The Meat Standards Australia Index – improving carcass feedback

Peter McGilchrist

Rod Polkinghorne
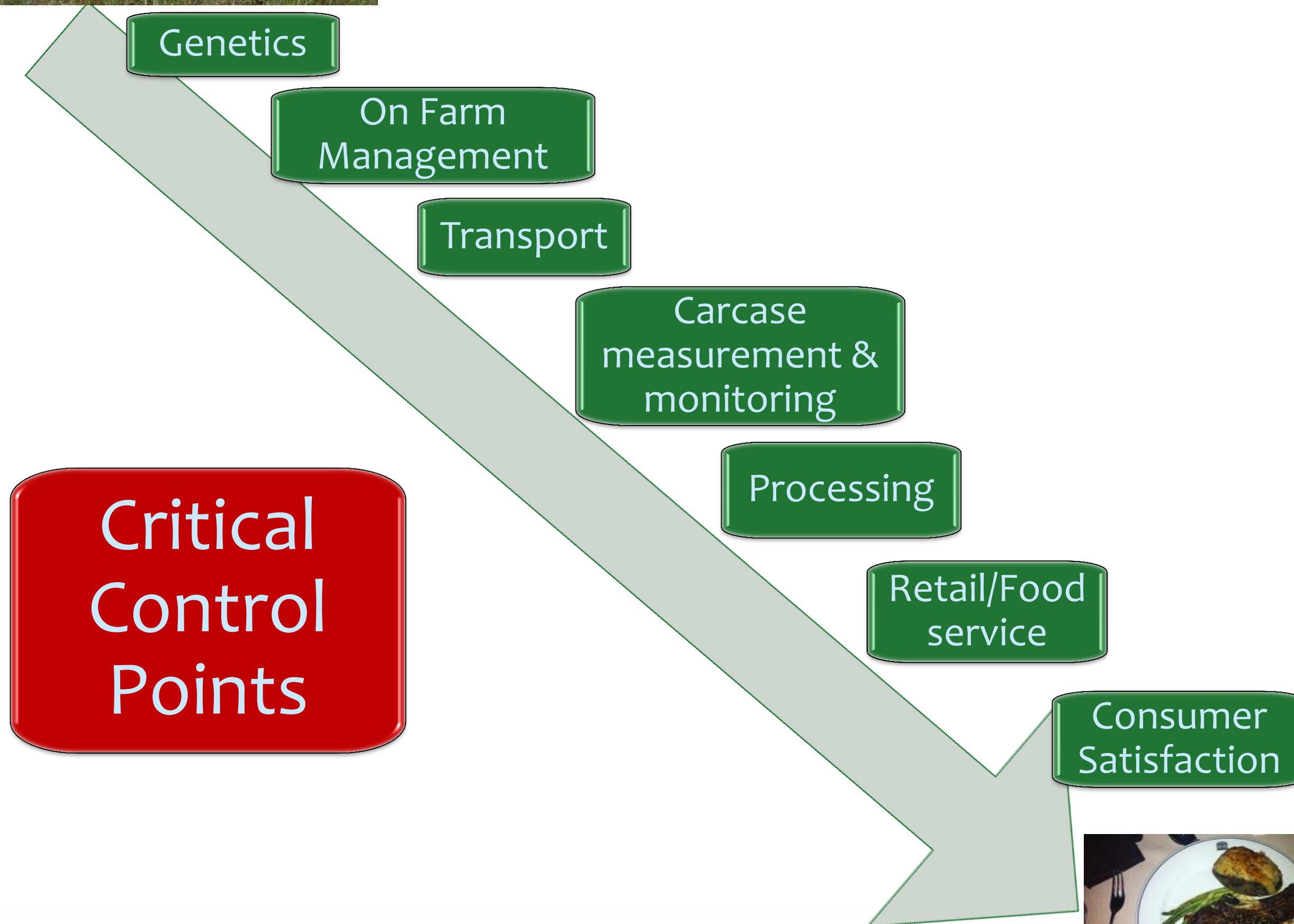### Alex Ball
John Thompson

OVERVIEW

- **Meat Standards Australia**

- **The MSA Index and its purpose**

- **Historic carcass feedback**

- **Factors which impact the MSA Index**

- **Importance of genetics**

- **Future work**

MEAT STANDARDS AUSTRALIA

Genetics

On Farm Management

Transport

Carcase measurement & monitoring

Processing

Retail/Food service

Consumer Satisfaction

Critical Control Points

INDONESIA

TORRES STRAIT

PAPUA NEW

SOUTH PACIFIC

Ashmore Reef

Scott Reef

NORTHERN TERRITORY

SANDY DESERT

TANAMI DESERT

Tennant Creek

Mount Isa

QUEEN

Tropic of Capricorn

PILBARA

Tom Price

L. Macleod

Camarvon
Shark
Bay

Gascoyne

Dirk Hartog I

Geraldton

PERTH
Rockingham
Mandurah

Northam
Merredin

Norseman

Corrigin

Bunbury

Ravensthorpe

Margaret River

Albany

SOUTH AUSTRALIA

Tarcoola

L. Torrens

NEW SOUTH WALES

Port Macquarie

NEWCASTLE
CENTRAL COAST
SYDNEY

Lord Howe I

MELBOURNE

Warrnambool

GEELONG

Wonthaggi

King I

BASS STRAIT

Flinders I

Cape Barren

Smithton

Burnie

Devonport

Launceston

Queenstown

TASM

L. Pedder

HOBART

South Bruny I

Greater than 1 000 000

000 001 - 1 000 000

000 - 100 000

ess than 20 000

on figures based on
census data

Road, principal

Selected railways

Spot elevation

State boundary

River, perennial

River, non-perennial

Lake, perennial

Lake, non-perennial

Reef

COMPONENTS OF MSA SYSTEM

■ Predictors

- Breed
  - Bos indicus content/Hump height
- Hormone growth promotants
- Gender
- Growth path
  - Carcass wt
  - Ossification score
  - Milk fed veal
- Hang
- Marble score
- Ageing: 5d min
- Cooking method
- 39 muscles

■ Basic criteria

– Stress minimisation

– Farm – kill = 36 hours

– Optimal processing

☐ Thresholds

– Ultimate ph<5.7

– Meat colour (3 or less)

– Rib fat > 3mm

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Http://www.Publish.Csiro.Au/nid/73/issue/4061.Htm (open access)

WHAT IS THE PROBLEM?

The MSA model describes a complex biological system

- The **downside** is that any model needs to be complex to describe the biology

- The **upside** is the complexity results in a more accurate model

Priority for Meat Standards Australia was to communicate eating quality information back along the supply chain to producers

= MSA quality index

HISTORIC CARCASS FEEDBACK

- Rib Fat
- Ossification
- Hump height
- HGPs

- Marbling
- HSCW
- pH_u
- Sex

- Sex, hump height/Bos Indicus content and HGP all have different effects on different muscles

- Ossification and marbling have different coefficients for different muscles

- Some impacts of traits on eating quality are non-linear and interact

- There is no single indicator muscle for quality

- Need to summarise the complex model into a simple index

= MSA quality index

WHAT IS THE MSA INDEX?

