Measuring value

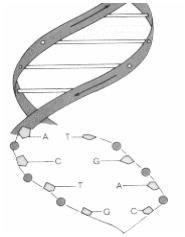
Professor Graham Gardner

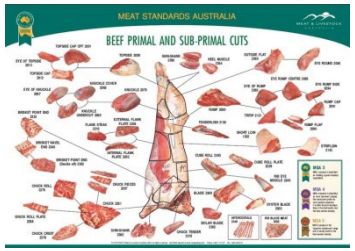
True Carcass Value

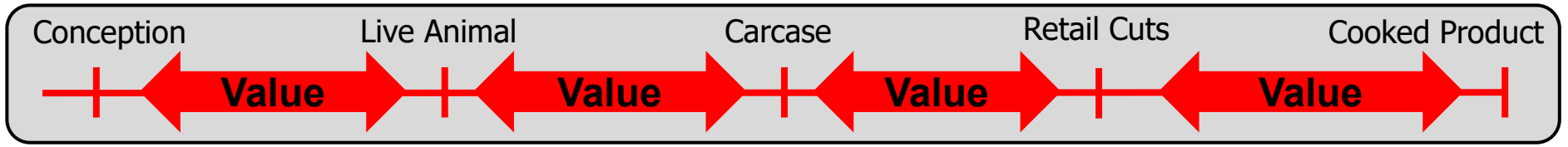
Carcass value ($) = Wt retail cuts (kg) X Value of the cuts ($/kg)

Creating value from better measurement

Predict quality and amount of final product

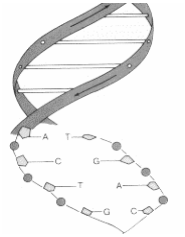


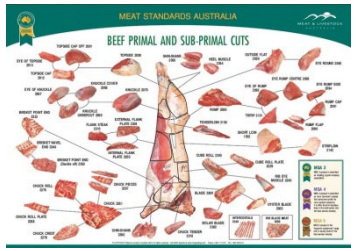




Creating value from better measurement

Predict quality and amount of final product

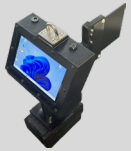




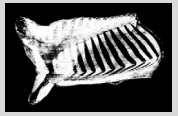
Conception | Live Animal | Carcase | Retail Cuts | Cooked Product

Value | **Value** | **Value** | **Value**

Lean Meat Yield

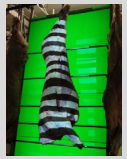


Microwave GR



DEXA

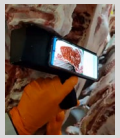
BCC3
Frontmatec



E+V
Marel

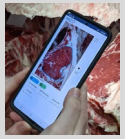
Eating Quality

QFOM



MasterBeef

SOMA

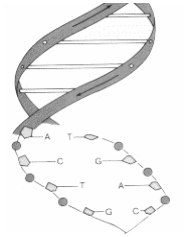


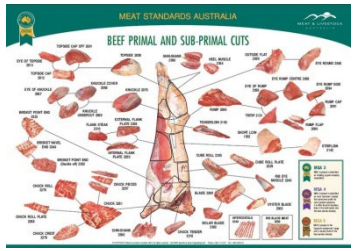
MEQ

Microwave IMF

Creating value from better measurement

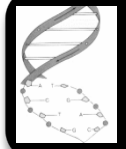
Predict quality and amount of final product



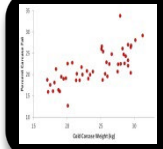



Conception → Live Animal → Carcase → Retail Cuts → Cooked Product

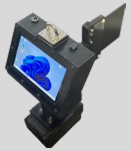
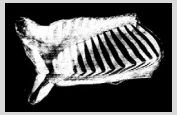
Value **Value** **Value** **Value**

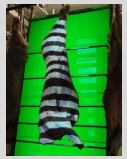

New Breeding Values


Systems to improve compliance

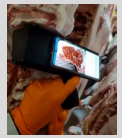


Enhanced Producer Feedback

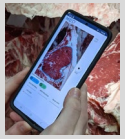

Lean Meat Yield


Microwave GR

DEXA

BCC3 Frontmatec

E+V Marel

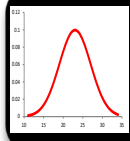
Eating Quality


QFOM

MasterBeef

SOMA

MEQ

Microwave IMF

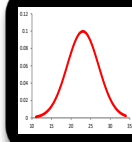
Cuts-based Lamb MSA



Benchmarking systems



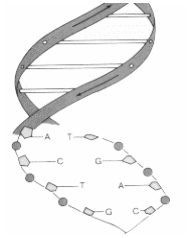
Cut wt prediction systems

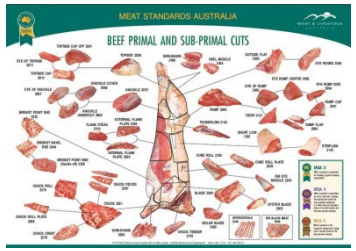

Enhanced Beef MSA



Profit functions to optimise carcase use $

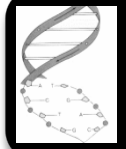
Creating value from better measurement

Predict quality and amount of final product



Conception — Value — Live Animal — Value — Carcase — Value — Retail Cuts — Value — Cooked Product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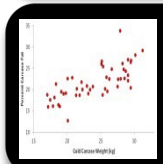

Enhanced Producer Feedback


Lean Meat Yield

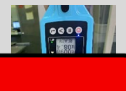



BCC3 Frontmatec

E+V Marel

Eating Quality





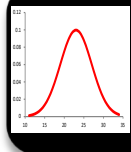
MEQ

Microwave IMF

AUS-MEAT

Trading Language

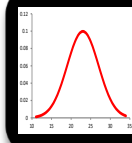
Cuts-based Lamb MSA

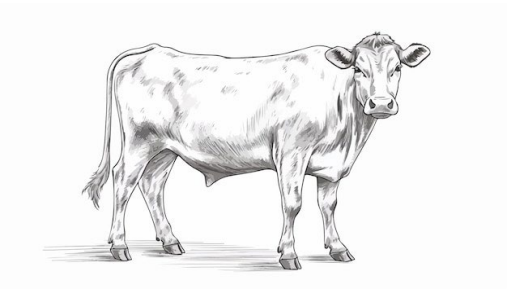


Benchmarking systems



Cut wt prediction systems

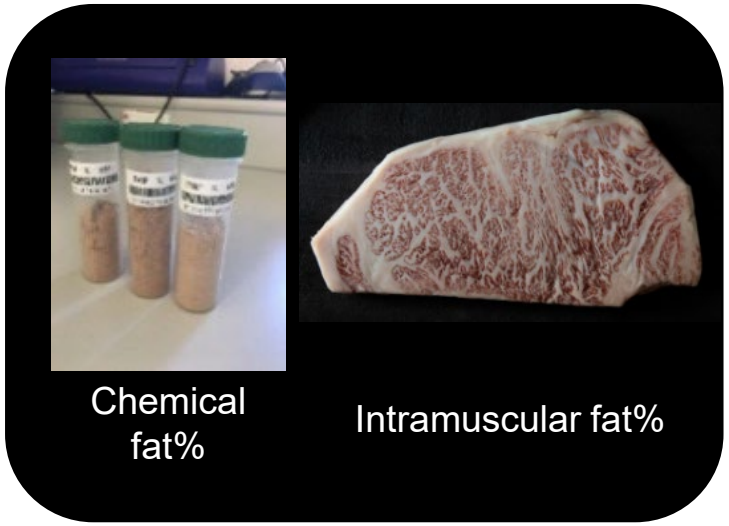

Enhanced Beef MSA



Profit functions to optimise carcase use $



Intramuscular Fat %

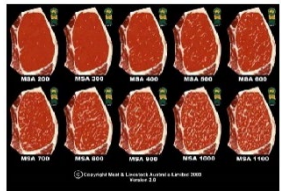
A new trait for beef



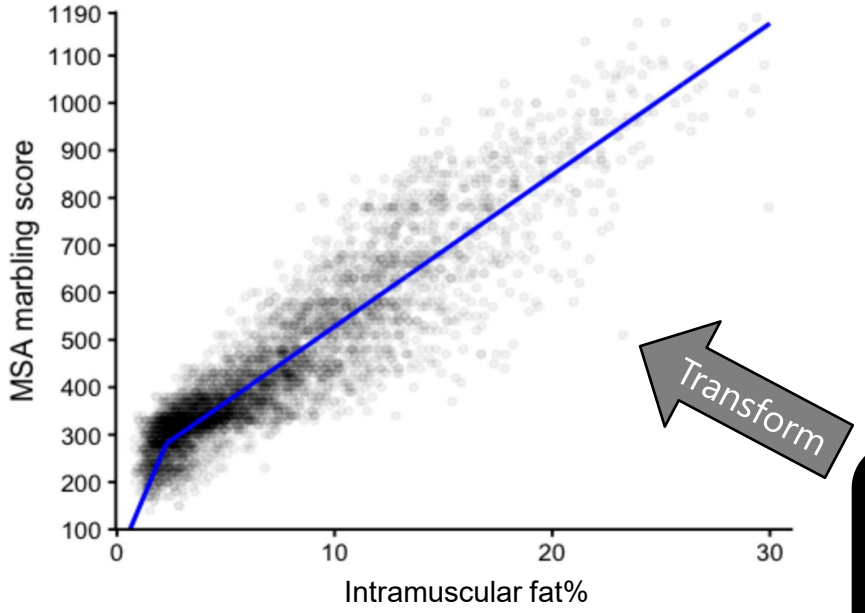
Total extractable fat from
loin muscle expressed as % of wet weight

Convert IMF% into visual marble score

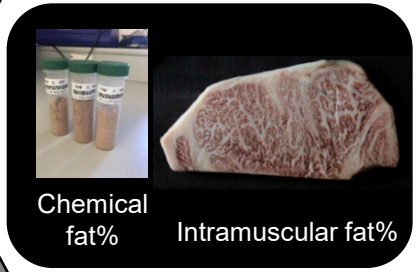
Beef MSA



Transform

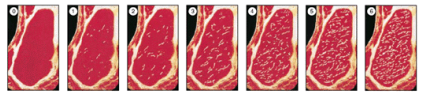


Transform

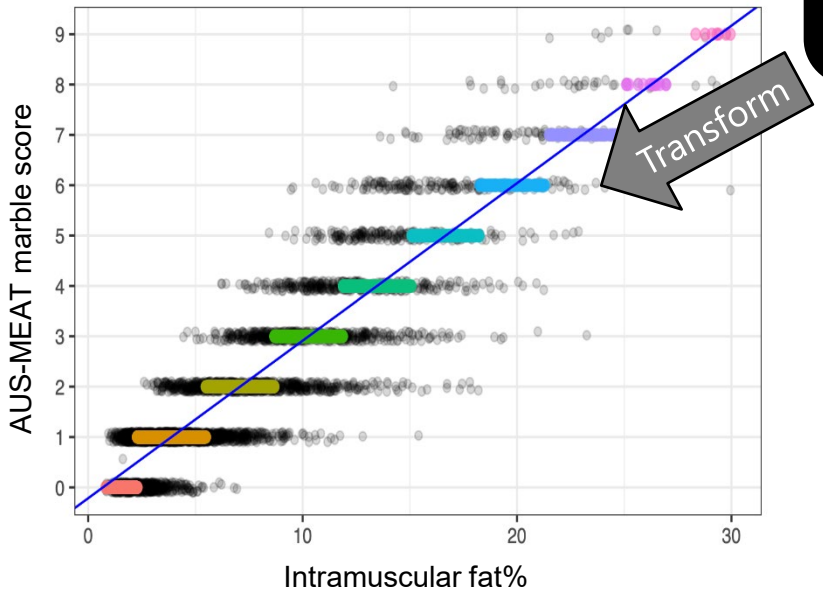


AUS-MEAT

BEEF MARBLING REFERENCE STANDARDS



Transform



Transform

Stewart et al. 2024. Meat Science, 109573.

