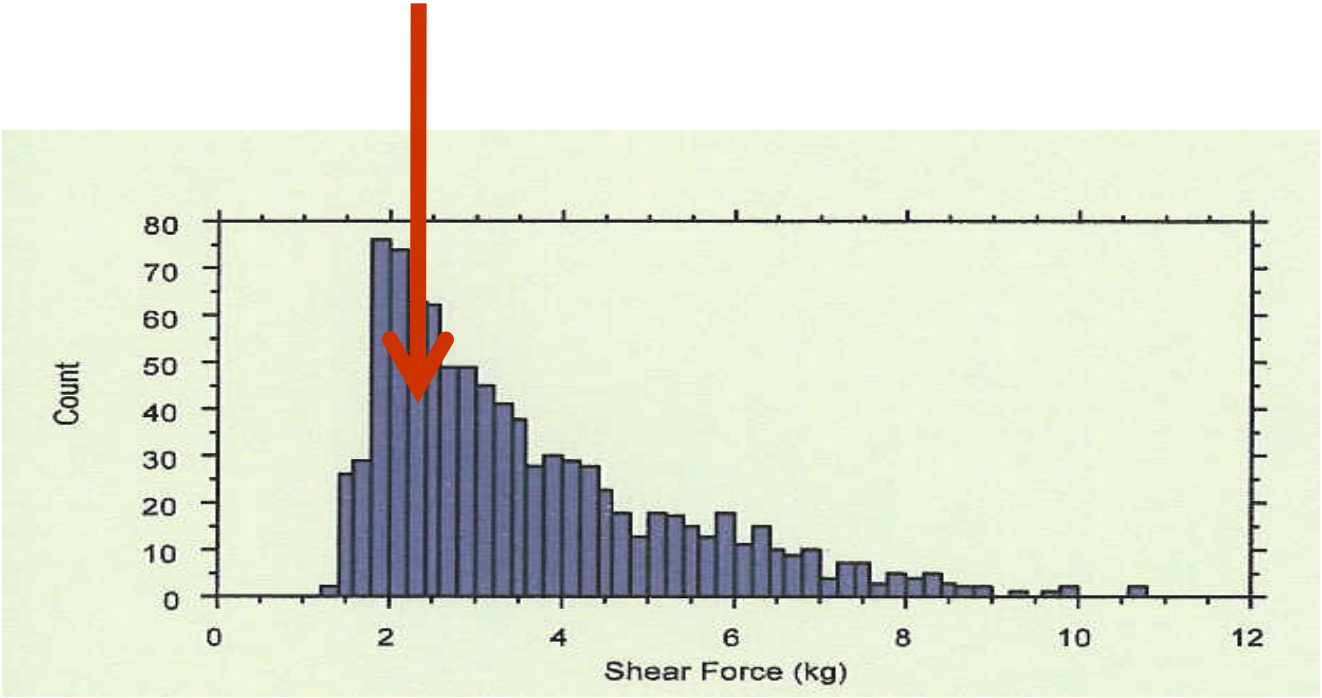
Topics:

1. MSA - history
2. Requirements
3. Supplychain compliance
4. The future is genetic management

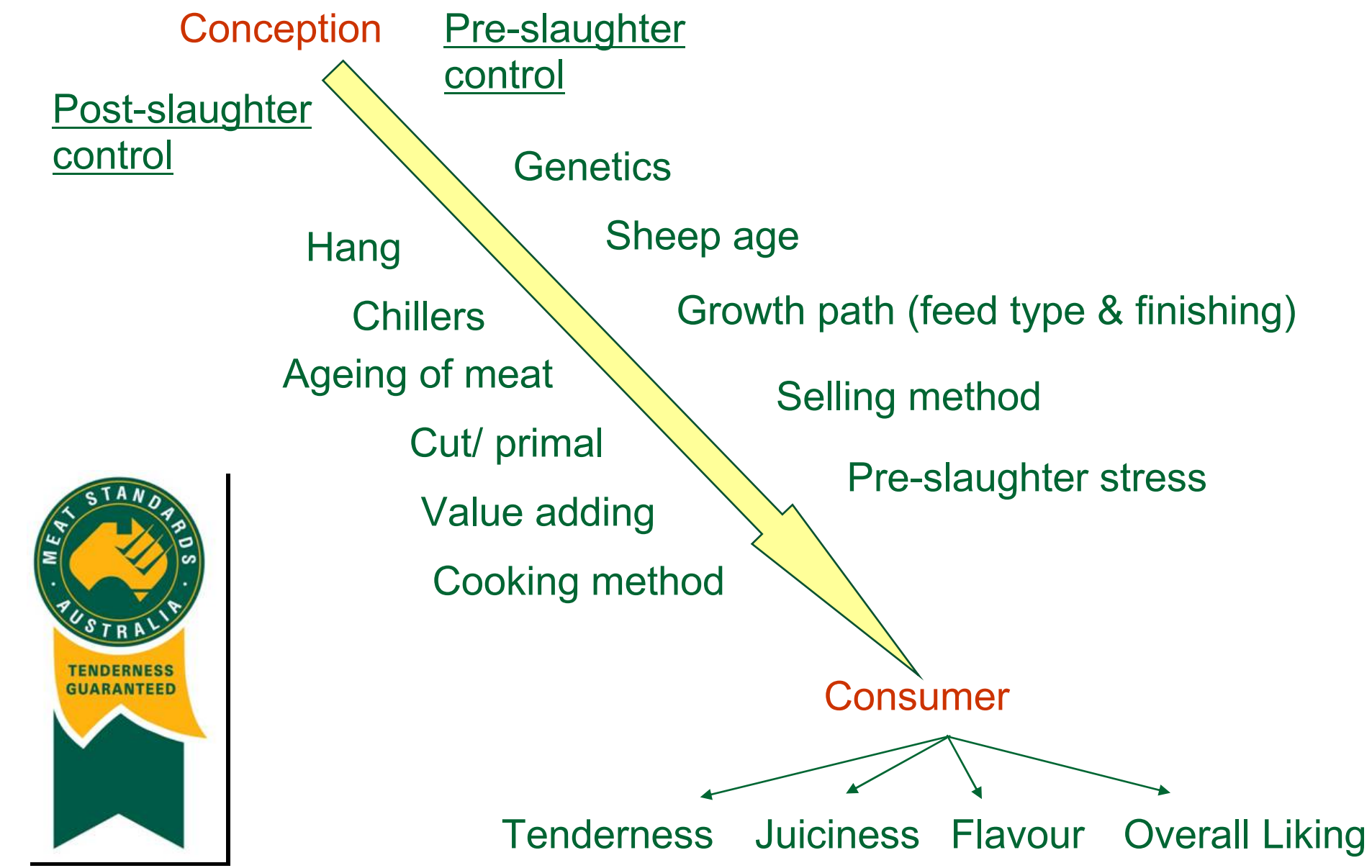
Where did we come from ?