A **single number** to indicate the overall quality of a carcass

A weighted average of eating quality scores

PURPOSE OF MSA INDEX

To provide a standard measure over time of carcass eating quality

- The Index will be an **alternative** to individual trait data for feedback

- A sound basis for evaluation of <u>on-farm genetic progress & management strategies</u> between seasons and years

- A solid <u>benchmarking tool</u> for suppliers of feeder and slaughter cattle

- Could be used in combination with yield for value-based payment systems

CONSTRUCTION OF MSA INDEX

Carcass inputs

MSA Parameter	Individual Carcass data
%Bos indicus	0
Sex	M
HGP	N
Milk FV	N
Saleyard	N
Carcass Wt	324
Ossification	140
Marbling	360
Rib fat	12
pHu	5.59
Ult Temp	4.3
Hang	AT
Days Aged	5

cut	muscle	GRL	RST	SFR	TSL	YAK	SSB	SCT
spinalis	SPN081	81	71	81	77	82		
tenderloin	TDR034	85		79				
tenderloin	TDR062	81	80	83	78	73	70	
tenderloin	TDG062	79						
cube roll	CUB045	71	71	71	71	72		
striploin	STA045	66	67	68	65	68	59	
striploin	STP045	64	65	68	64	66	58	
oyster blade	OYS036	70	67	73	74	74		
blade	BLD095			46	51			
blade	BLD096	59	63	65	64	67	52	65
chuck tender	CTR085		53	56	61			64
rump	RMP131	58	66	65	68	63	55	61
rump	RMP231	61	69	68	67	71		
rump	RMP005	65	69	73	74	75		
rump	RMP032			70	72			
rump	RMP087		58	63	63			62
knuckle	KNU066	52	65	60	63	62		52
knuckle	KNU098			59	64			62
knuckle	KNU099	41	52	49	56	53		57
knuckle	KNU100			66	69	67		60
outside flat	OU...							4
outside flat	OU...							4
eye round	EY...							6
topside	TO...							6
topside	TOP033	42		53	64	64		66
topside	TOP073	41	49	49	59	60	51	59
chuck	CHK068			50	55			67
chuck	CHK074	63	59	64	70	62		75
chuck	CHK078	58	60	61	65	61		72
chuck	CHK081			63	67	62		78
chuck	CHK082			55	58			
thin-flank	TFL051			65				65
thin-flank	TFL052			74	66			71
thin-flank	TFL064			68	65			67
rib-blade	RIB041			53				
brisket	BRI056			45	59	55		62
brisket	BRI057			43	50	50		66
shin	FQshin							66
shin	HQshin							69
intercostal	INT037			59				

MSA Grading Model (39 cuts x common cook method)

X Cut proportion of all 39 muscles

=

Sum for all 39 cut x cooks (MSA Index)
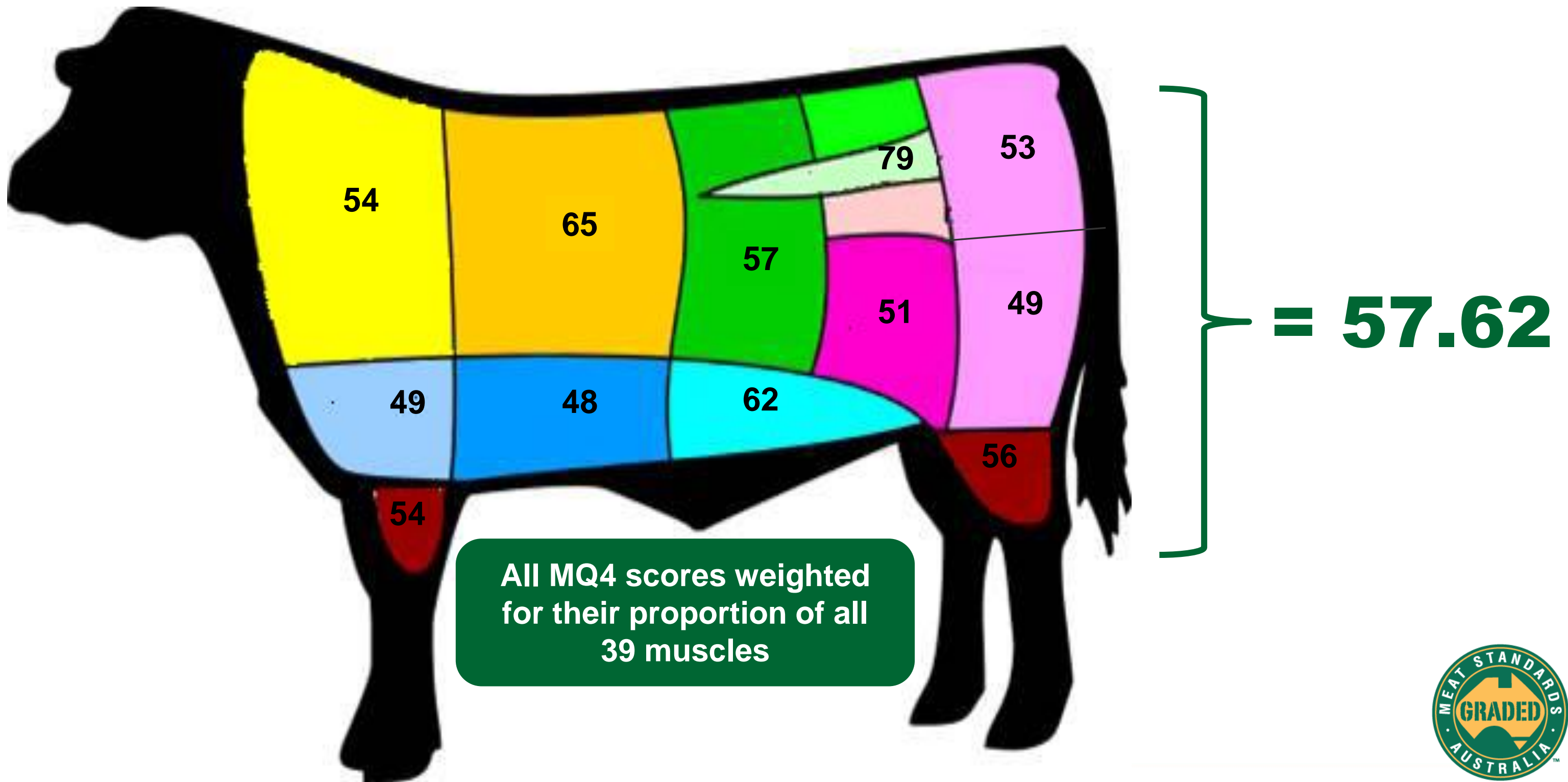
IMPACT OF CARCASS INPUTS ON MSA INDEX?

Carcase Input or Measure	Size of effect on the MSA Index (units)	Relative Importance of these traits
HGP Status	-5	Very High
Milk-fed Vealer	4	Very High
Saleyard	-5	Very High
Rib Fat	0.1	Medium
Carcase Weight	0.01	Low
Gender	0.3	Low

These factors are governed by production decisions, nature and market specifications

IMPACT OF CARCASS INPUTS ON MSA INDEX?