Trade on eating quality

Carcase Wt

Ossification

IMF

Rib Fat Depth

Ultimate pH

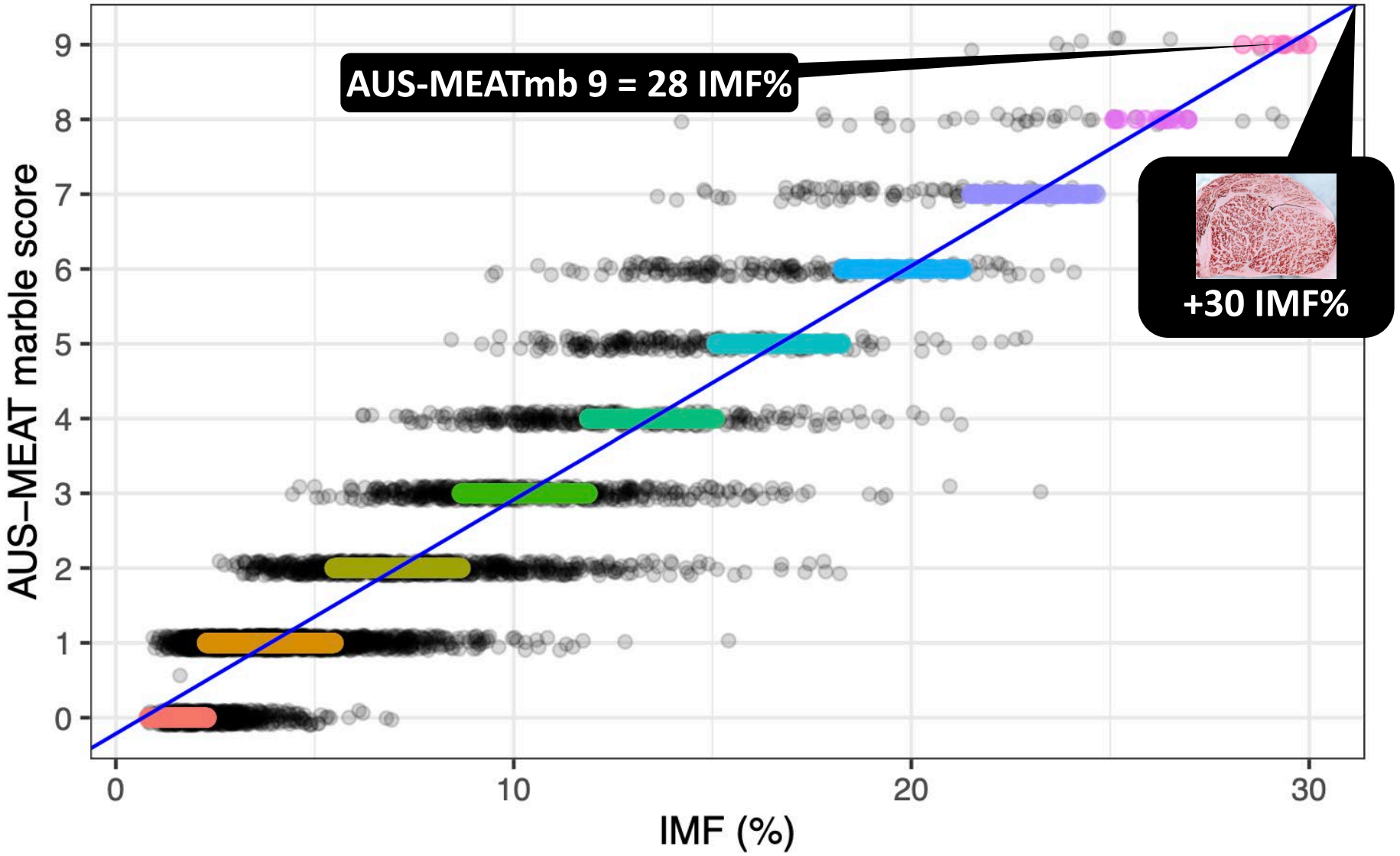
Meat Standards Australia eating quality model

Description	Format	Name	Input	?
Estimated % Bos Indicus	% or X if doubt	EPBI	0	
Animal Sex Type	M/F	Sex	F	
mone Growth Promotent	Y or ? / N	HGP	n	
MilkFedVealer	Y/N	MFV	n	
SaleYard	Y/N	SlYrd	n	
Rinse/Flush	Y/N	RnFl	n	
ed Carcase Weight	Weight in Kg	HSCW	350	
HangMethod	T/TS/TL/TC/XT	Hang	at	
Hump Height	mm	Hump	63	
Ossification USDA	USDA measure	uoss	290	
Marbling USDA	USDA measure	umb	300	
RibFat	mm	RbFt	10	
Ultimate pH	Metered pH	UpH	5.5	
Loin Temp at Grade	Metered Temp C	Utmp	9	
Days of Ag g from Kill	Days Ag	Age	5	

Aged

cut	muscle	GRL	RST	SFR	TSL	SCT	CRN
spinalis	SPN081	79	69	79	75		
tenderloin	TDR034	82		76			
tenderloin	TDR062	78	77	80	74		
tenderloin	TDR063	73					
cube roll	CUB045	62	62	62	64		
striploin	STA045	55	56	58	58		
striploin	STP045	53	54	57	57		
oyster blade	OYS036	67	64	69	72		
blade	BLD095			43			
blade	BLD096	53	57	58	59	59	
chucktender	CTR085		49	51	53	59	
rump	RMP131	51	59	56	62	54	
rump	RMP231	54	62	61	60		
rump	RMP005	59		67	67		
rump	RMP032			64	68		
rump	RMP087		52	57	55	56	
knuckle	KNU066	46	59	54	58	47	
knuckle	KNU098			54	59	56	
knuckle	KNU099	36	47	44	51	52	
knuckle	KNU100			60	62	55	
outside flat	OUT005		40	43	56	59	52
outside flat	OUT029			54	61	55	
eye round	EYE075	40	44	42	45	46	45
topside	TOP001	39		51	53	50	
topside	TOP033	40		53	58	60	
topside	TOP073	34	43	43	56	52	
chuck	CHK068			48	53	65	
chuck	CHK074	63	56	61	67	72	
chuck	CHK078	56	57	58	62	69	
chuck	CHK081			60	64	75	
chuck	CHK082			52	56		
thin-flank	TFL051			58		58	
thin-flank	TFL052			67	59	64	
thin-flank	TFL064			61	58	60	
rib-blade	RIB041			48			
brisket	BRI056			44	58	60	38
brisket	BRI057			41	49	64	
shin	FQshin					57	
shin	HQshin					60	
intercostal	INT037			57			

Visual scores don't go high enough!



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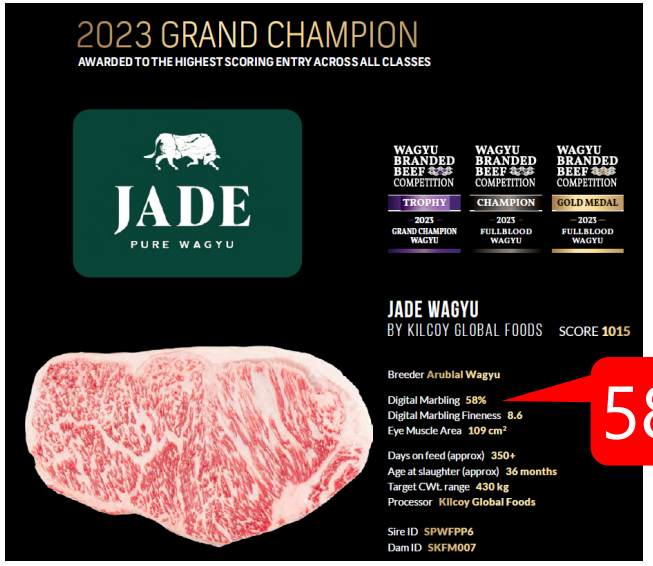
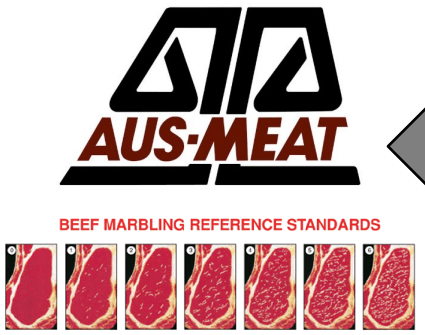


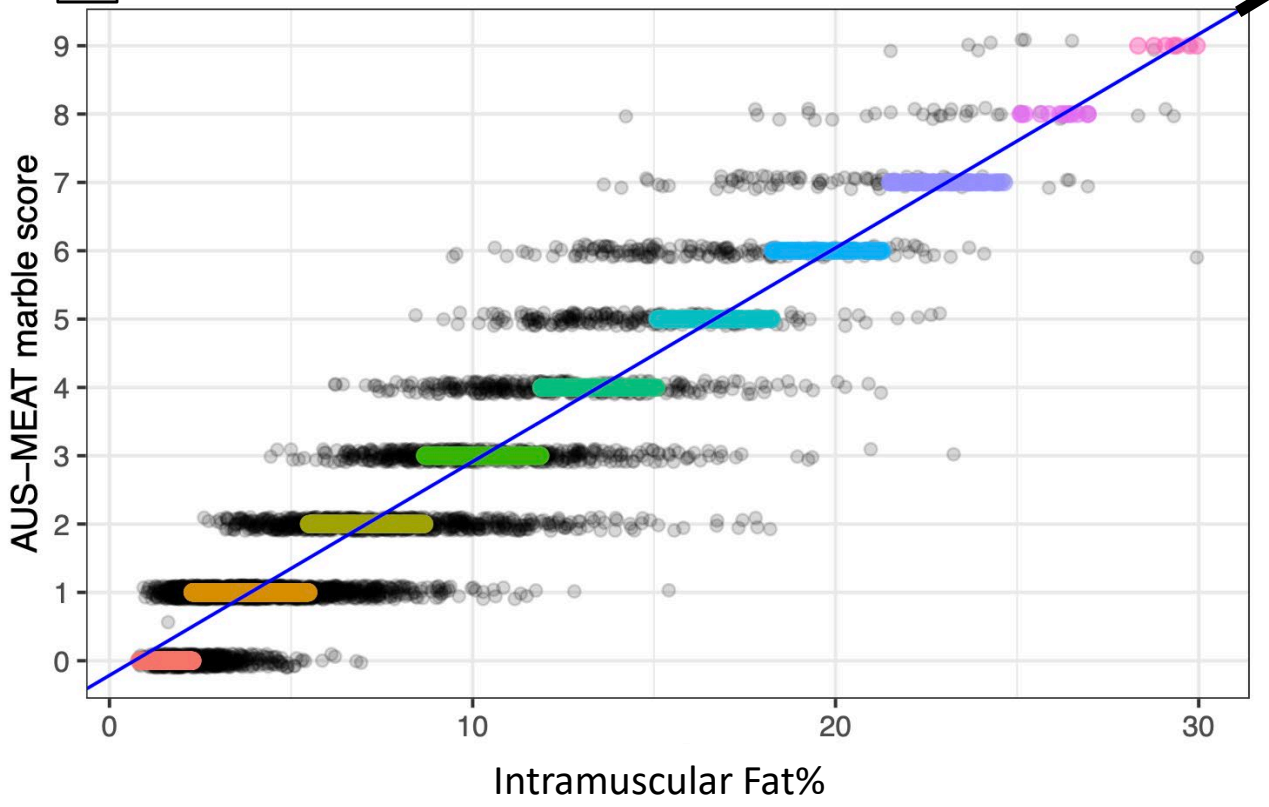
Convert IMF% into visual marble score

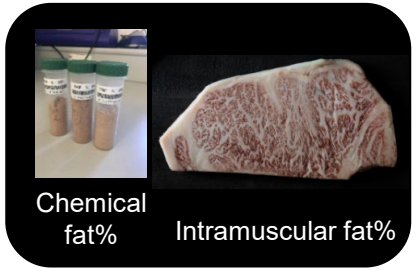


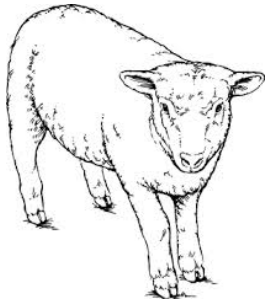
Transform

Extend the range

It can go further!