The variation in tenderness

1997/98 retail audit – Safari *et al.* (2002) n = 907

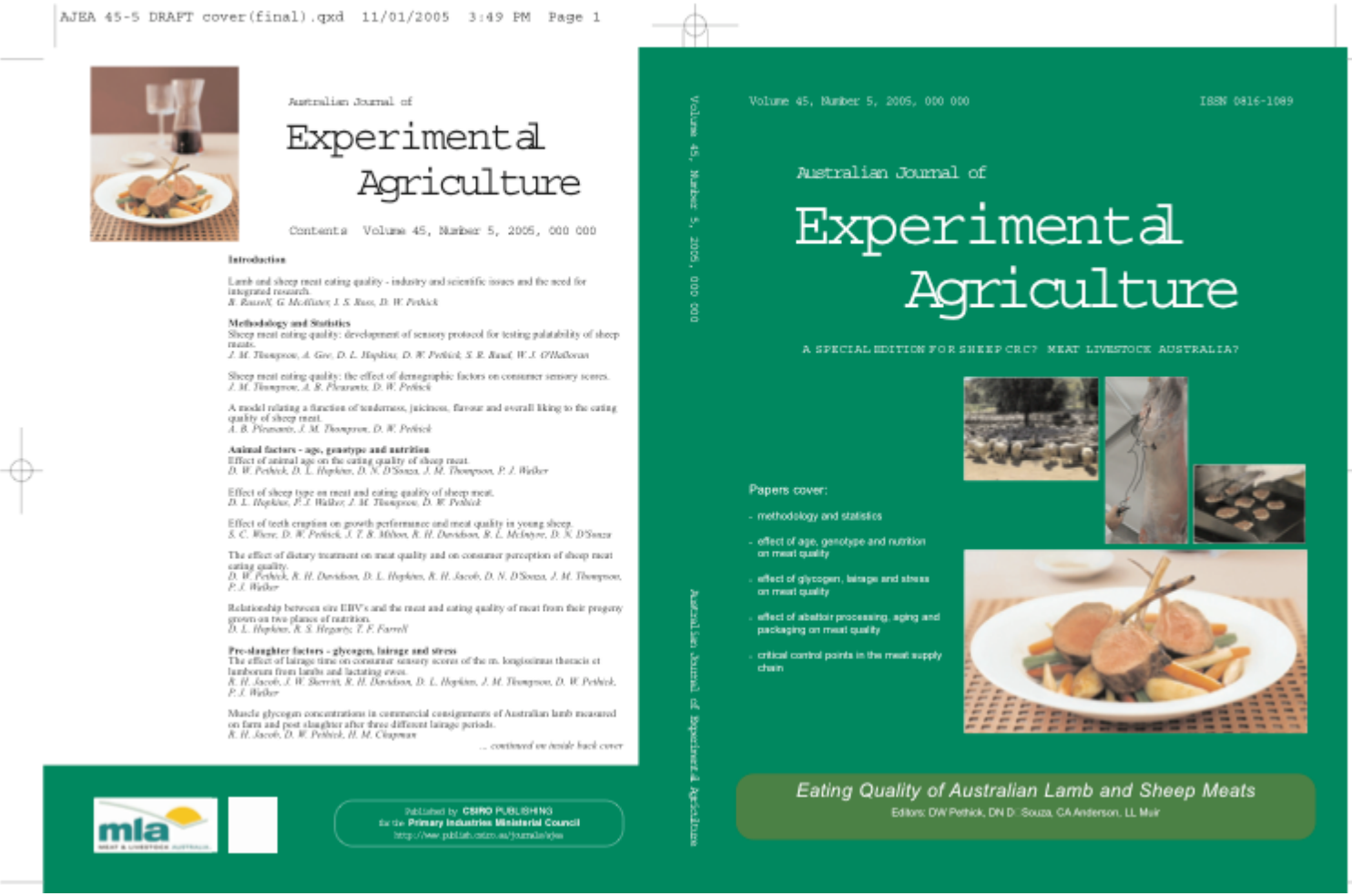


Critical Control Points



R&D Outcomes

Published 2005



AJEA 45-5 DRAFT cover(final).qxd 11/01/2005 3:49 PM Page 1

Australian Journal of

Experimental Agriculture

Contents Volume 45, Number 5, 2005, 000 000

Introduction

Lamb and sheep meat eating quality - industry and scientific issues and the need for integrated research.
R. Russell, G. McAllister, I. S. Ross, D. W. Pethick

Methodology and Statistics

Sheep meat eating quality: development of sensory protocol for testing palatability of sheep meats.
J. M. Thompson, A. Gee, D. L. Hopkins, D. W. Pethick, S. R. Reed, W. S. O'Halloran