Carcase Input or Measure	Size of effect on the MSA Index (units)	Relative Importance of these traits
MSA Marbling	0.15	High
Hump Height	-0.7	High
Tropical Breed Content	Between 0 and -6.3	Very High
Ossification	0.6	High
Rib Fat	0.1	Medium
Carcase Weight	0.01	Low

These factors are impacted by genetics and can be improved through genetic selection

All can be manipulated to improve MSA Index

IMF EBV IMPACT ON MSA INDEX

1% increase in IMF EBV of sire =

27 ± 5 MSA marble point increase in progeny =

~0.41 point increase in MSA index
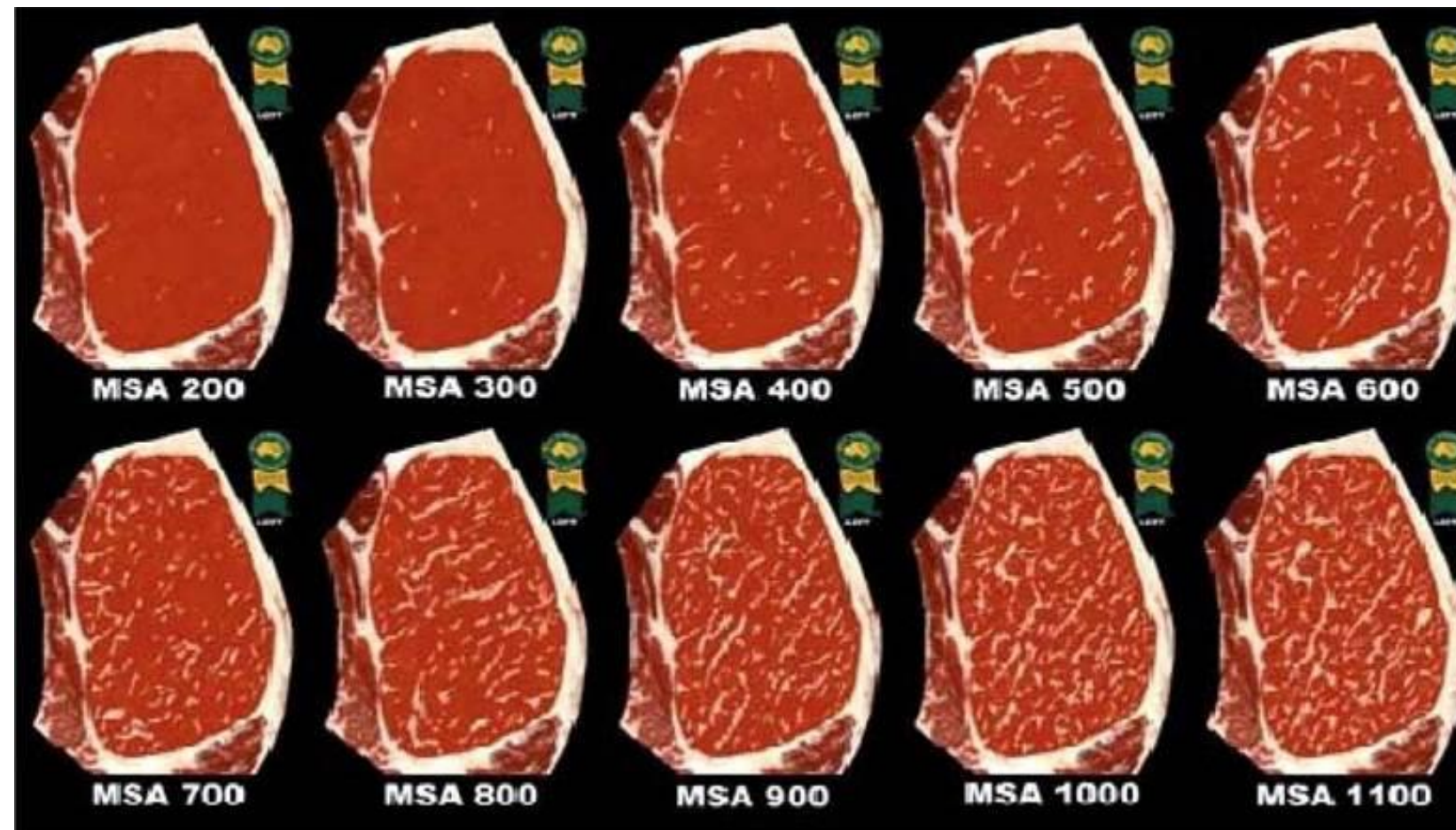
EFFECT OF GROWTH ON OSSIFICATION

Effect of sire EBV on steer growth
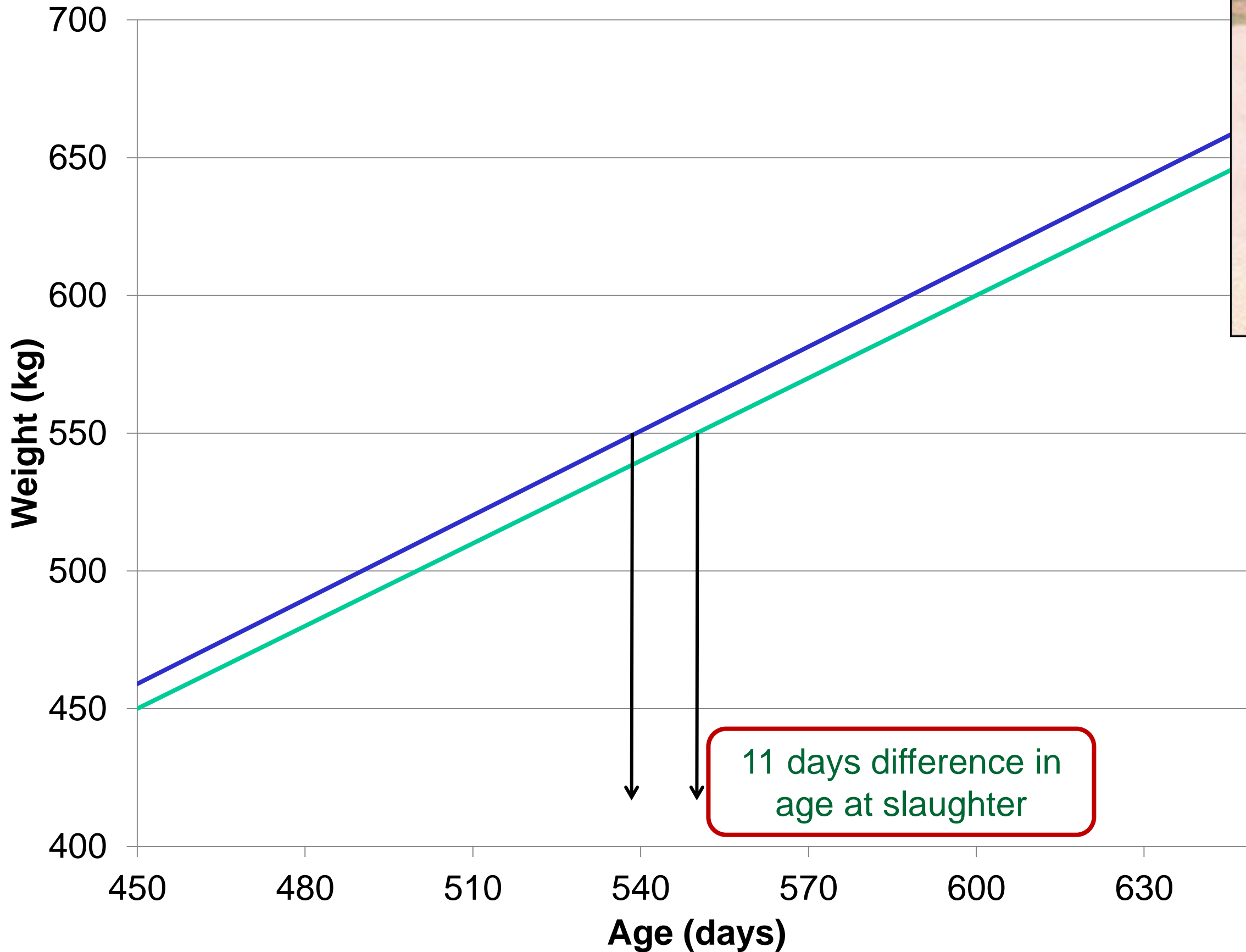
EFFECT OF GROWTH ON OSSIFICATION