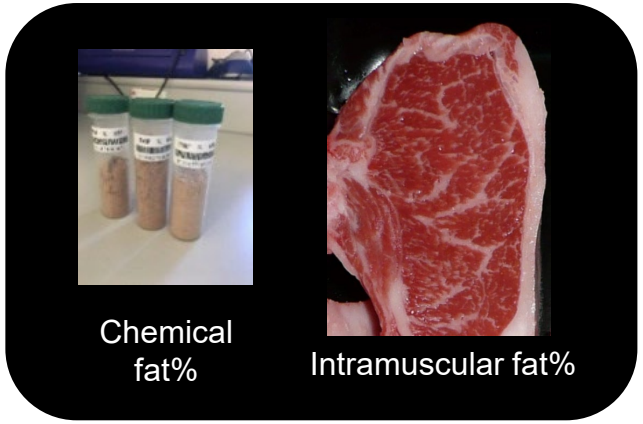






Intramuscular fat %

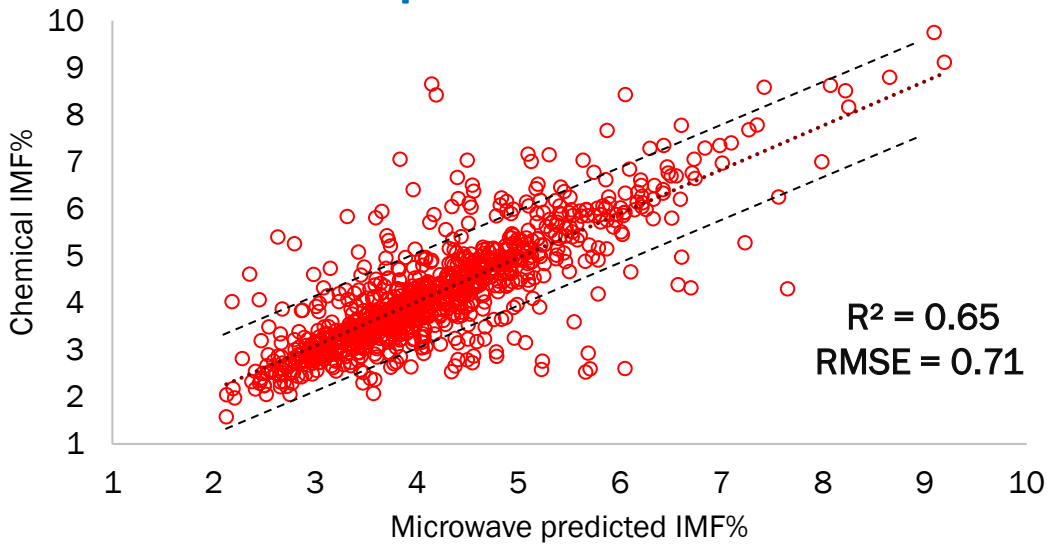
New AUS-MEAT trait

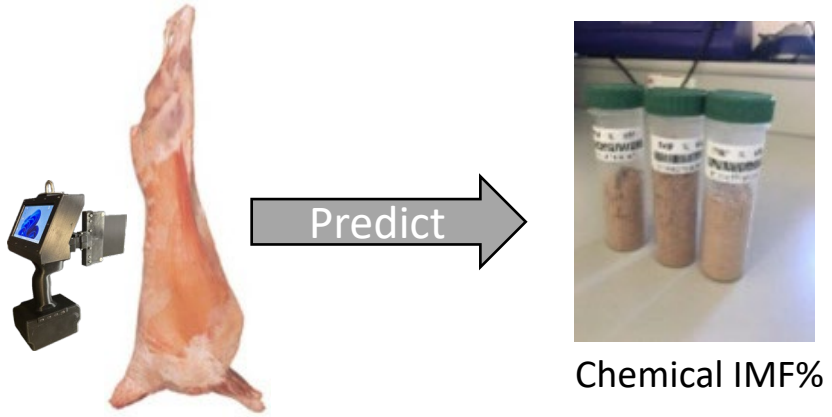


Total extractable fat from
loin muscle expressed as % of wet weight

Microwave predicted IMF%

Compared to lab IMF%

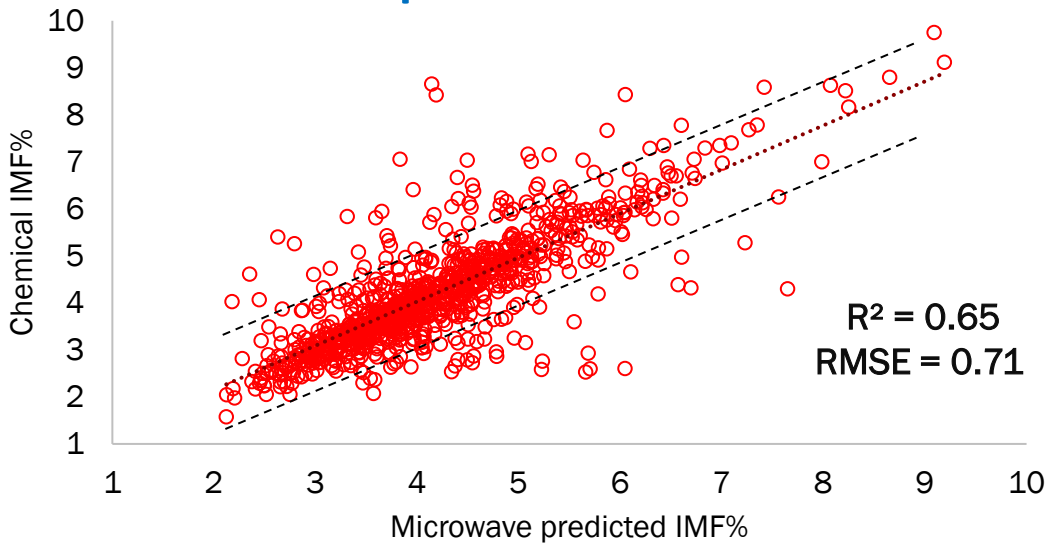




Microwave scan at C-site (hot)

Microwave predicted IMF%

Compared to lab IMF%

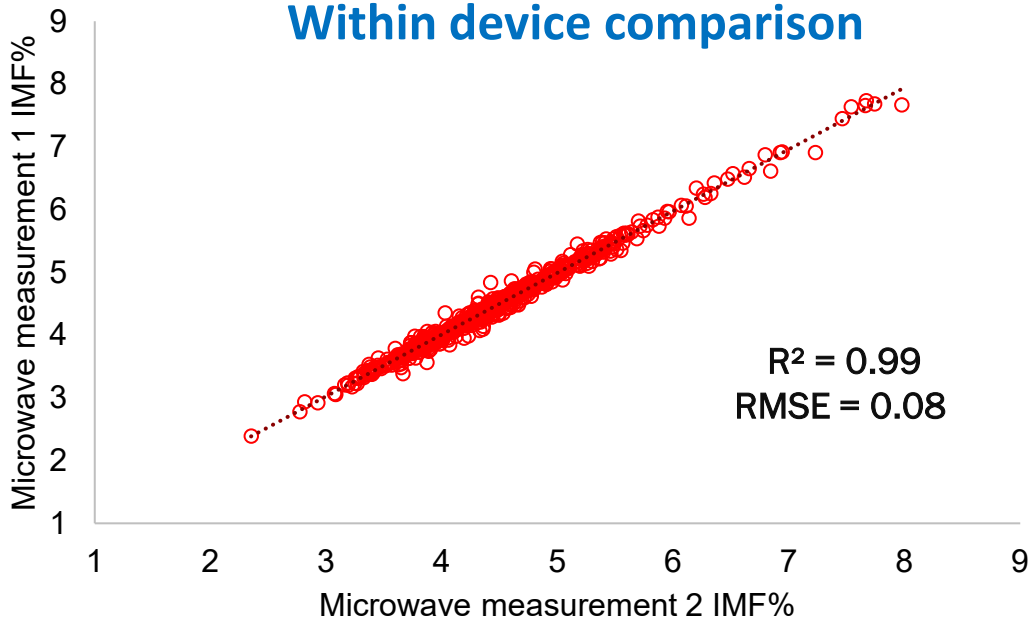


Predict

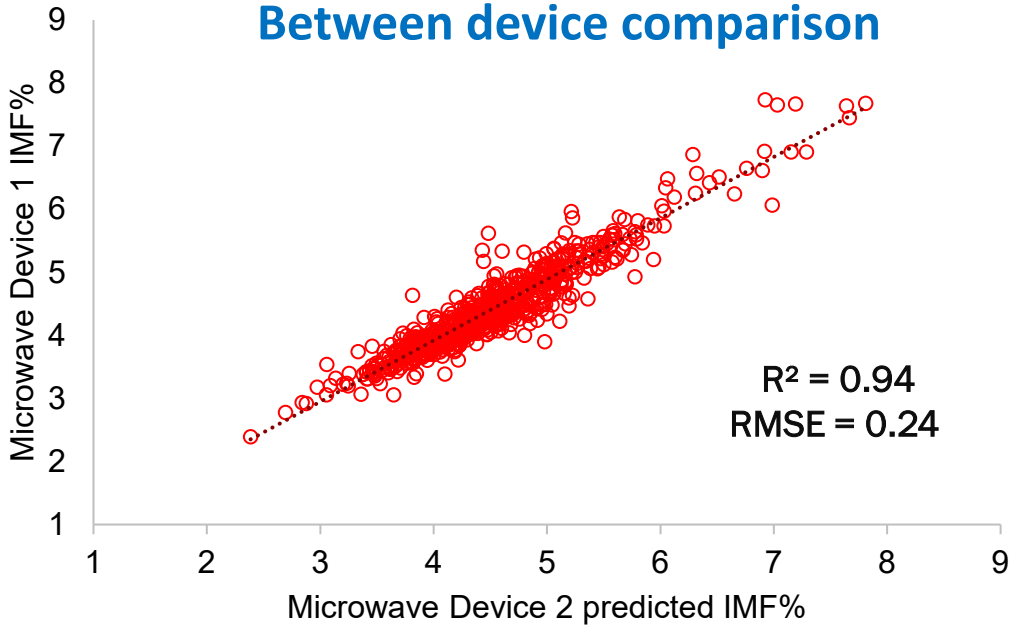
Chemical IMF%

Microwave scan at C-site (hot)