Sheep meat eating quality: the effect of demographic factors on consumer sensory scores.
J. M. Thompson, A. R. Pleasants, D. W. Pethick

A model relating a function of tenderness, juiciness, flavour and overall liking to the eating quality of sheep meat.
A. B. Pleasants, J. M. Thompson, D. W. Pethick

Animal factors - age, genotype and nutrition

Effect of animal age on the eating quality of sheep meat.
D. W. Pethick, D. L. Hopkins, D. N. D'Souza, J. M. Thompson, P. J. Walker

Effect of sheep type on meat and eating quality of sheep meat.
D. L. Hopkins, P. J. Walker, J. M. Thompson, D. W. Pethick

Effect of teeth eruption on growth performance and meat quality in young sheep.
S. C. Weere, D. W. Pethick, J. T. B. Milton, R. H. Davidson, R. L. McIntyre, D. N. D'Souza

The effect of dietary treatment on meat quality and on consumer perception of sheep meat eating quality.
D. W. Pethick, R. H. Davidson, D. L. Hopkins, R. H. Jacob, D. N. D'Souza, J. M. Thompson, P. J. Walker

Relationship between sire EBV's and the meat and eating quality of meat from their progeny grown on two planes of nutrition.
D. L. Hopkins, R. S. Hegarty, T. F. Farrell

Pre-slaughter factors - glycogen, lairage and stress

The effect of lairage time on consumer sensory scores of the m. longissimus thoracis et lumborum from lambs and lactating ewes.
R. H. Jacob, J. W. Sherritt, R. H. Davidson, D. L. Hopkins, J. M. Thompson, D. W. Pethick, P. J. Walker

Muscle glycogen concentrations in commercial consignments of Australian lamb measured on farm and post slaughter after three different lairage periods.
R. H. Jacob, D. W. Pethick, H. M. Chapman

... continued on inside back cover

Published by CSIRO PUBLISHING
for the Primary Industries Ministerial Council
http://www.publish.csiro.au/journals/ajea

Volume 45, Number 5, 2005, 000 000 ISSN 0816-1089

Australian Journal of

Experimental Agriculture

A SPECIAL EDITION FOR SHEEP CRC? MEAT LIVESTOCK AUSTRALIA?

Papers cover:

- methodology and statistics
- effect of age, genotype and nutrition on meat quality
- effect of glycogen, lairage and stress on meat quality
- effect of abattoir processing, aging and packaging on meat quality
- critical control points in the meat supply chain

Eating Quality of Australian Lamb and Sheep Meats

Editors: DW Pethick, DN D. Souza, CA Anderson, LL Muir

Volume 45, Number 5, 2005, 000 000 Australian Journal of Experimental Agriculture

Industry system outcome

MEAT STANDARDS AUSTRALIA

SHEEPMEAT PROCESSING GUIDE

MINIMUM REQUIREMENTS

STEP 1

RECOMMENDED GROWTH RATES

- 1st and 2nd cross - a minimum of 100grams/day for 2 weeks prior to consignment.
- Greater than 50% **Merinos** and **pure Merinos** at least 150grams/day for 2 weeks prior to consignment.

SUPPLY METHODS

- Direct consignment - All categories eligible.
- Saleyards - 1st and 2nd cross accepted through saleyards.
- Greater than 50% **Merinos** or **pure Merinos** accepted through saleyards providing processor can demonstrate that animals through this pathway meet pH/temp window requirements and pHu requirements as outlined in MSA Sheepmeat Standards Manual.

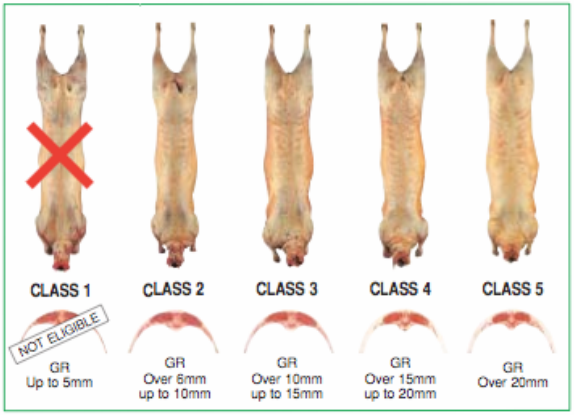
PRE - SLAUGHTER

- Minimum 2 weeks off shears (wool length ≥ 5mm).
- Fat score ≥ 2.
- HSCW ≥ 16kg for sucker (milk fed lamb), HSCW ≥ 18kg for all weaned lambs, hogget and mutton.
- Total time off feed not greater than **48 hours before slaughter**.
- Animals to have access to water at all times while not in transit.
- Minimum of 2 weeks at consignment property before dispatch.
- Maximum time in transit 24 hours.
- National Vendor Declaration (Sheep and Lambs) and Waybill to be correctly filled out and accompany consignment to saleyards or processor.

PROCESSING

- AUS-MEAT accreditation.
- Time spent in lairage yards at processing plant to be not greater than 24 hours with access to water.
- If livestock are held over in a holding paddock and fed at the processing plant, the processor must demonstrate that animals through this pathway meet pH/temp window requirements and pHu requirements as outlined in MSA Sheepmeat Standards Manual.
- Head only electrical stunning.
- No sick or injured animals to be included.
- Excessively damaged carcases to be excluded (eg leg removed from carcase).
- Maintain carcase identification.