- **Extra 8kg growth EBV ≈ growing 2% faster**

- Saving of 11 days to get to same weight

- Ossification increases by approximately 10 units in 2 months = 0.17 per day

- 11 days saves 1.9 units of Ossification

- Reduces MSA Index by ~0.1 averaged over a mob

ESTIMATED BOS INDICUS % IMPACT

Description	Input	Input	Input	Input	Input	Input	Input	Input
Estimated % Bos Indicus	**0**	**12**	**18**	**25**	**38**	**50**	**75**	**100**
Animal Sex Type	M	M	M	M	M	M	M	M
Hormone Growth Promotent	N	N	N	N	N	N	N	N
MilkFedVealer	N	N	N	N	N	N	N	N
SaleYard	N	N	N	N	N	N	N	N
Rinse/Flush	N	N	N	N	N	N	N	N
Hot Std Carcase Weight	280	280	280	280	280	280	280	280
HangMethod	AT	AT	AT	AT	AT	AT	AT	AT
Hump Height	50	50	50	50	50	50	50	50
Ossification USDA	160	160	160	160	160	160	160	160
Marbling USDA	320	320	320	320	320	320	320	320
RibFat	12	12	12	12	12	12	12	12
Ulitimate pH	5.55	5.55	5.55	5.55	5.55	5.55	5.55	5.55
Loin Temp at Grade	4	4	4	4	4	4	4	4
Days of Ageing from Kill	5	5	5	5	5	5	5	5
MSA Index	**60.1**	**59.4**	**59**	**58.6**	**57.7**	**57**	**55.4**	**53.8**

ESTIMATED BOS INDICUS % IMPACT

As hump height decreases, eating quality increases

WHEN WOULD PRODUCERS INCREASE THEIR MSA INDEX?

- When you get paid to increase quality
- If you care about consumers
- To improve the lot feeder rank of your cattle

MSA INDEX TRENDS OVER TIME

- **Average MSA index for 2014-15 was 57.61**

- **Increase of 0.84 points from 2013-14 – this is a significant increase in eating quality**
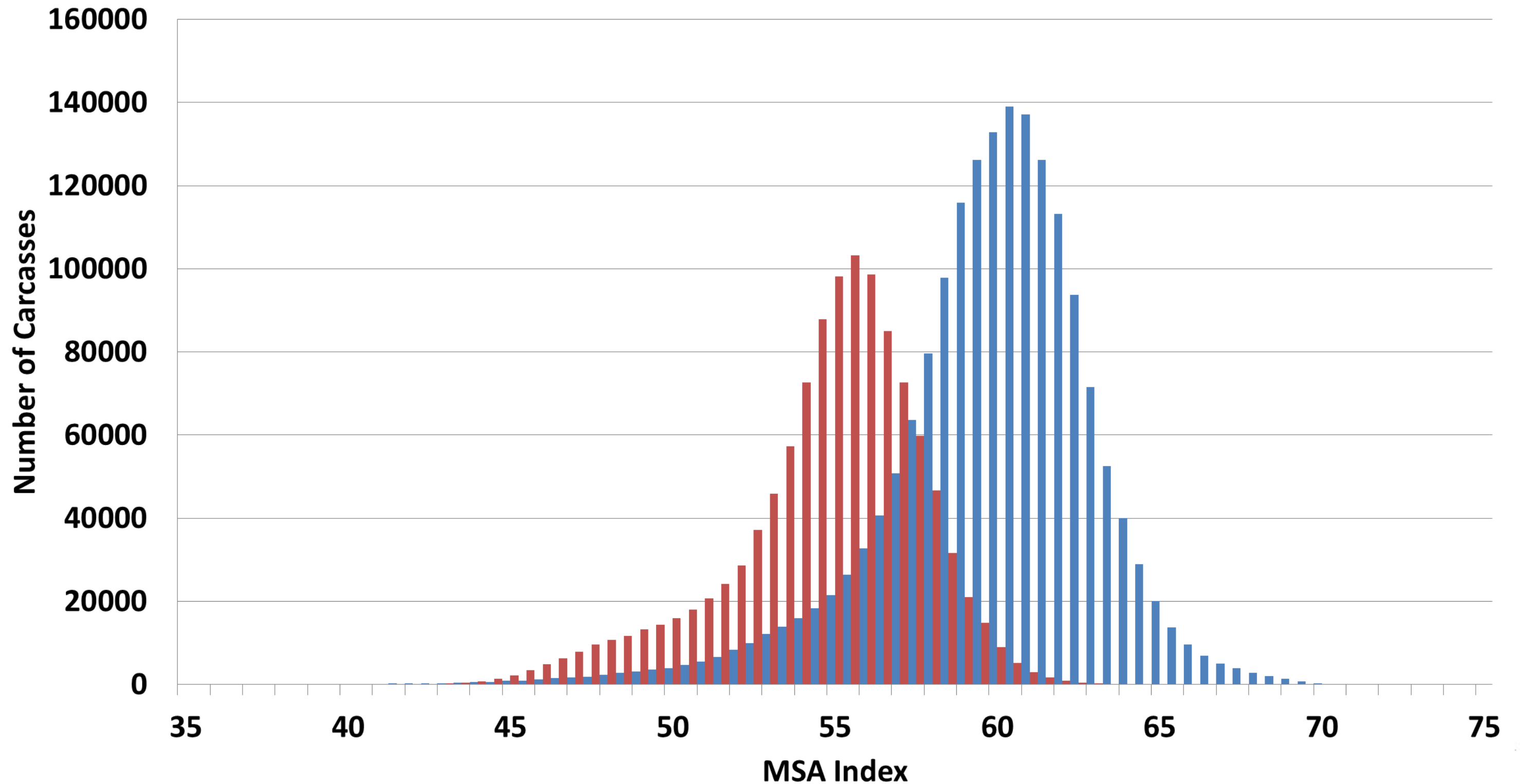
MSA Index over time
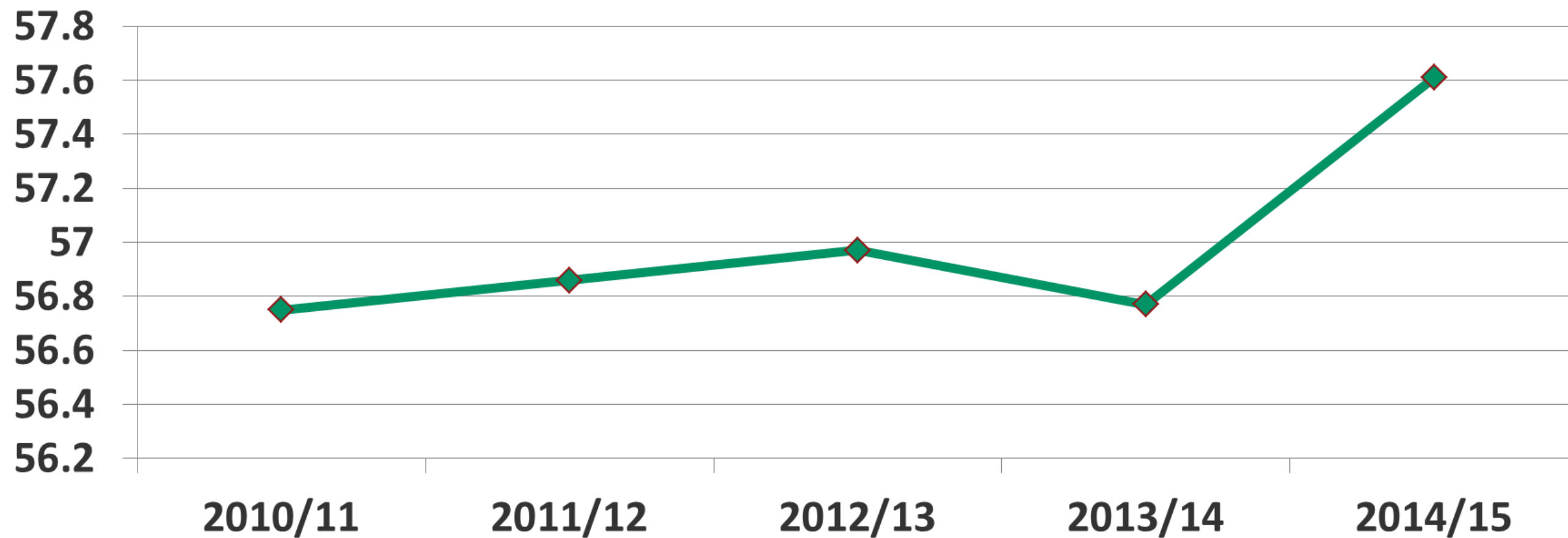
MSA INDEX PERFORMANCE IS LIFTING