Within device comparison



Between device comparison

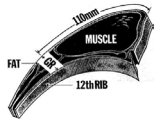


Cuts-based lamb MSA

Lean % + Weight + IMF% → EQ

DEXA lean %

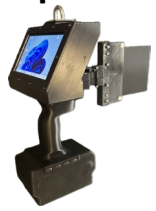
Microwave



GR Knife

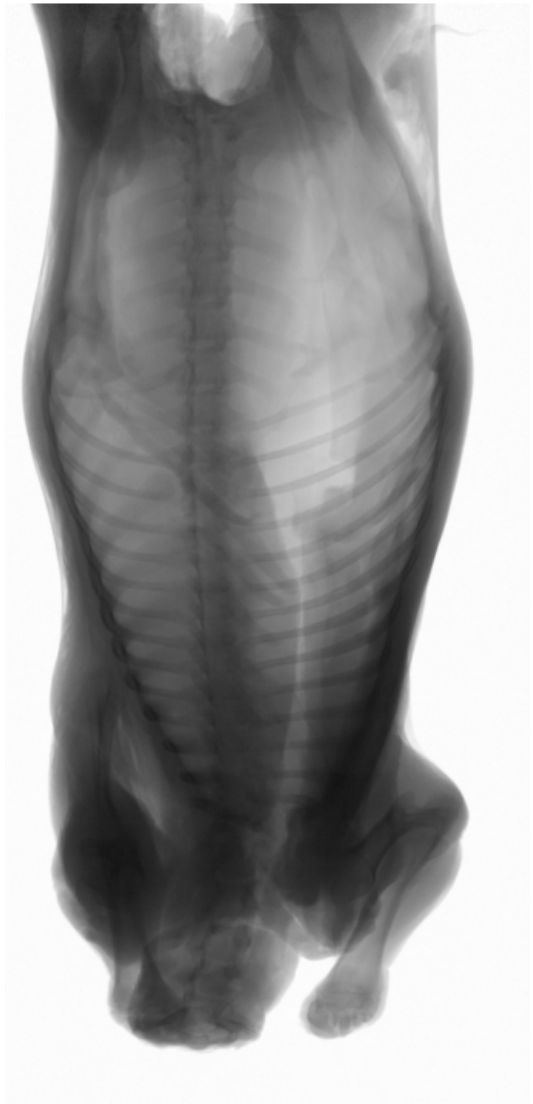
MEQ Probe

NIR probe



Microwave

DEXA for eating quality



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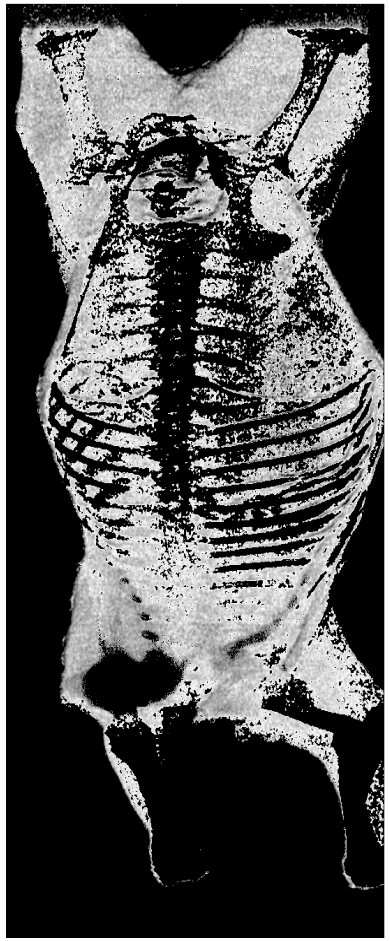
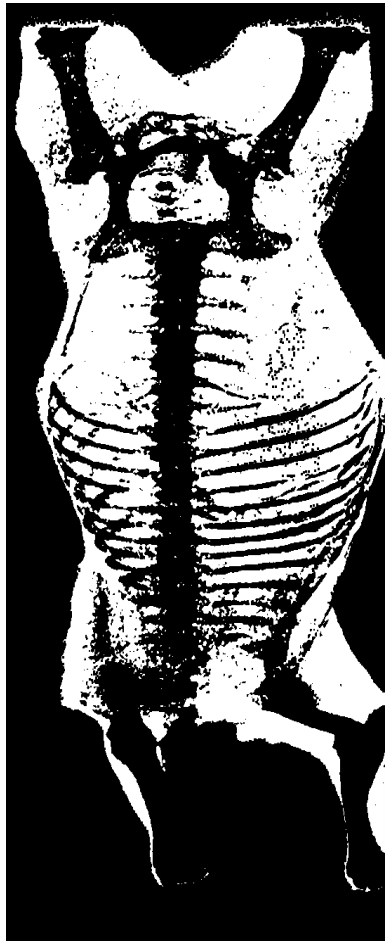
MEAT & LIVESTOCK AUSTRALIA

Improved DEXA bone detection

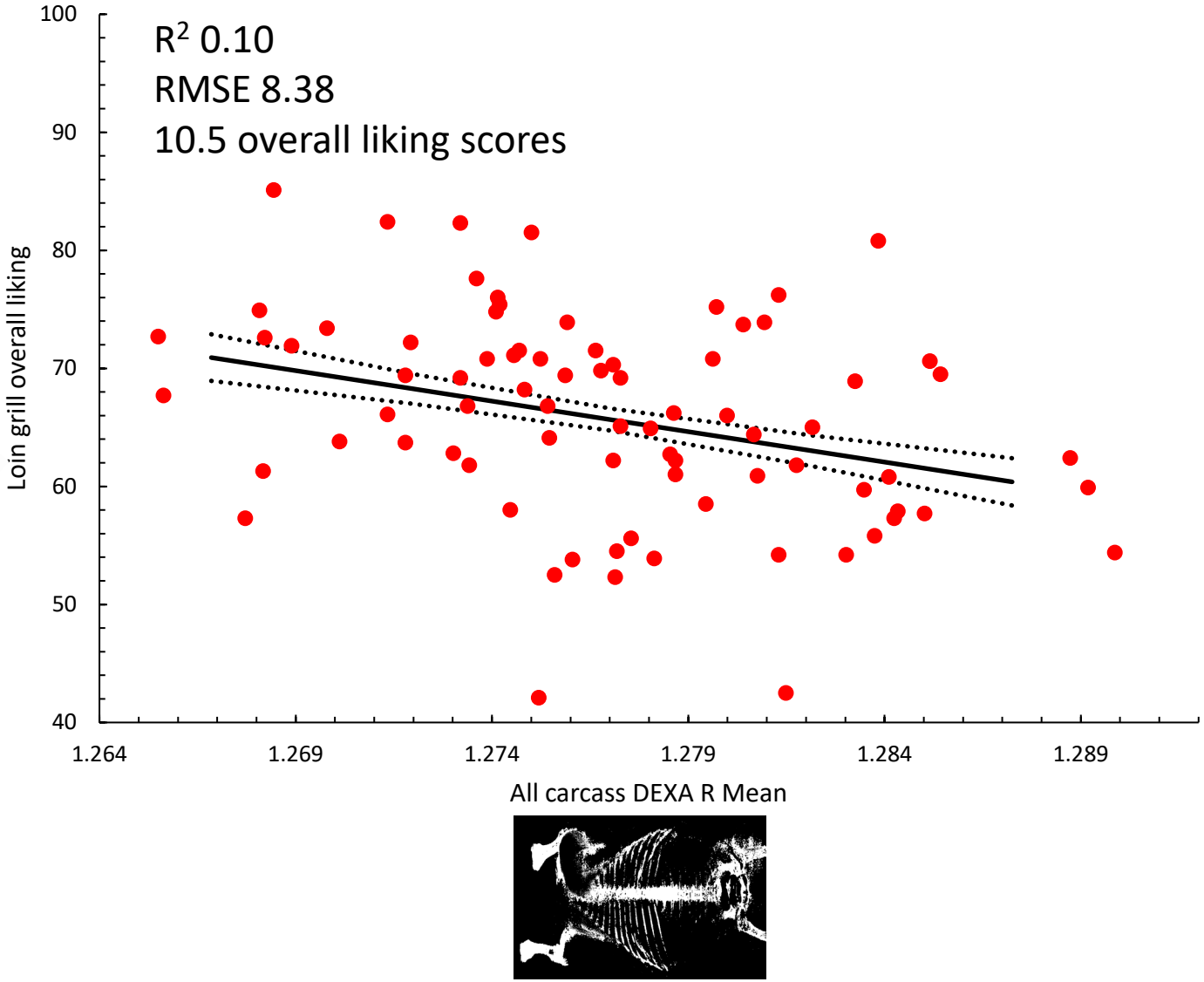


Before



After

Bone R-values predicting loin grill overall liking



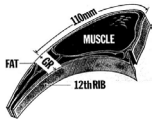
Anderson et al. (2021). The potential for dual energy X-ray absorptiometry to predict lamb eating quality. Meat Science 181, 108434.

Cuts-based lamb MSA

Lean % + Maturity + IMF% → EQ

DEXA lean %

Microwave



GR Knife

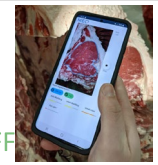
DXA bone

MEQ Probe

NIR probe

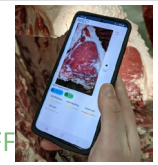
Microwave

Currently AUS-MEAT Accredited

	Marbling	Marbling	Meat Colour	Fat Colour	Eye Muscle Area	Intramuscular Fat%
 Q-FOM	✓ Score 100 - 1190	✓ Score 0 - 9	✓ Score 1A - 6	✓ Score 0 - 6	✓	
 VIAScan	✓ Score 100 - 1190					
 MasterBeef	✓ Score 100 - 1190					
 MIJ-30		✓ Score 7 - 9				
 MEQ Probe	✓ Score 100 - 1190	✓ Score 7 - 9				
 MEQ Camera	✓ Score 100 - 1190	✓ Score 0 - 9	✓ Score 1A - 6	✓ Score 0 - 8	✓	

[OFF]

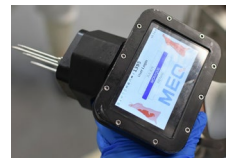
Currently AUS-MEAT Accredited

	Marbling	Marbling	Meat Colour	Fat Colour	Eye Muscle Area	Intramuscular Fat%
 Q-FOM	✓ Score 100 - 1190	✓ Score 0 - 9	✓ Score 1A - 6	✓ Score 0 - 6	✓	
 VIAScan	✓ Score 100 - 1190					
 MasterBeef	✓ Score 100 - 1190					
 MIJ-30		✓ Score 7 - 9				
 MEQ Probe	✓ Score 100 - 1190	✓ Score 7 - 9				
 MEQ Camera	✓ Score 100 - 1190	✓ Score 0 - 9	Score 1A - 6	Score 0 - 8		