CARCASE FAT CLASS



STEP 2

CARCASE SPECIFICATIONS

Category / Cipher	HSCW	Fat Score	GR
Lamb (Milk fed) as declared on NVD or **Young Lamb * YL ***	≥ 16kg	≥ 2	≥ 6mm
Lamb * L *	≥ 18kg	≥ 2	≥ 6mm
Hogget * H *	≥ 18kg	≥ 2	≥ 6mm
Mutton * M *, * W *, * E *	≥ 18kg	≥ 2	≥ 6mm

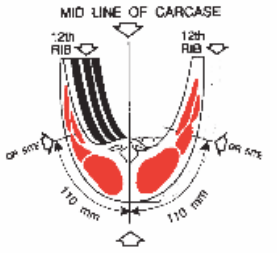
pH Temperature Window and Hang Options

Hang Method	Temperature @ pH 6	Minimum ageing (before consumption / display / sale)
AT	18-25°C	5 days
AT	8-18°C	10 days
TS	8-35°C	5 days

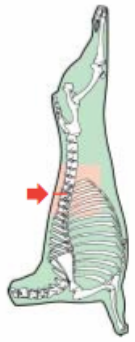
STEP 3

REFER: SHEEPMEAT PRIMAL CUTS CHART

GR MEASUREMENT SITE



The fat class is determined on the depth of tissue at the GR SITE. This site is located over the 12th rib, 110mm from the midline as shown in the diagram.



BASIC CATEGORY

DENTITION	DESCRIPTION	CATEGORY/CIPHER
0	**LAMB - female, castrate or entire male** animal that: ◆ Has 0 permanent incisor teeth. ◆ Milk Fed Lamb (Symbol 'MF'): Lamb that has not been weaned. Younger than 8 weeks.	**LAMB * L *** * 12 months (approx.)
1 - 8	**MUTTON - female or castrate male** animal that: ◆ Has at least one (1) permanent incisor tooth. ◆ In male has no evidence of Secondary Sexual Characteristics (SSC).	**MUTTON * M *** * Over 10 months

ALTERNATIVE CATEGORY

DENTITION	DESCRIPTION	CATEGORY/CIPHER
0	Carcase derived from **female or castrate male** ovine that: ◆ Has 0 permanent incisor teeth (in addition): ◆ Has no eruption of permanent upper molar teeth.	**YOUNG LAMB * YL *** * Up to 5 months only
1 - 2	Carcase derived from **female or castrate male** ovine that: ◆ Has 1 but no more than 2 permanent incisor teeth. ◆ In male has no evidence of Secondary Sexual Characteristics (SSC).	**HOGGET * H *** or **YEARLING MUTTON** * 10 to 18 months
1 - 8	Carcase derived from **female** ovine that: ◆ Has 1 or more permanent incisor teeth.	**EWE MUTTON * E *** * Over 10 months
1 - 8	Carcase derived from **castrate male** ovine that: ◆ Has 1 or more permanent incisor teeth. ◆ Has no evidence of Secondary Sexual Characteristics (SSC).	**WETHER MUTTON * W *** * Over 10 months

** Chronological age as shown is approximate only*

Underpinned by consumer testing

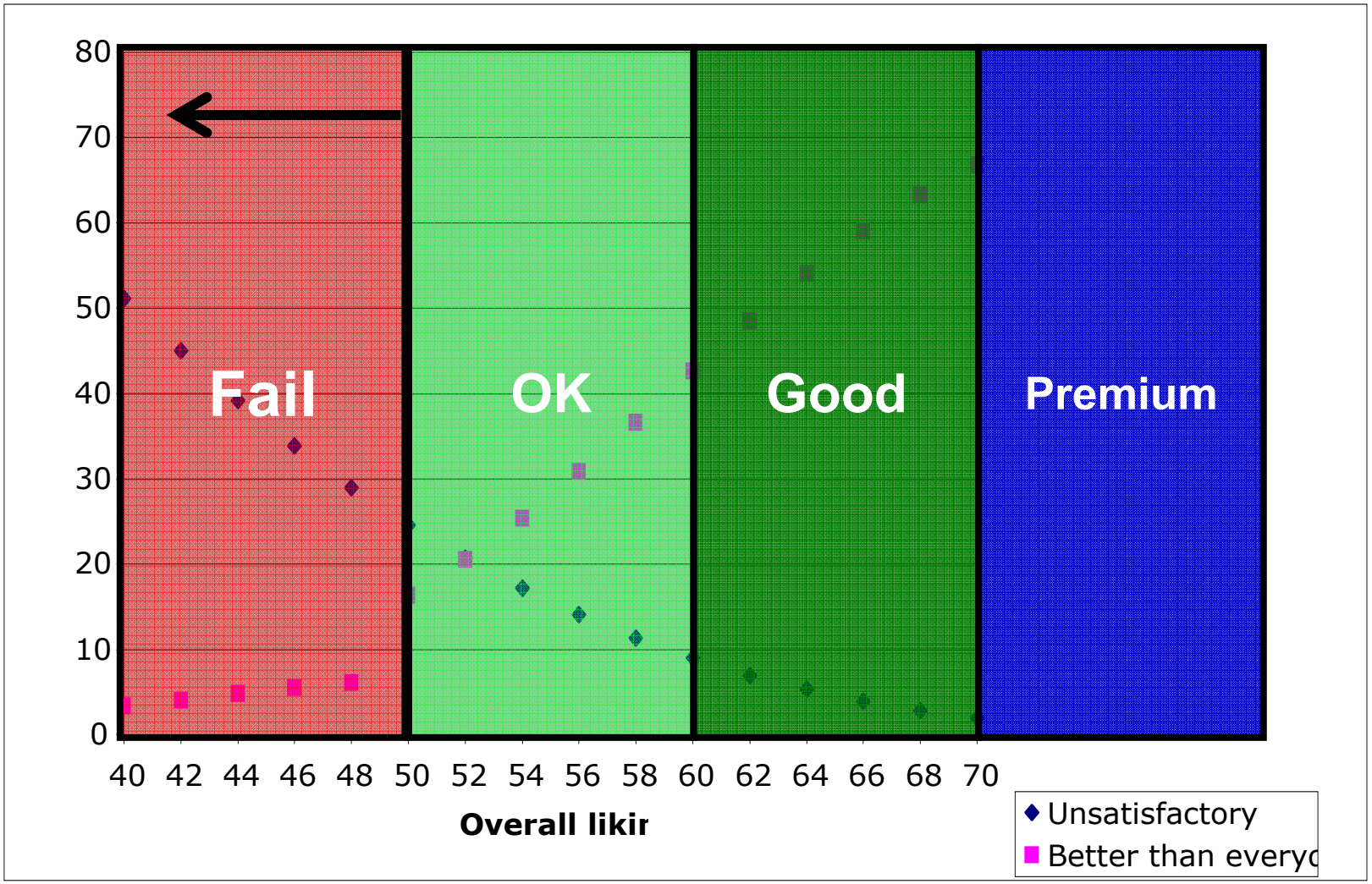
- Tenderness (0 – 100)
- Juiciness
- Liking of flavour
- Overall liking