Percentile	2010/11	2011/12	2012/13	2013/14	2014/15
99%	65.17	65.26	65.59	65.69	65.74
95%	63.17	63.14	63.22	63.17	63.44
90%	62.12	62.04	62.07	62.01	62.37
75%	60.33	60.14	60.23	60.07	60.58
50%	56.98	57.00	57.21	57.00	57.94
25%	54.19	54.27	54.33	54.10	55.04
10%	50.35	51.34	51.36	51.01	52.52
5%	47.84	48.77	48.76	48.55	50.39
1%	44.87	45.37	45.52	45.44	46.60

2014/15 Financial Year Index Distribution
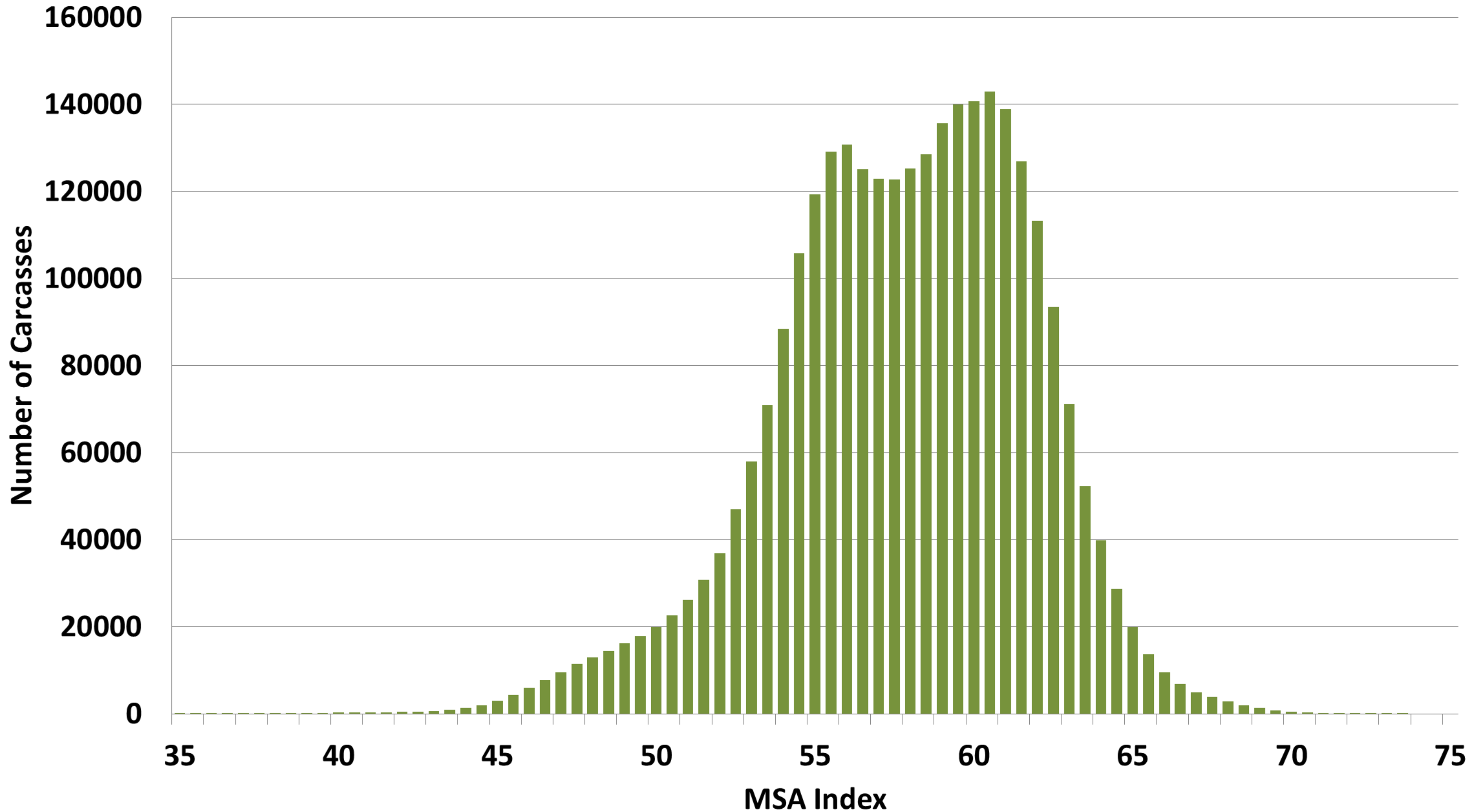
2014/15 HGP Index Distribution
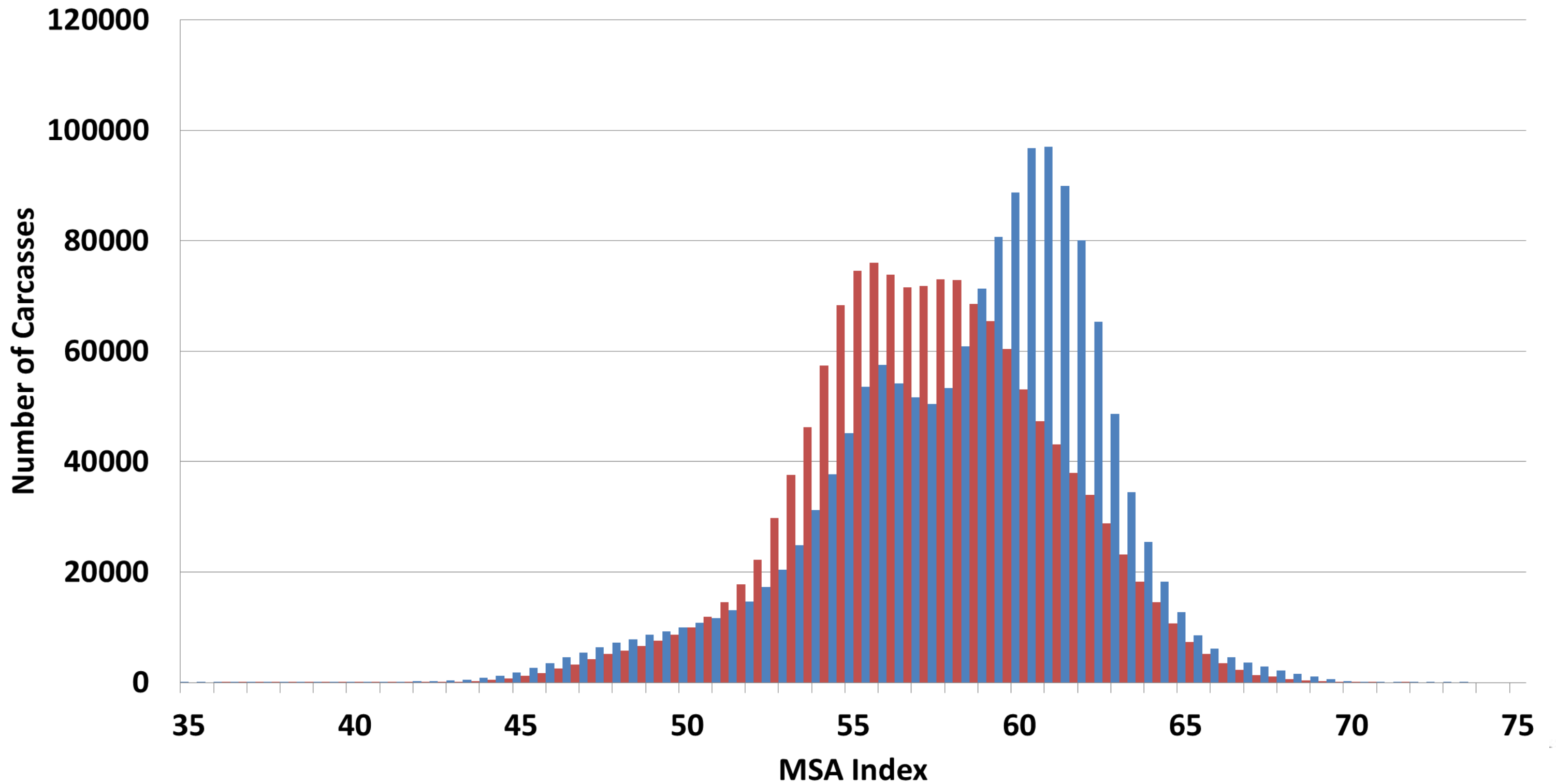
2014/15 Gender Index Distribution
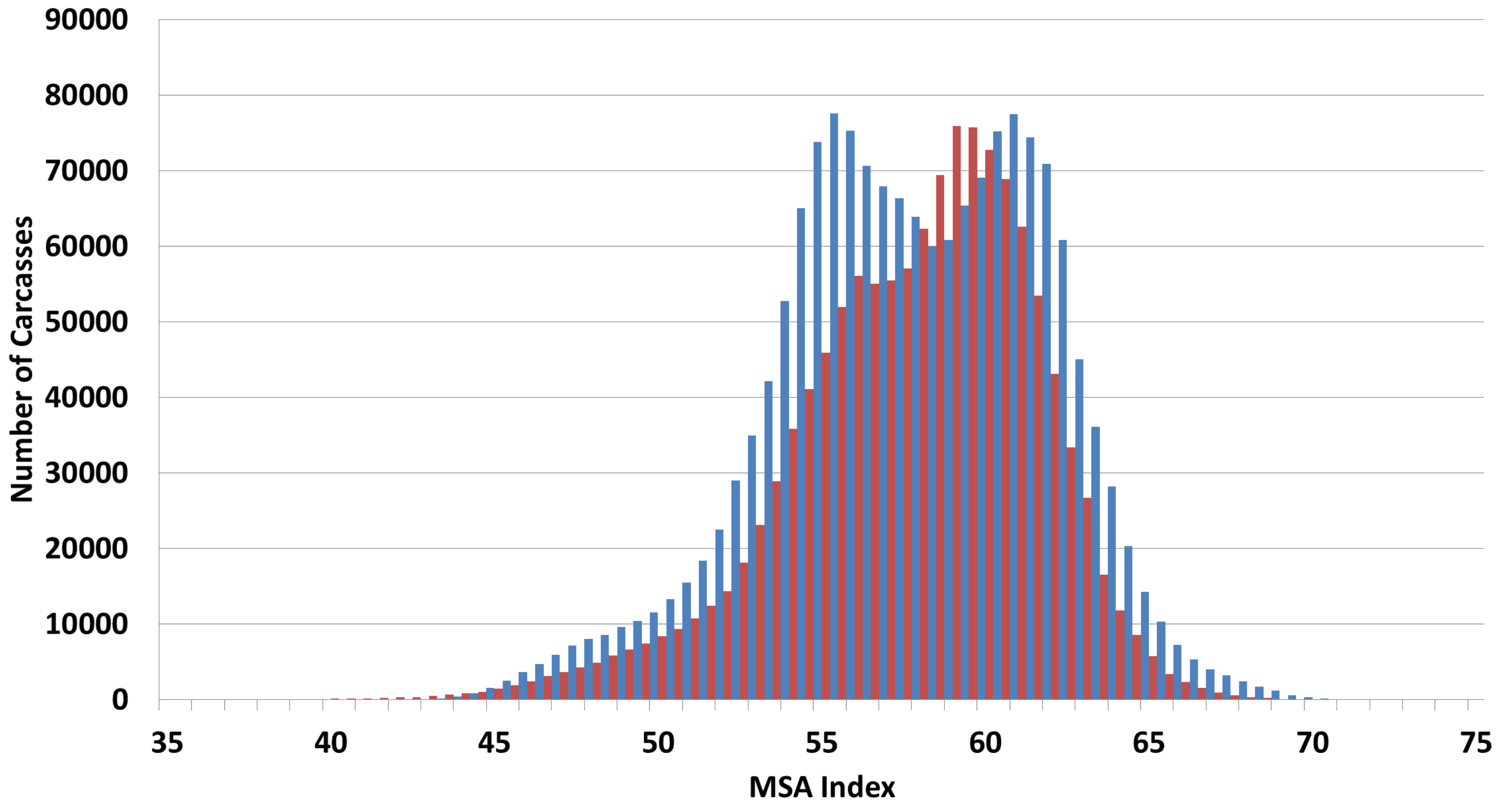
FUTURE WORK