Microwave
2.0 to 8.0 IMF%

SOMA NIR device
3.5 to 8 IMF%

MEQ Probe
1.7 to 7.5 IMF%



Summary

1. Assembling the measurement jigsaw puzzle
2. Lamb IMF% integrated into MSA model
3. Beef IMF% accepted input to MSA model
4. Extend AUS-MEAT marble scores using IMF%
5. DEXA bone a new EQ trait

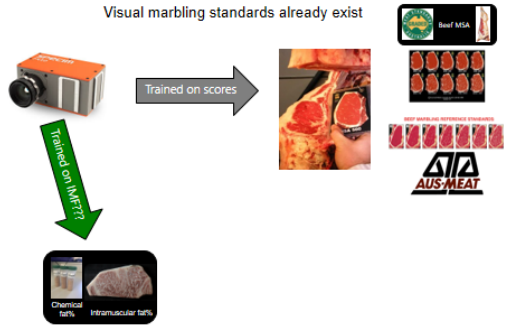
Outline

1. Measurement to create supply chain value
2. Lamb IMF%
3. New DEXA EQ trait
4. Extend AUS-MEAT marble scores using IMF%

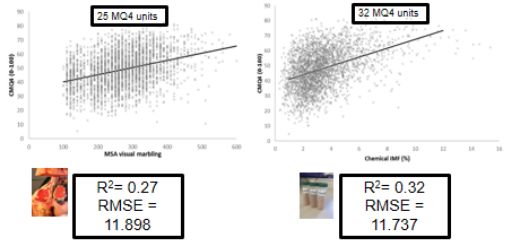
Intramuscular Fat %

A new trait for beef

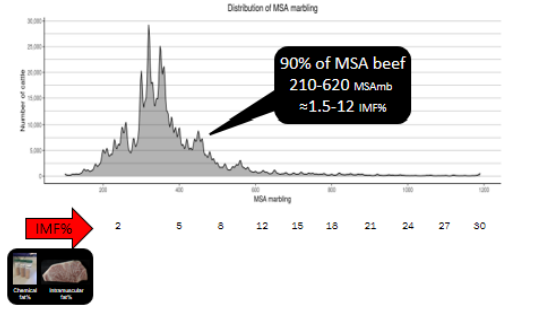
Why do we need a new IMF% trait?

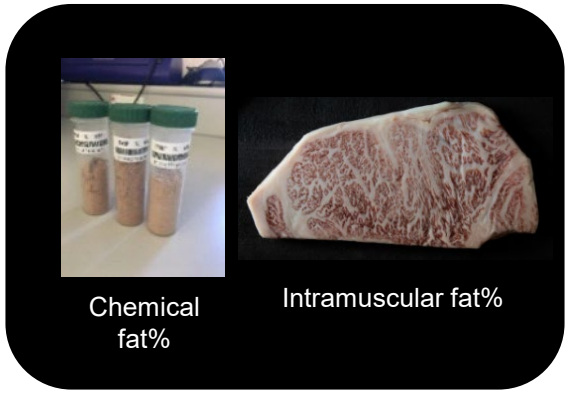


MSAmb vs IMF on CMQ4

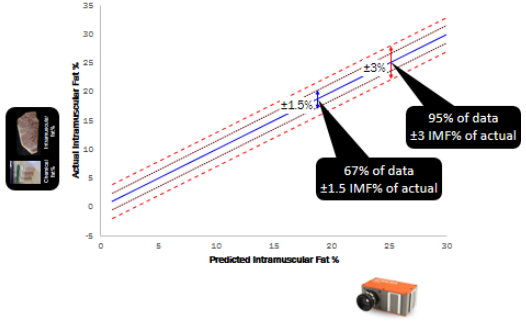


IMF% population range (MSA data)

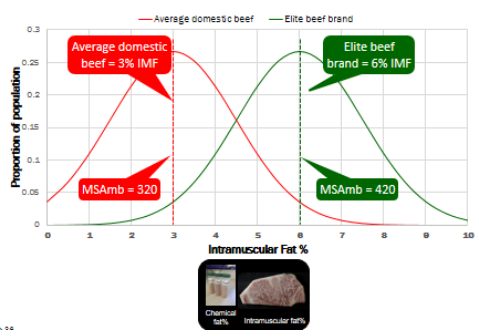




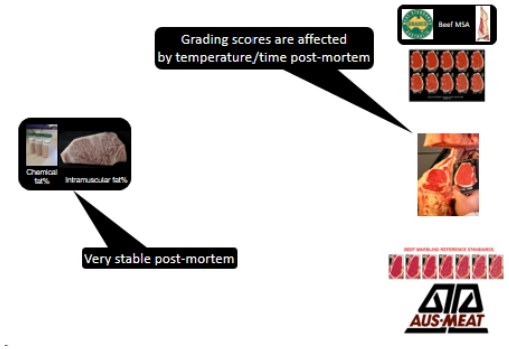
IMF% error tolerance



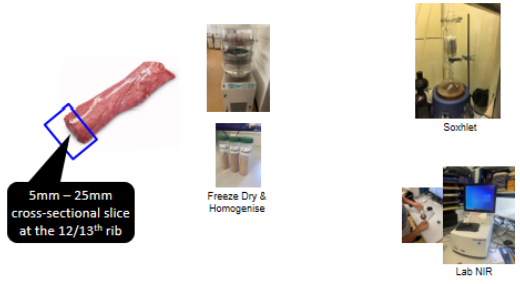
IMF% error tolerance



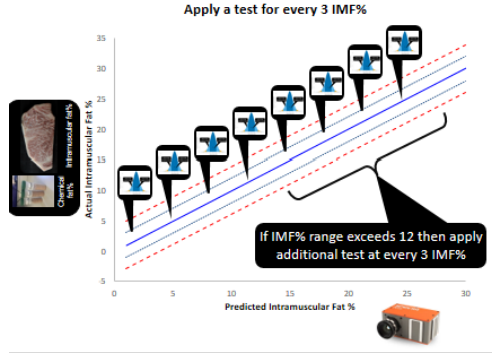
IMF% doesn't change post-mortem



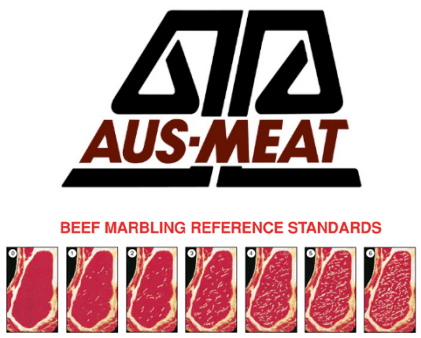
What is IMF%?

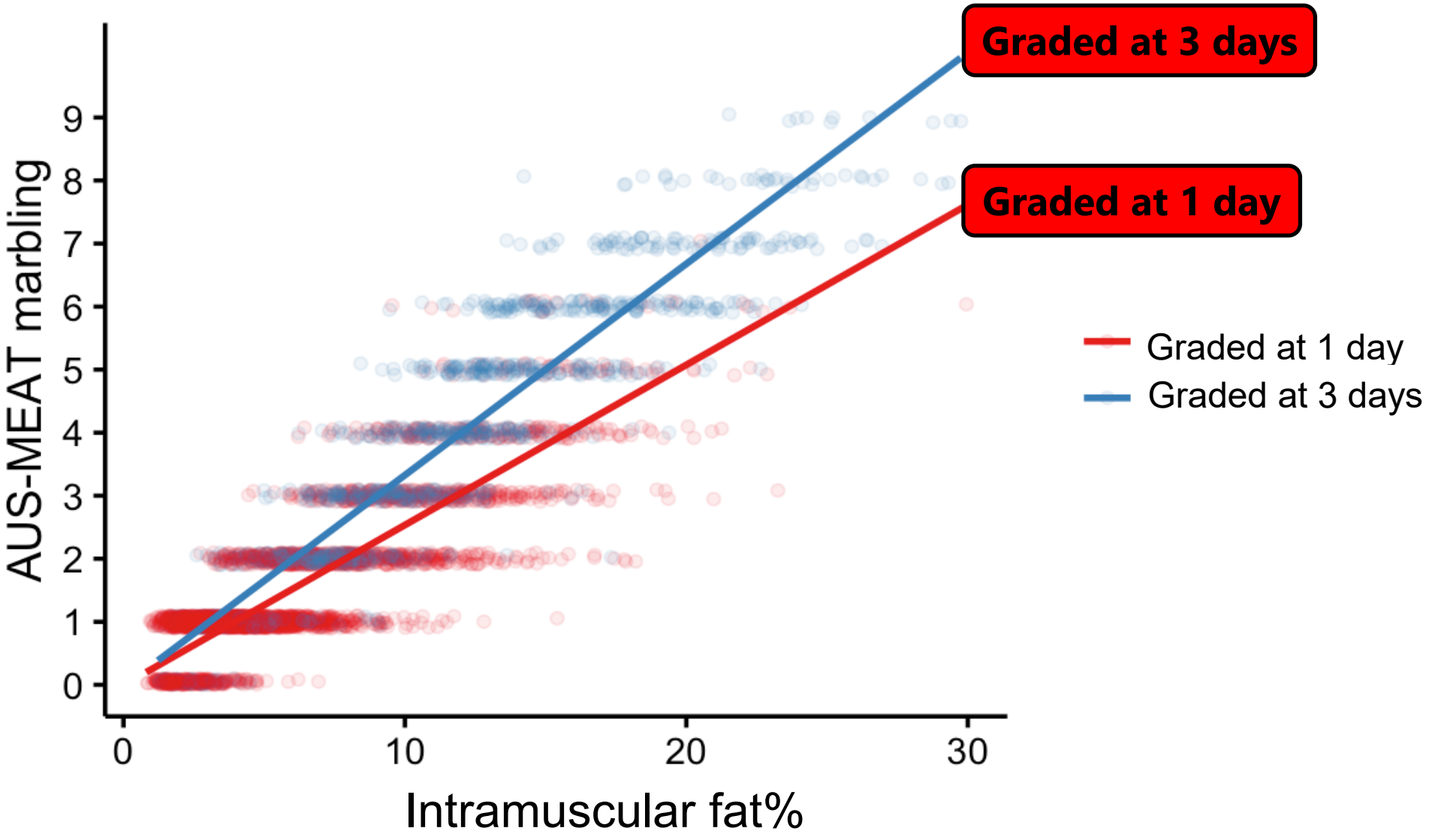


How to assess accuracy?