■ Unsatisfactory ■ Good every day ■ Better than every day ■ Premium

Recognised world wide

Real people – real answers !

Grade lamb into 4 categories



Cut x Cook R&D chart

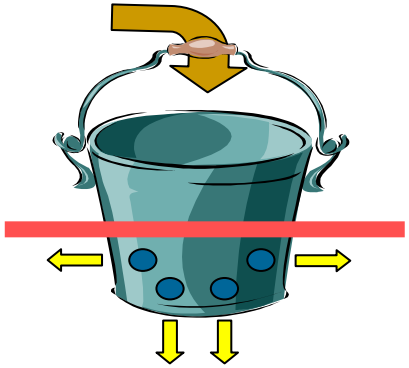
			LAMB	
	Cook	Region	O/all Like	Rating
Tenderloin	GRL	SDDL	78	
Short Loin Roast boned	RST	SDDL	75	
Short Loin Chops	GRL	SDDL	74	
Rack Roast - (cap on)	RST	SDDL	79	
Rack Roast - (cap off)	RST	SDDL	83	
Loin Noisettes	GRL	SDDL	71	
Eye of Loin Strips	SFR	SDDL	70	
Eye of Loin Steaks	GRL	SDDL	68	
Cutlets (cap on)	GRL	SDDL	83	
Cutlets - denuded, Fr.trim	GRL	SDDL	79	
Topside Strips	SFR	LEG	60	
Topside Steaks	GRL	LEG	49	
Topside Roast	RST	LEG	48	
Silverside Strips	SFR	LEG	63	
Round Strips	SFR	LEG	63	
Round Steaks	GRL	LEG	60	
Round Roast	RST	LEG	58	
Rump Roast - denuded	RST	LEG	68	
Rump Roast	RST	LEG	73	
Leg Roast - bone In	RST	LEG	66	
Easy-carve Leg	RST	LEG	62	
Chump Chops	GRL	LEG	73	
Shoulder Chops	GRL	FQTR	58	
Shoulder Roast	RST	FQTR	59	
Oyster Cut Strips	SFR	FQTR	67	
Oyster Cut Roast boned	RST	FQTR	61	
FQR Roast boned & denuded	RST	FQTR	61	
Forequarter Roast	RST	FQTR	65	
FQR chops non-bone half	GRL	FQTR	65	
FQR chops bone half	GRL	FQTR	61	

Eating Quality – MSA lamb

- Producers role
  - ✓ Management (old)
  - ✓ Genetics (new)
- Processors role
  - ✓ Managing chillers (old)
  - ✓ Genetics (new)
- Retailer role

Eating quality = supply chain

Producers role 1 – glycogen



- = nutrition in the last 3 weeks
- Xbred – 100gm/d
- Merino – 150gm/d

Nutrition

- Plus muster to slaughter 48hours

Stress

- ↑Muscle genetics for Merinos/Maternals

Producers role 2 – fatness ?

- ≥6mm GR (Score 2)
- Score 2/3 ideal
- Overdone carcase fatness DOES NOT guarantee intramuscular fat

Processing factors

- Managing chilling
  - E-stimulation
  - Tenderstretch

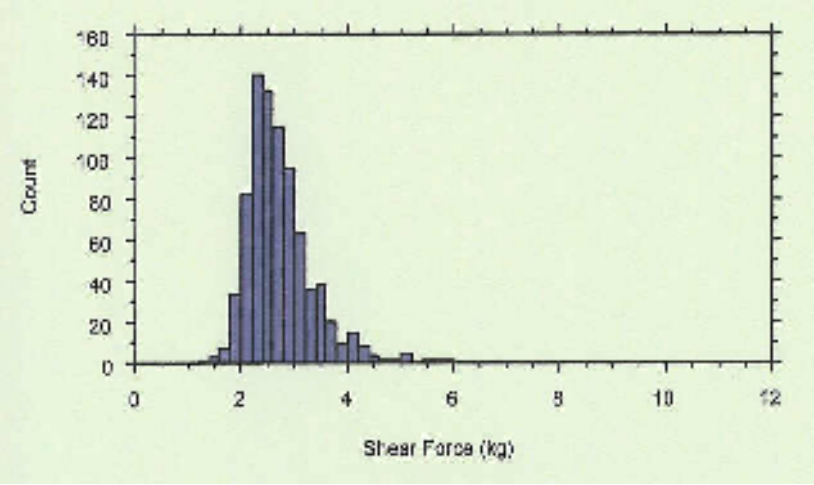
Retail factors

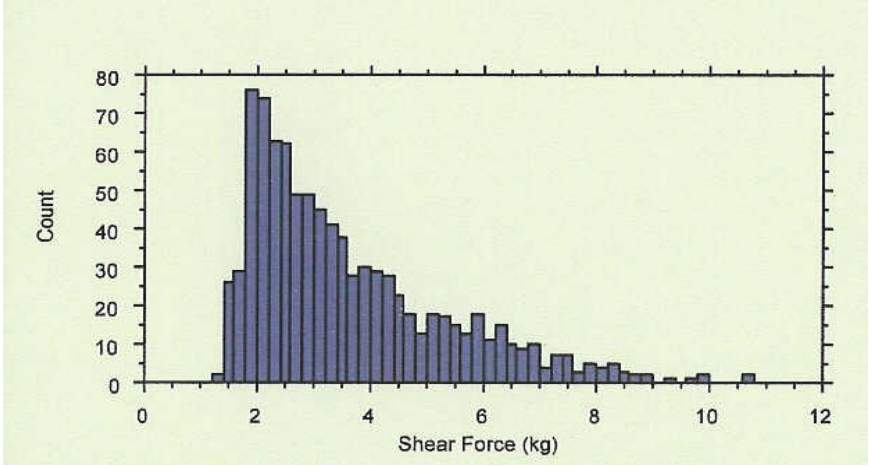
- Ageing
- Cuts

Stimulation systems

Change is possible

MSA data (2005) n = 806, optimal processing, fat & pH compliant





MSA is a no brainer

- Its not hard because lamb is a good base product
- Have 8 processors grading lamb - we need more
- Full system means producers also signing up and this has proved one of the slow points
- Like its not hard or expensive
- **A great footy team would nail this !**

New directions underway

Balance 2 key consumer traits

- Lean Meat Yield
- Eating quality

Lean meat yield

- Carcase weight
  - Heavier allows modern cuts and value adding (trim lamb)
- Carcase composition
  - Leaness – consumers don't like salvage fat (>90% cut it off)
  - Muscling – consumers want a decent eye muscle & not all bone

Producers role 3 – intramuscular fat NEW

- How do we underpin IMF ?

What do we know about LMY & EQ

The Information Nucleus

- Approx 500 sires (Terminals, Maternals, Merino)
- 10,000 slaughter lamb progeny
- 5 year cycle

INF data – mean intramuscular fat

- Ideal value 4-6%
- Current average is 4.2% (Xbred lamb)

- So we are OK but ‘bumping’ toward the bottom end

INF data – mean IMF & heritabilities

- Ideal value 4-6%
- Current average is 4.2% (Xbred lamb)

- Carcase traits – all moderate/high

- Eating quality traits - high
  - Intramuscular fat
  - Tenderness (Shear force)

Correlations - genetic

- LMY vs IMF: -ve & high
- LMY vs tenderness -ve & moderate
- IMF vs tenderness +ve & v. high

INF intramuscular fat data says:

- 3 ➔ 6% IMF
- Shear force tenderness down by 1 kg

- This a serious

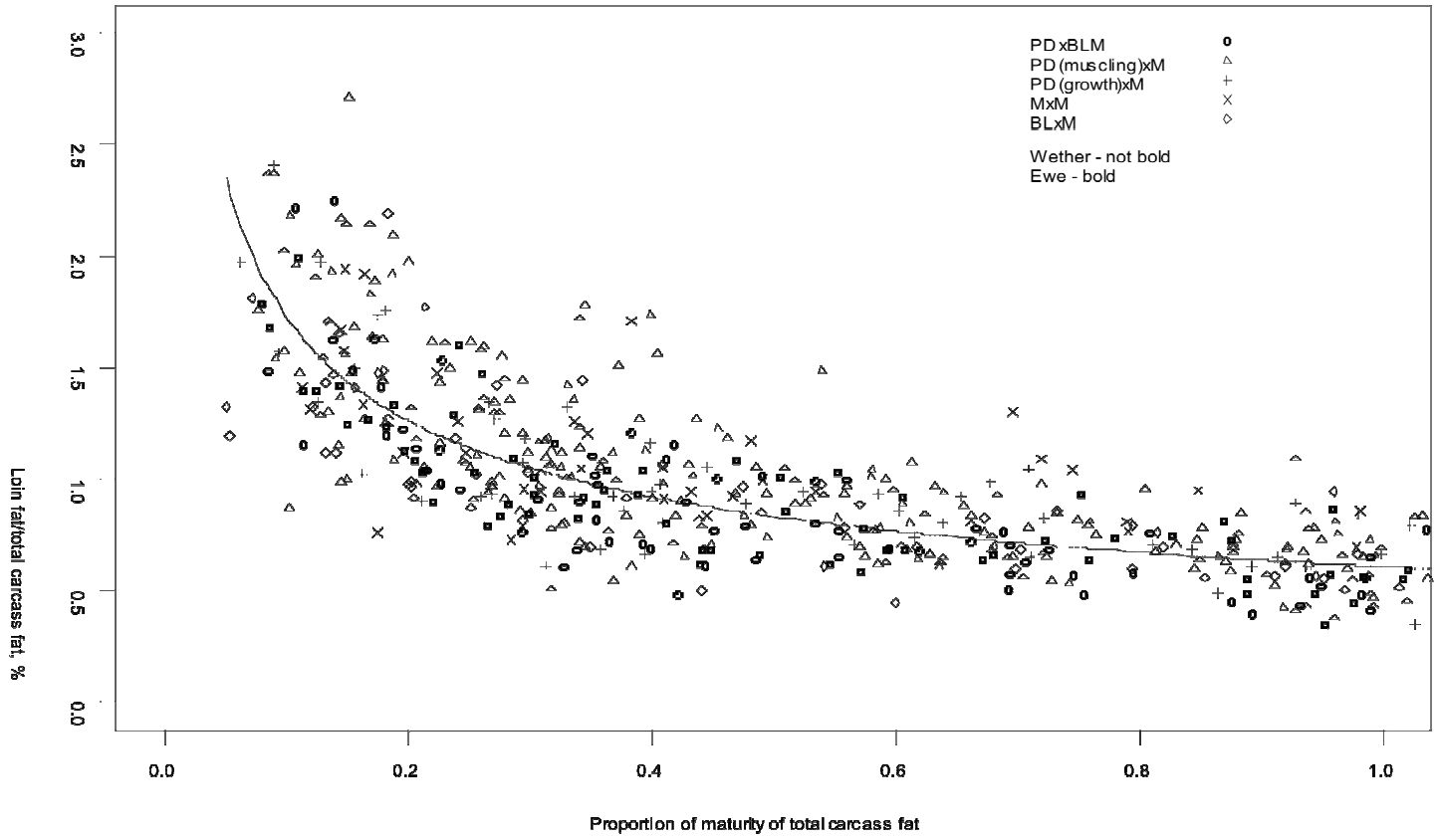
- PLUS we know IMF influences flavour – thought to be the key vehicle
- Flavour a key driver for lamb

How does IMF develop ?