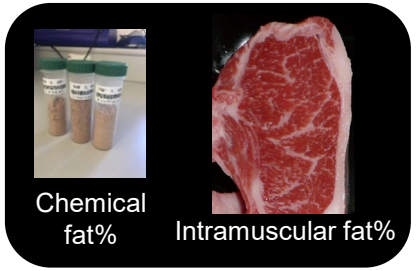


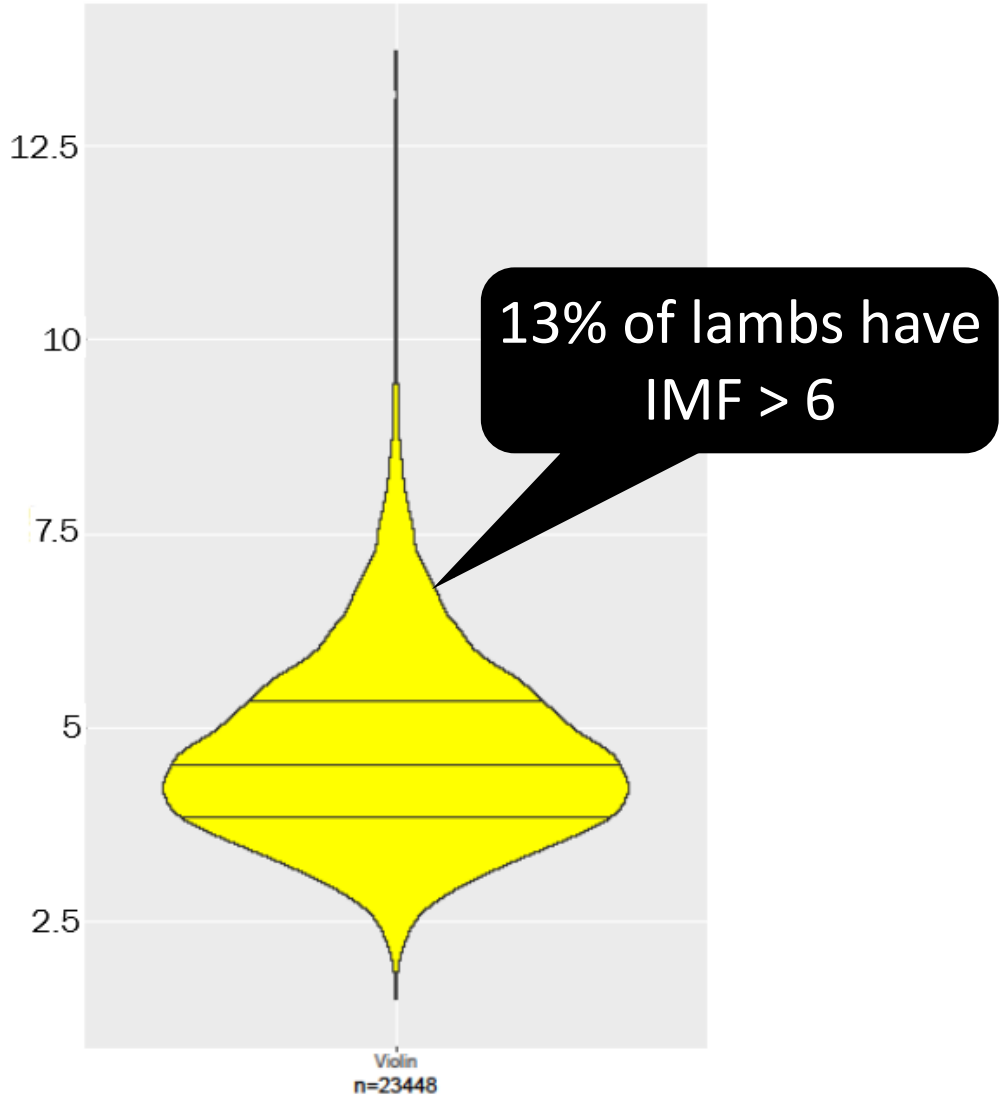
Grader data collected at 1 or 3 days





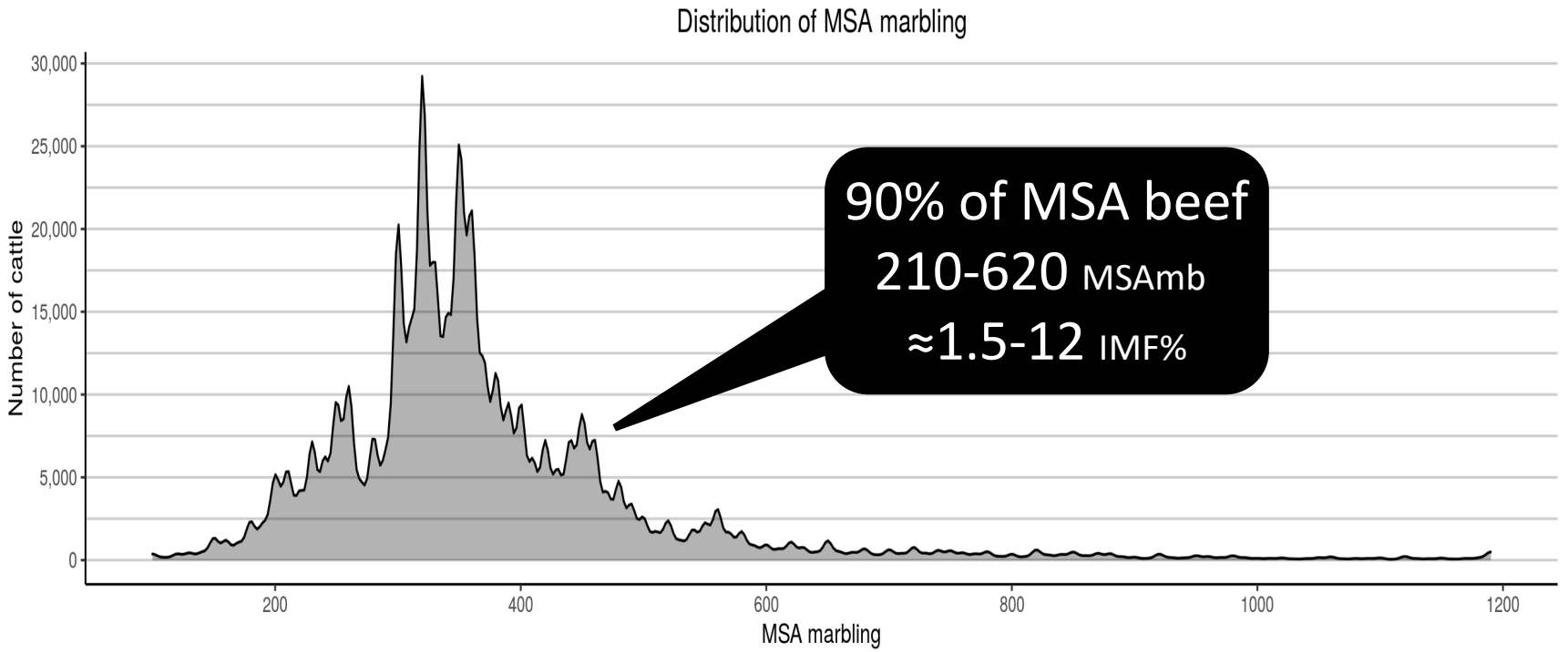
IMF% population range (nucleus flock)



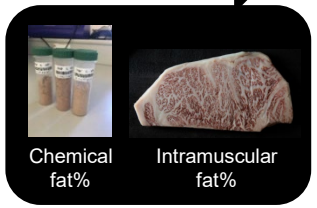


13% of lambs have IMF > 6

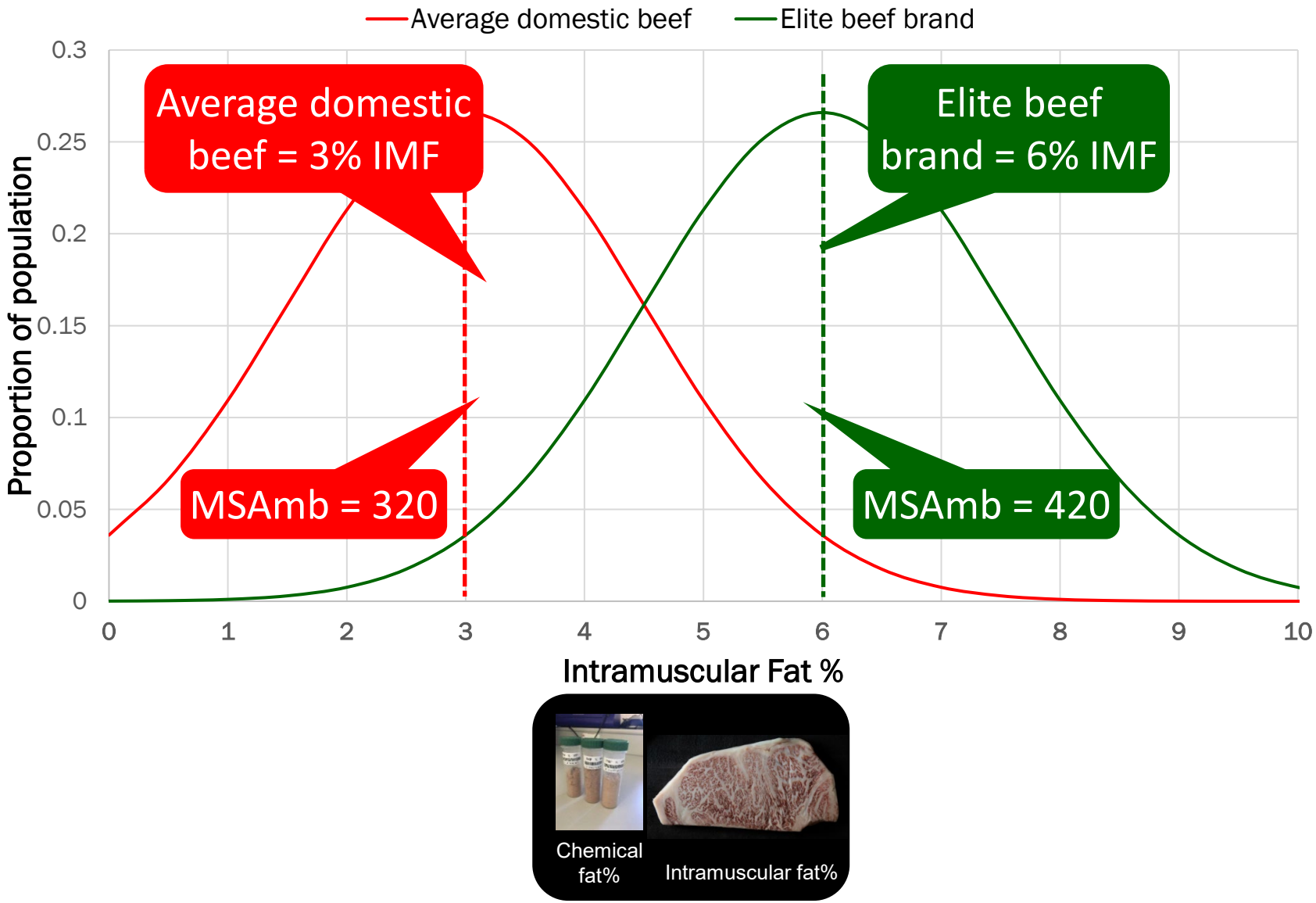
IMF% population range (MSA data)



IMF% 2 5 8 12 15 18 21 24 27 30



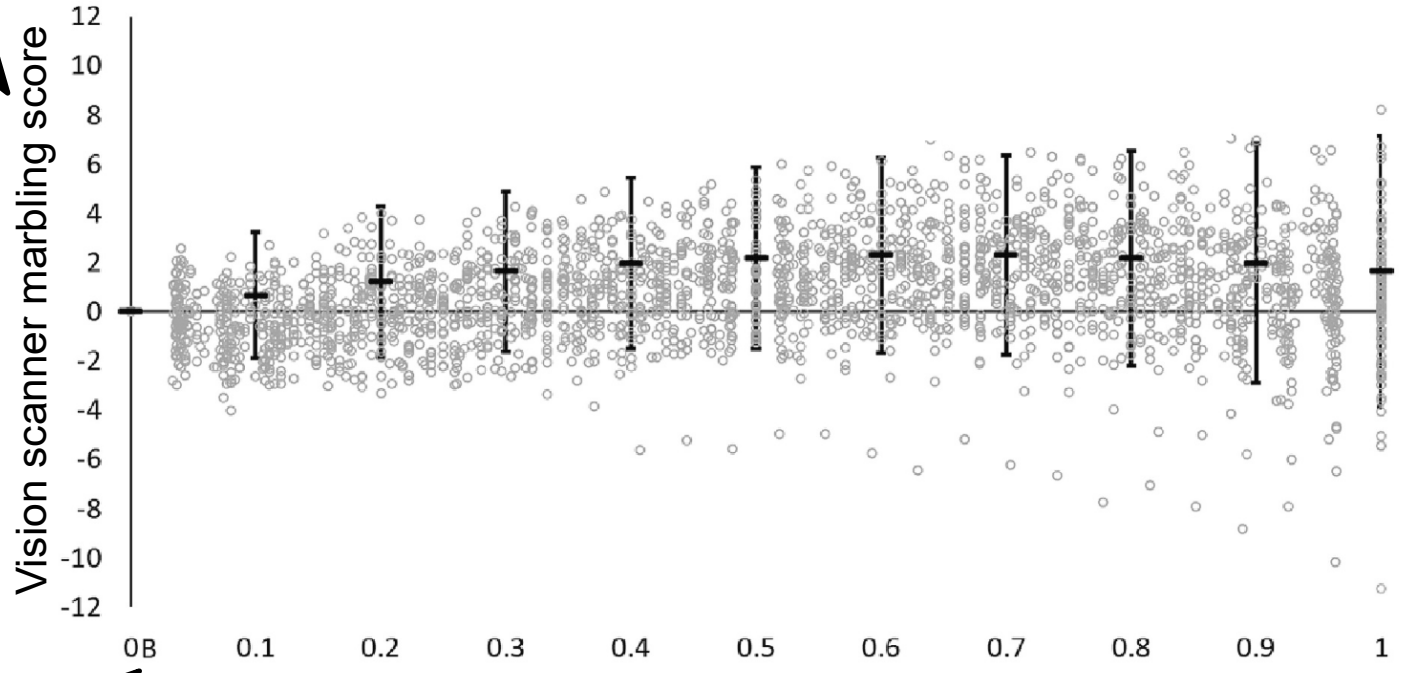
IMF% error tolerance



Does IMF% vary along length of cube roll?

Marbling variation across length of cube roll

Mean difference from first steak



First steak

Steak position as a proportion of cube roll length

Currently AUS-MEAT Accredited

Cut Surface Camera Technologies (CSCT) - Conditional Approval

(Please note that specific establishment approval from AUS-MEAT is required before commercial use of these devices at each establishment)

Equipment Name	Equipment Supplier	Contact Details	Comments
E + V Cold Carcass Beef Grading Camera VBG2000	E+V Technology GmbH& Co.KG		Approval Rescinded 24/11/2022.
MEQ Camera	MEQ	https://www.meqprobe.com/	Currently hold **Conditional Approval***: (i) Meat Colour
MIJ-30	Meat Image Japan	https://www.mij-labo.co.jp/en/products/ https://www.mij-labo.co.jp/en/home/	Approval Rescinded 24/11/2023.
MIJ-Mobile	Meat Image Japan	https://www.mij-labo.co.jp/en/products/ https://www.mij-labo.co.jp/en/home/	Approval Rescinded 24/11/2023.

*Further revalidation trials are required before gaining Final Approval by the AMILSC.

Intramuscular Fat Percentage (IMF%) Sheepmeat

(Please note that specific establishment approval from AUS-MEAT is required before commercial use of these devices at each establishment)

Equipment Name	Equipment Supplier	Contact Details	Comments
MEQ Probe (Sheepmeat)	MEQ Probe	https://www.meqprobe.com/take-action https://www.meqprobe.com/	Range of IMF% in Sheepmeat: 1.7% - 7.5% *(updated AMILSC Feb 2023)*
SOMA S-7090 NIR	Soma Optics Ltd.	Akiko Furuya International sales team, Fujihira Industry Co., Ltd akiko.furuya@fujihira.co.jp	Range of IMF% in Sheepmeat: 3.5% - 8.0%

Intramuscular Fat Percentage (IMF%) Beef

(Please note that specific establishment approval from AUS-MEAT is required before commercial use of these devices at each establishment)

Equipment Name	Equipment Supplier	Contact Details	Comments
			No Devices currently Approved.

Cut Surface Camera Technologies (CSCT) - FULL Approval

(Please note that specific establishment approval from AUS-MEAT is required before commercial use of these devices at each establishment)

Equipment Name	Equipment Supplier	Contact Details	Comments
Q-FOM Beef Camera	Frontmatec Smoerum A/S	https://www.frontmatec.com/en/front-page https://www.frontmatec.com/en/contact	Currently hold **Full Approval**: (i) AUS-MEAT Meat Colour (ii) AUS-MEAT Fat Colour (0-6) (iii) AUS-MEAT Marbling (0-6) (iv) AUS-MEAT High Marbling (7-9) (v) MSA Marbling (vi) Eye Muscle Area (EMA)
MEQ Camera	MEQ	https://www.meqprobe.com/	Currently hold **Full Approval**: (i) AUS-MEAT Fat Colour (0-8) (ii) AUS-MEAT Marbling (0-6) (iii) AUS-MEAT High Marbling (7-9) (iv) MSA Marbling (v) Eye Muscle Area (EMA)
MIJ-30	Meat Image Japan	https://www.mij-labo.co.jp/en/products/ https://www.mij-labo.co.jp/en/home/	Currently hold **Full Approval**: (iii) AUS-MEAT Marbling (7-9)
Masterbeef app & Camera Device	Masterbeef	https://masterbeef.com.au/	Currently hold **Full Approval**: (i) MSA Marbling
VIAscan CAS III	Marel Cedar Creek	https://marel.com/en https://marel.com/en/products	Currently hold **Full Approval**: (i) MSA Marbling

Non-Cut Surface Camera Technologies (NCSCT) - Full Approval

(Please note that specific establishment approval from AUS-MEAT is required before commercial use of these devices at each establishment)

Equipment Name	Equipment Supplier	Contact Details	Comments
MEQ Probe Auroch v1.0	MEQ Probe	https://www.meqprobe.com/	Currently hold **Full Approval**: (i) MSA Marbling (ii) AUS-MEAT Marbling (7-9)

Predict CT Lean%, Fat% and Bone% in sheep carcases in Sheepmeat

(Please note that specific establishment approval from AUS-MEAT is required before commercial use of these devices at each establishment)

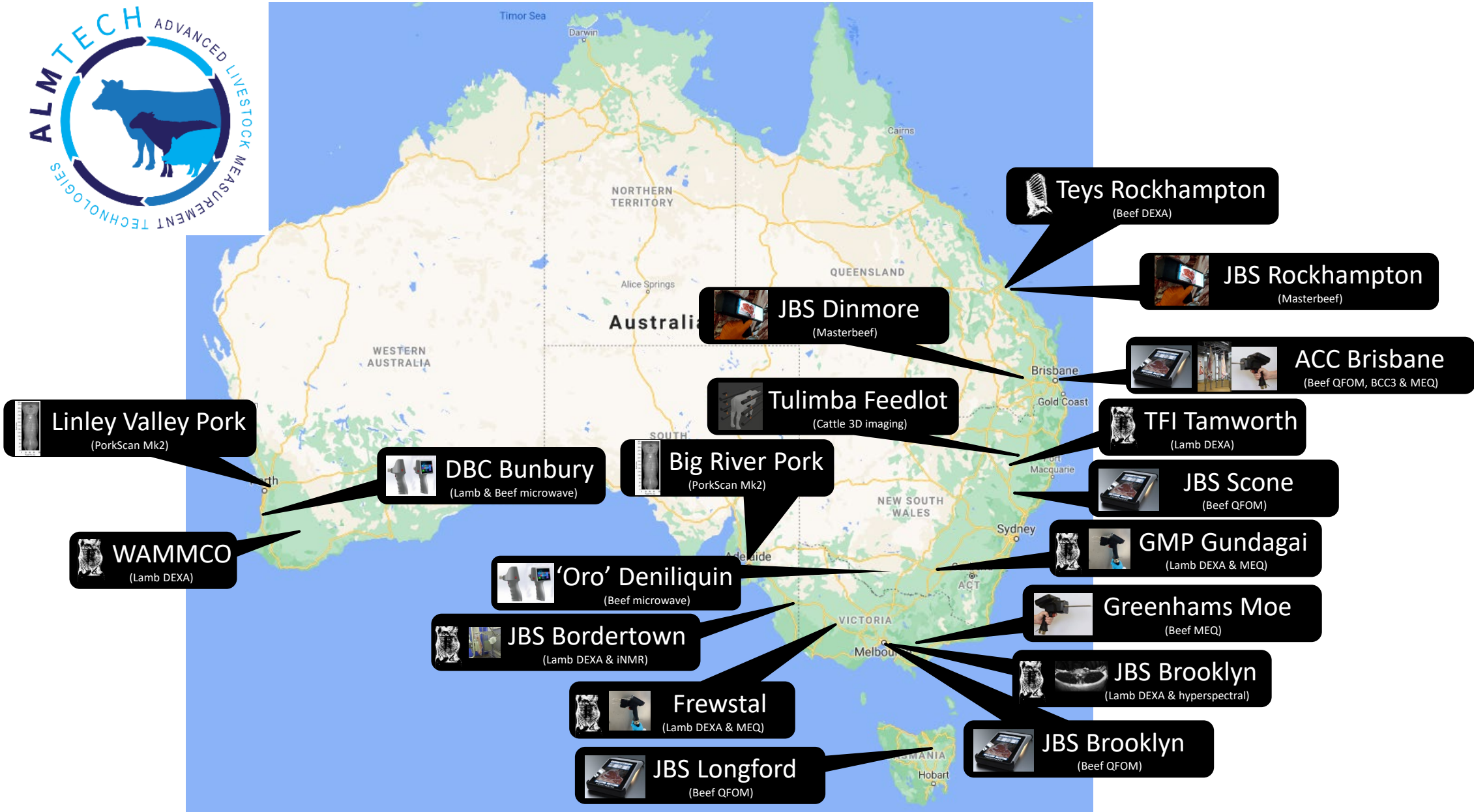
Equipment Name	Equipment Supplier	Contact Details	Comments			
			APPROVED LEVEL OF ACCURACY			
			Hot Standards Carcase Weight	Carcase Fat %	Carcase Lean %	Carcase Bone %
Dual Energy Xray Absorptiometer (DXA) device	Scott Automation and Robotics	Scott | Scott Technology - Automation & Robotics Solutions (scottautomation.com)	<22kg	10.9% - 30.3%	53.2% - 65%	14.9% - 25.0%
			22-28kg	14.0% - 35.0%	50.9% - 66.2%	13.3 – 18.0%
			>28kg	22.0% – 37.1%	*49% - 60.6%*	11.6% - 17.5%

https://www.ausmeat.com.au/services/list/meat/equipment-approval-information/

2016.....