IMF is EARLY maturing in lamb !

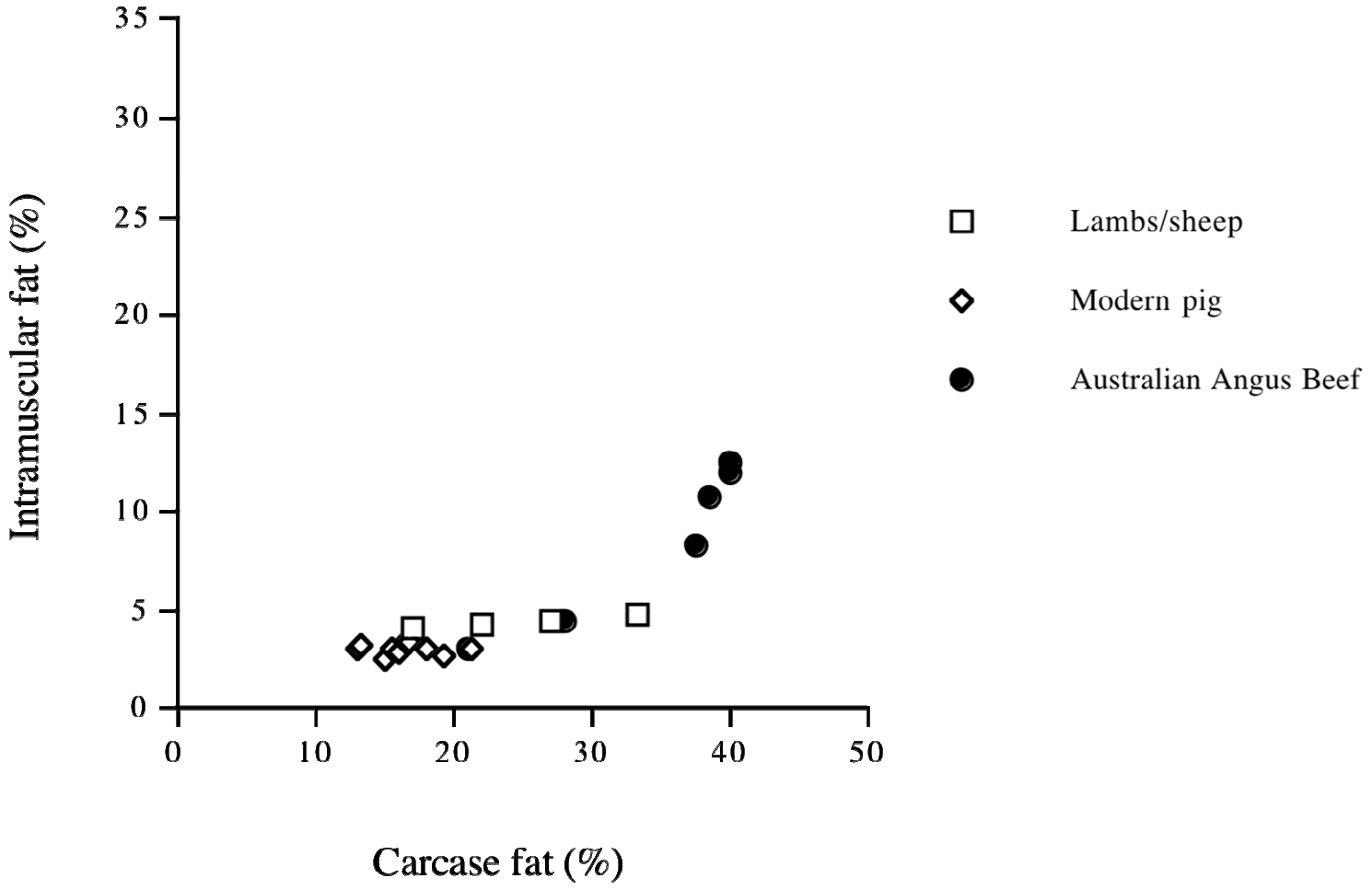
Lambs/young sheep – serial slaughter expt

(n=665 loins, Hopkins et al. 2007)