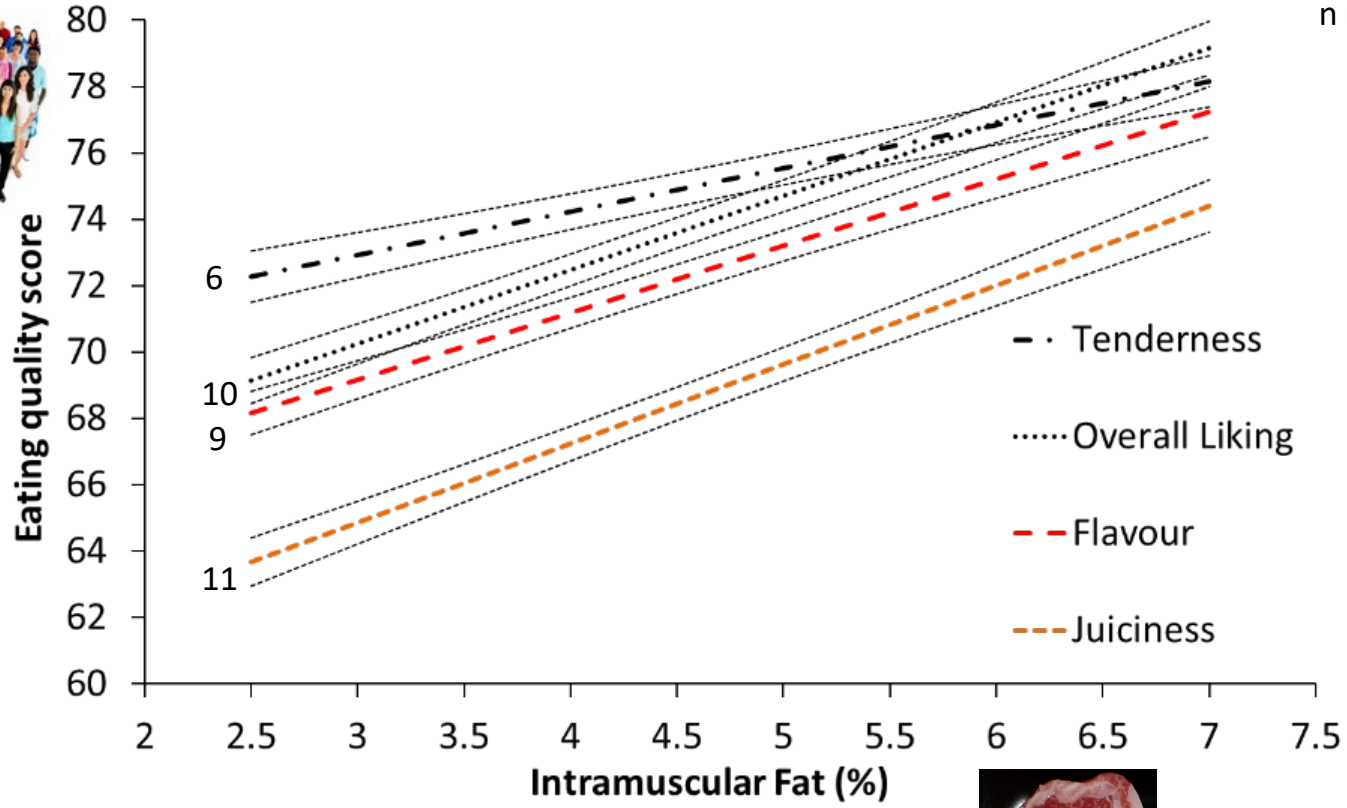

Timor Sea
Darwin
Cairns
NORTHERN TERRITORY
QUEENSLAND
Alice Springs
Australia
WESTERN AUSTRALIA
Brisbane
Gold Coast
Geraldton
SOUTH AUSTRALIA
Port Macquarie
Perth
NEW SOUTH WALES
Sydney
Adelaide
Canberra ACT
Great Australian Bight
JBS Bordertown
(Lamb DEXA)
VICTORIA
Melbourne
TASMANIA
Hobart

ALMTech commercialisation roll-out



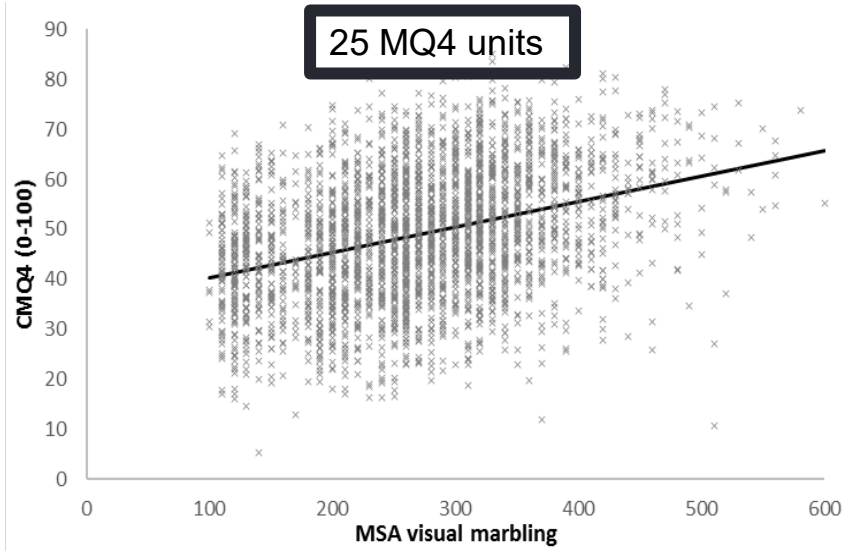
IMF improves eating quality

n = 1434

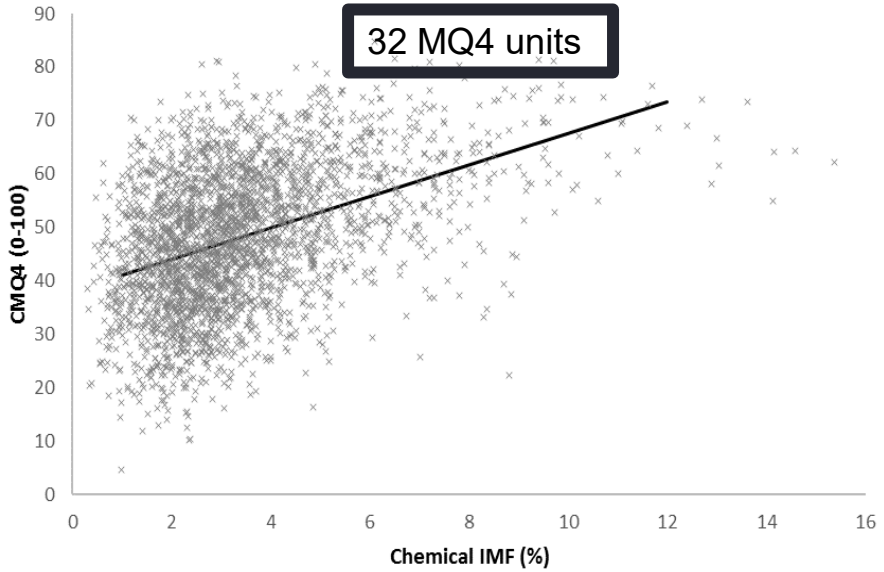


Pannier *et al.* Meat Sci. 2014

MSAmb vs IMF on CMQ4



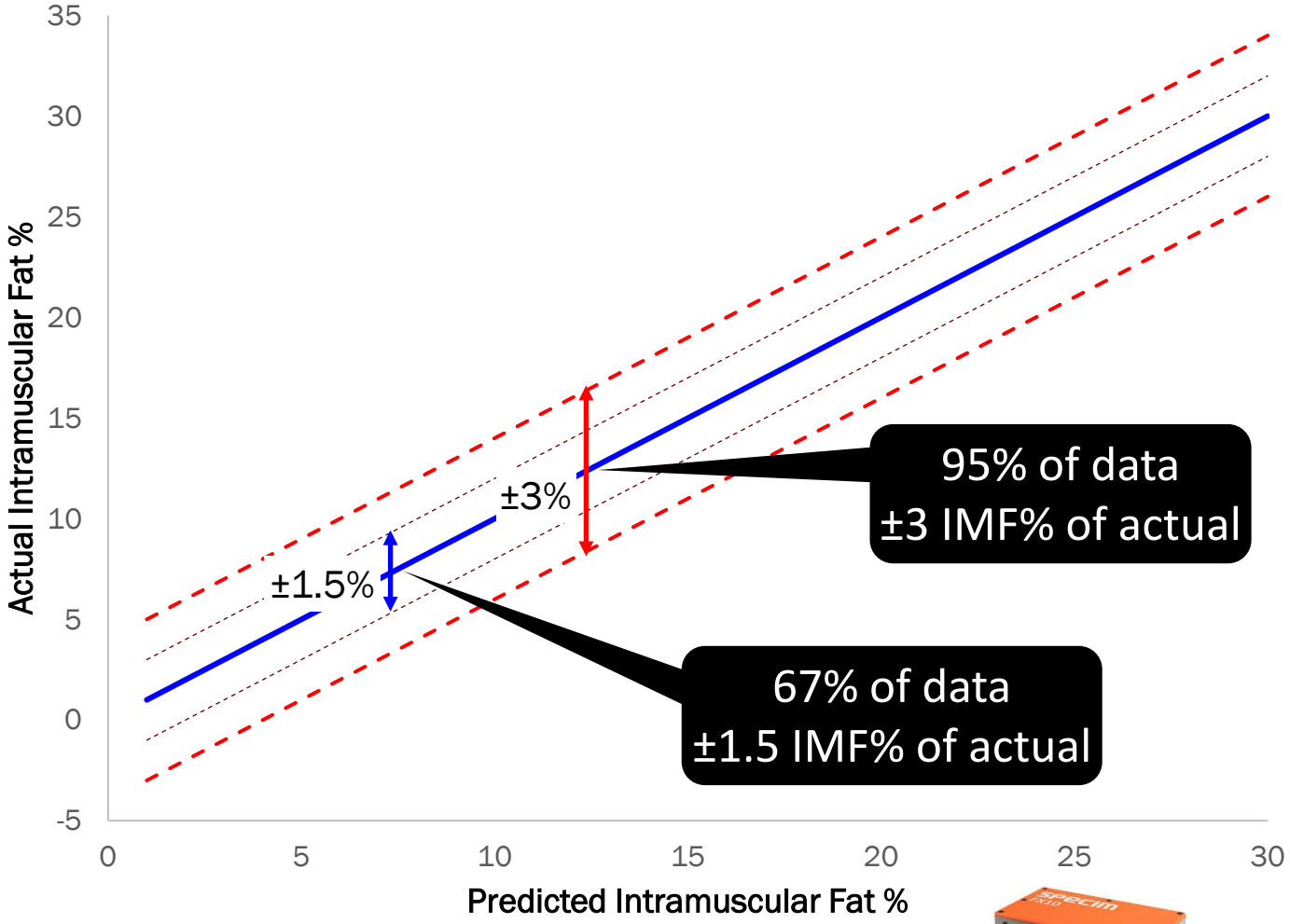
R^2= 0.27
RMSE = 11.898



R^2= 0.32
RMSE = 11.737

Stewart et al. 2021. Meat Science

IMF% error tolerance - beef



IMF% error tolerance - beef

Apply a test for every 3 IMF%