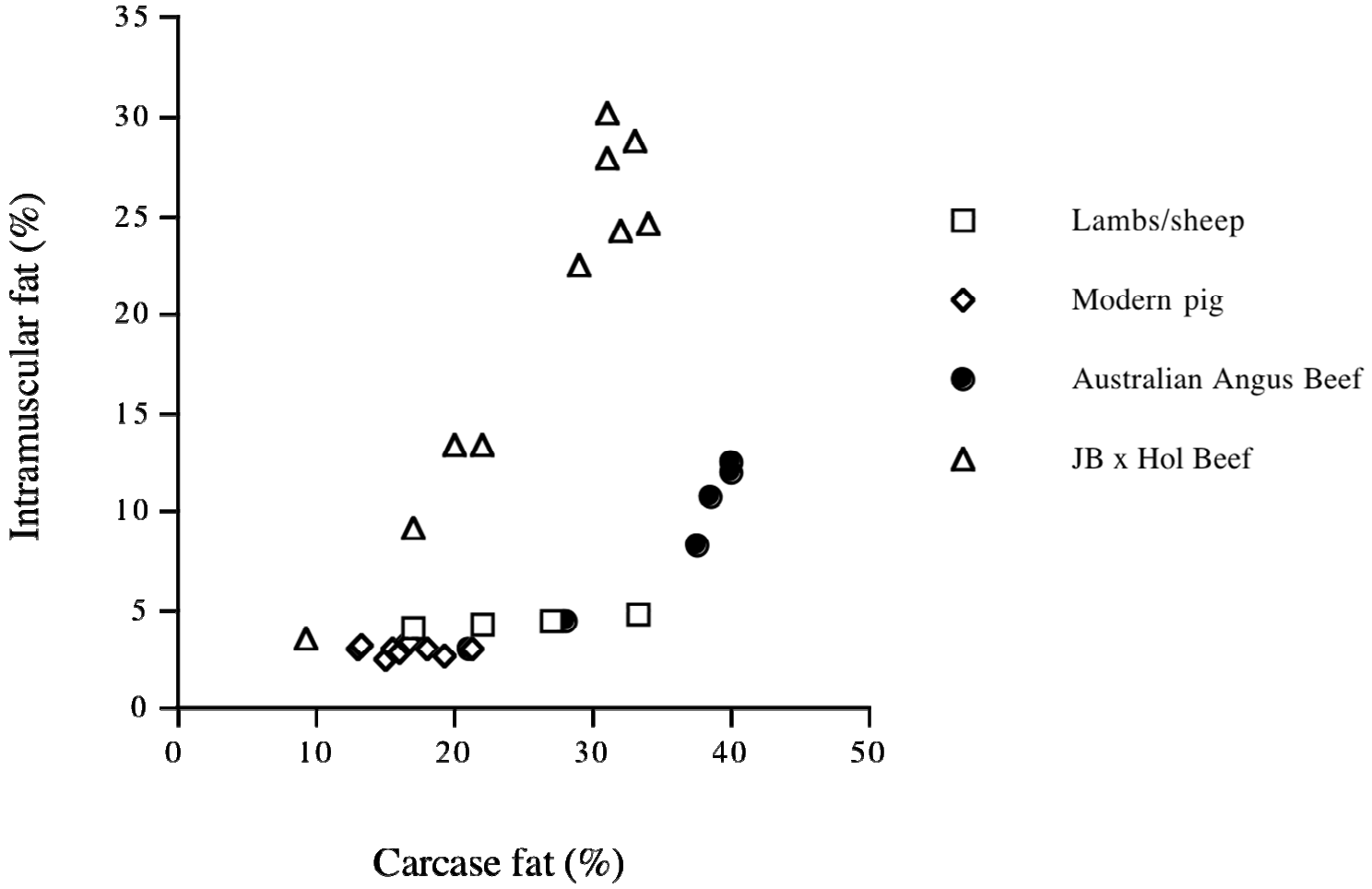
Marbling or IMF

Livestock must be very fat to promote marbling



Marbling or IMF

Genetics can change this !



New directions – next steps

FIRST

- Calibrate our new meat science data against consumers
- Including understanding of how to get a tender topside

THEN

- Use ‘bread and butter genetics’ = LAMBPLAN™ to manage the eating quality with lean meat yield

New directions – Challenges

- Still not possible to ‘grade’ every lamb carcase (i.e. to get a marble score)
- So the cheapest and best option is to use genetics to underpin the eating quality
- This could be used on a ‘mob’ basis

New directions – Challenges

HOWEVER

Supply chain cooperation the key

- Develop the retail spec
- Buy the right rams to deliver this spec
- Prove that you have done so

Quick reality check

Getting 4* cuts in moderate carcase weight beef

- Optimal processing
- No hormones
- Get'em young (< about 140 oss = 18-24 months)
- Have just enough marble = solid score 1 (4-6% IMF) ?

Willingness to pay data

(Price relative to 3*, n = number consumers)

	n	Ungrade	3*	4*	5*
Mean	10,380	47%	100%	146%	208%

Australia, Korea, Japan, USA

Ireland, France, South Africa

Genetic solution is ‘easy’

- Can essentially dial up lean meat yield and eating quality
- And for that matter human health, colour - you name it !
- However it will mean seedstock, commercial producers, processors and retailers working in a new and more sophisticated way
- ARE WE READY – YES
- CAN WE – IT’S YOUR INDUSTRY SO YOU TELL ME

Key facts/messages

- MSA lamb is a no brainer - its simple and we have proven evidence that it works.
- Why wouldn't all processors and producers sign up ?
- There is still heaps of room to differentiate

Key facts/messages

- Refining the underpinning of eating quality – how ?
- We can do this most simply via genetics
  - Intramuscular fat in the ideal zone
  - Tender topside
  - ….. more to come
- Will lead to new claims

Key facts/messages

- Indeed the lamb industry on a broad front will have many ‘genetic’ choices to make & balance

- Lean meat yield
- Eating quality
- Human health
- Fresh colour and retail colour
- …..

Key facts/messages

- We need a more professional supply chain to deliver this potential
- I worry that the current climate means we can over look the R&D potential
- Like we have never been in this position to contribute
- BUT I fear the ‘buyer’ mentality will prevail (buyer know all !)

Position AUS lamb as premier meat on Planet!

THANK YOU

Willingness to pay data

(Price relative to 3*, n = number consumers)

	n	Ungrade	3*	4*	5*
Australia	4680	46%	100%	146%	198%
Japan	1620	52%	100%	167%	294%
USA	1440	47%	100%	153%	214%
Ireland	1380	48%	100%	131%	164%
France	540	43%	100%	140%	187%
Sth Africa	720	48%	100%	137%	200%
Mean	**10,380**	**47%**	**100%**	**146%**	**208%**