- Historic evaluation of carcass eating quality over time

- Evaluate the impact of the MSA grading system and carcass feedback to generate change in quality

- Generate an MSA Index estimated breeding value for *Bos Taurus* cattle
    - IMF
    - Growth
    - Rib fat
    - Carcass weight

- Incorporation of the tenderness gene markers for *Bos indicus*?

CONCLUSION

- MSA index has been very well received by industry

- Provides industry a tool to evaluate potential carcass eating quality Over time

- Every carcass which meets MSA requirements gets an MSA index score

- Actual range of MSA Index is between 30 and 80

- Genetics has a permanent & cumulative impact on quality

- The MSA Index and a simulation calculator are available online or on mobile via myMSA.com.au
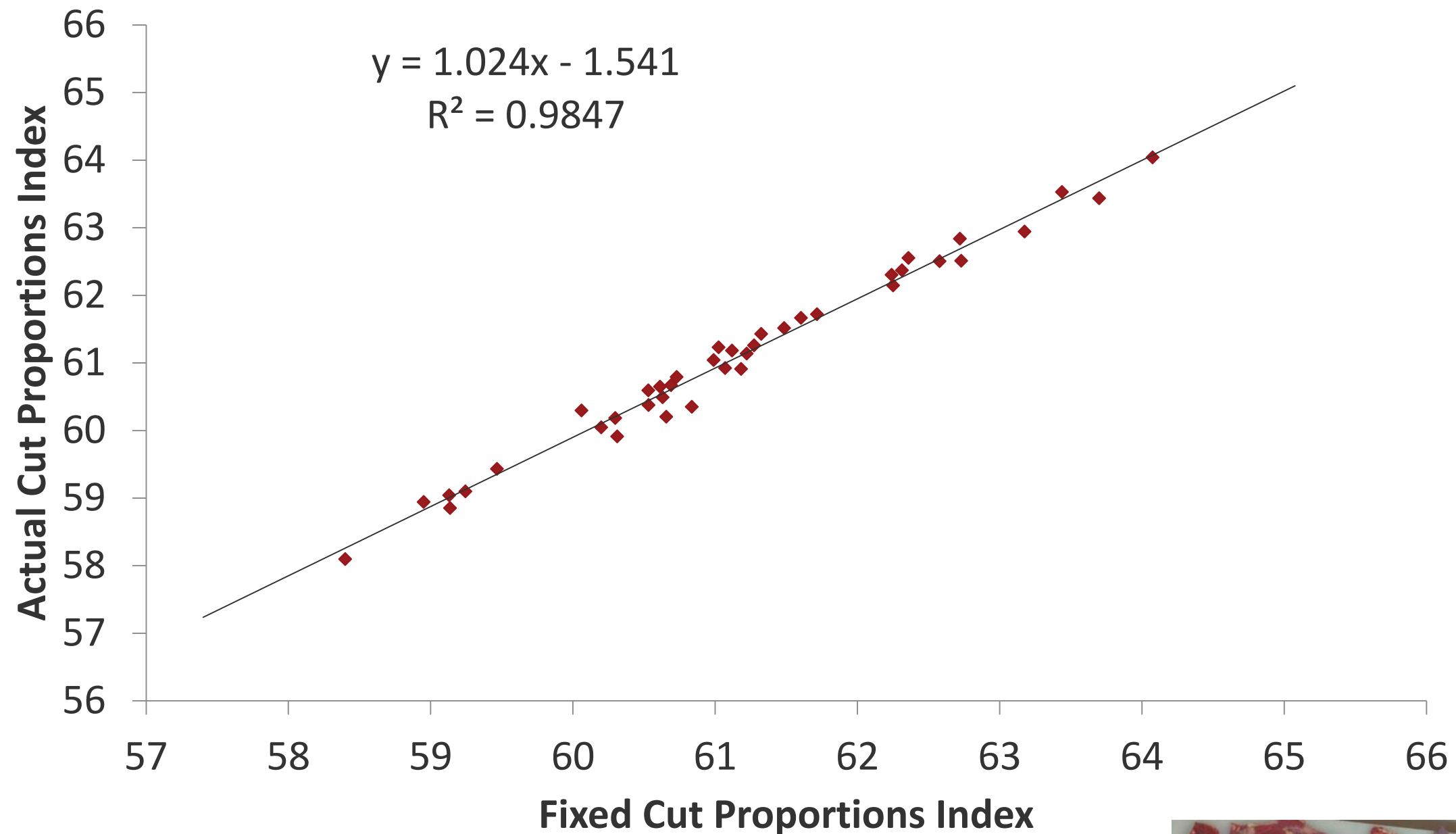
Thankyou for listening!

FORMATION OF THE MSA INDEX

Need to know which:

1. Cuts to use

2. Cook method for each cut

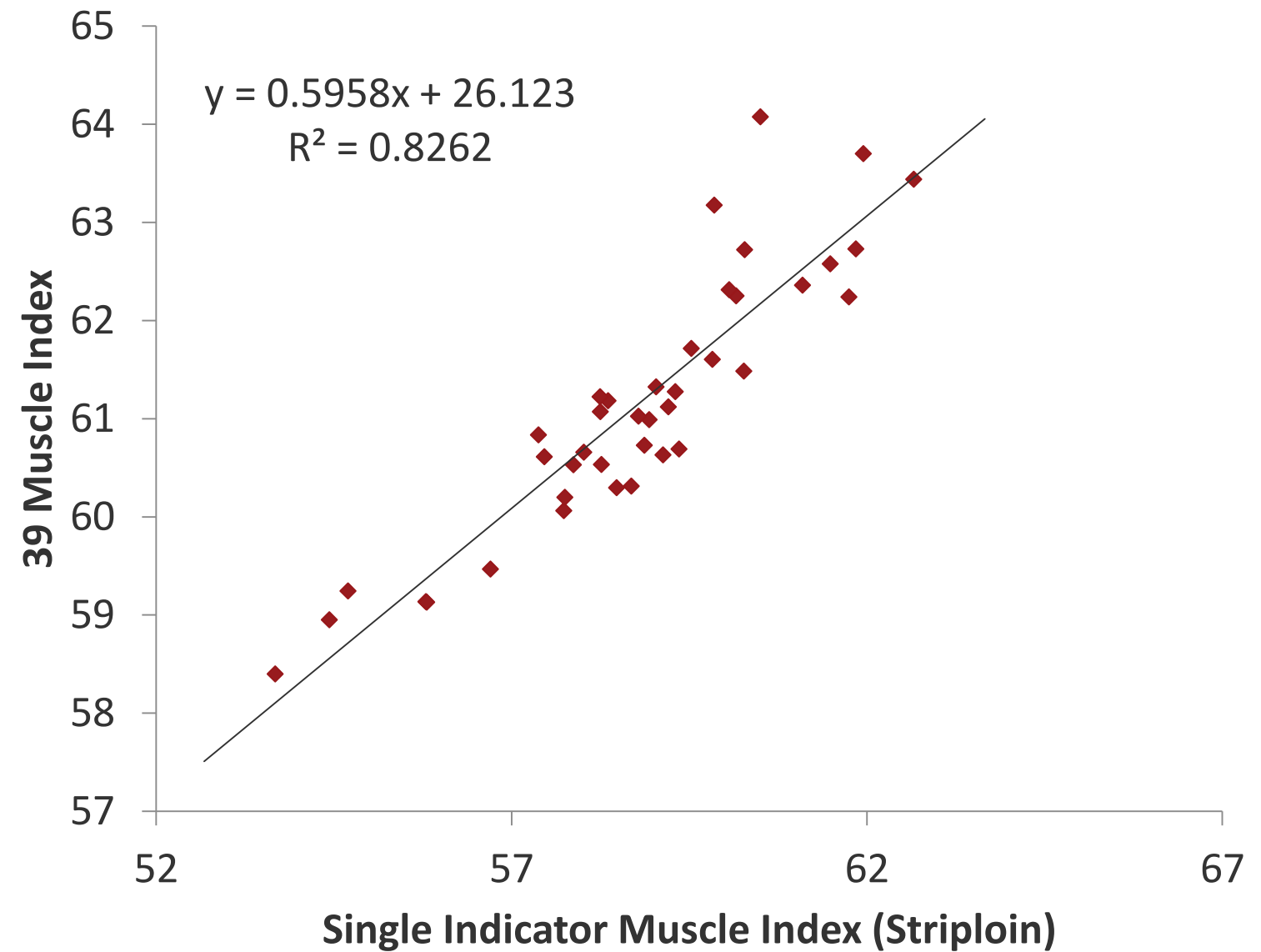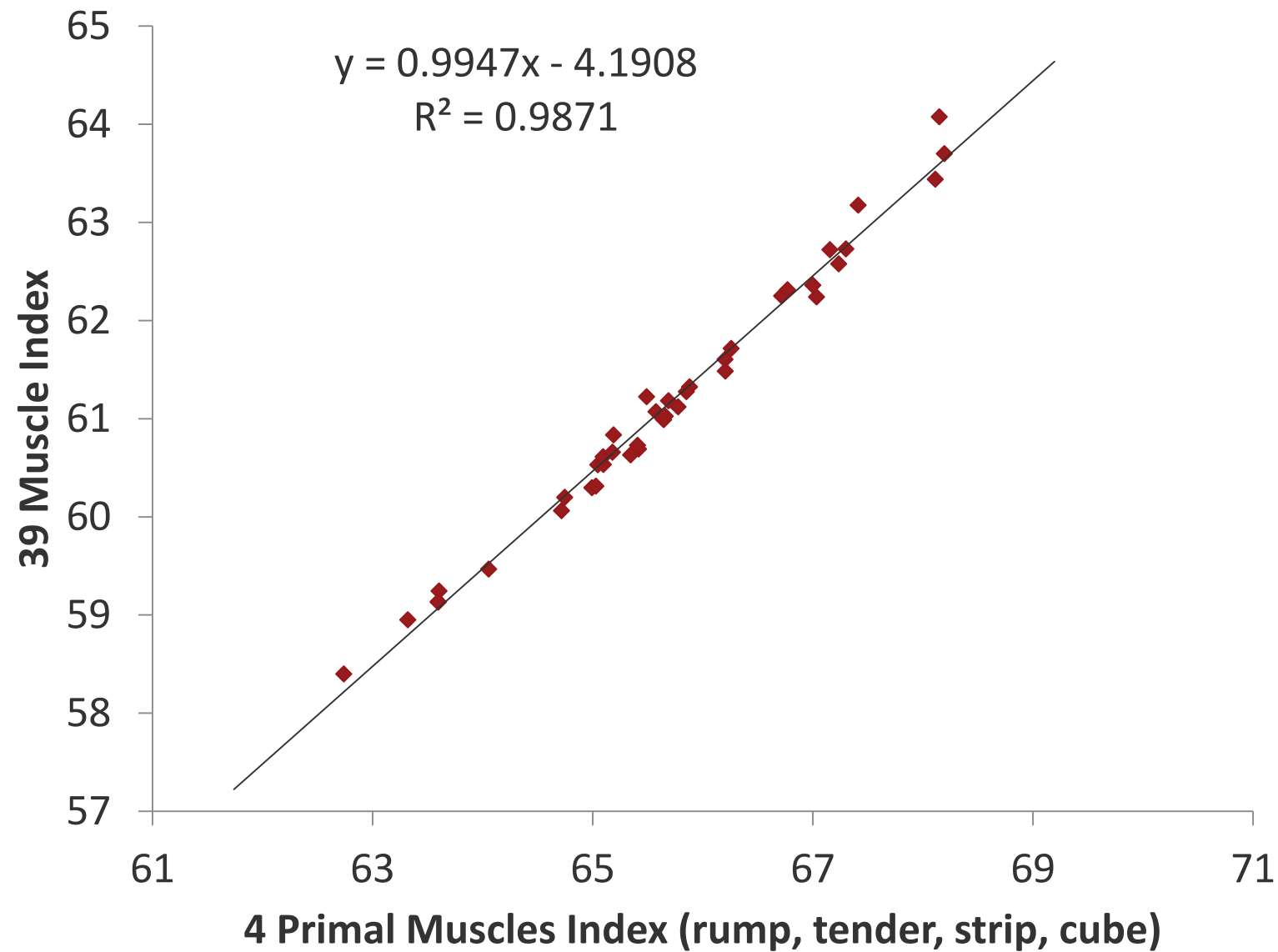3. Muscle weight proportions

ACTUAL WEIGHTS OR FIXED %'S

y = 1.024x - 1.541
R² = 0.9847

Actual Cut Proportions Index (y-axis)
Fixed Cut Proportions Index (x-axis)

Getting actual cuts weights is impossible and predicting them is inaccurate....

So lets use fixed proportions

1 MUSCLE OR 39 MUSCLES

$y = 0.9947x - 4.1908$
$R^2 = 0.9871$

39 Muscle Index (y-axis, 57 to 65)

4 Primal Muscles Index (rump, tender, strip, cube) (x-axis, 61 to 71)

$y = 0.5958x + 26.123$
$R^2 = 0.8262$

39 Muscle Index (y-axis, 57 to 65)
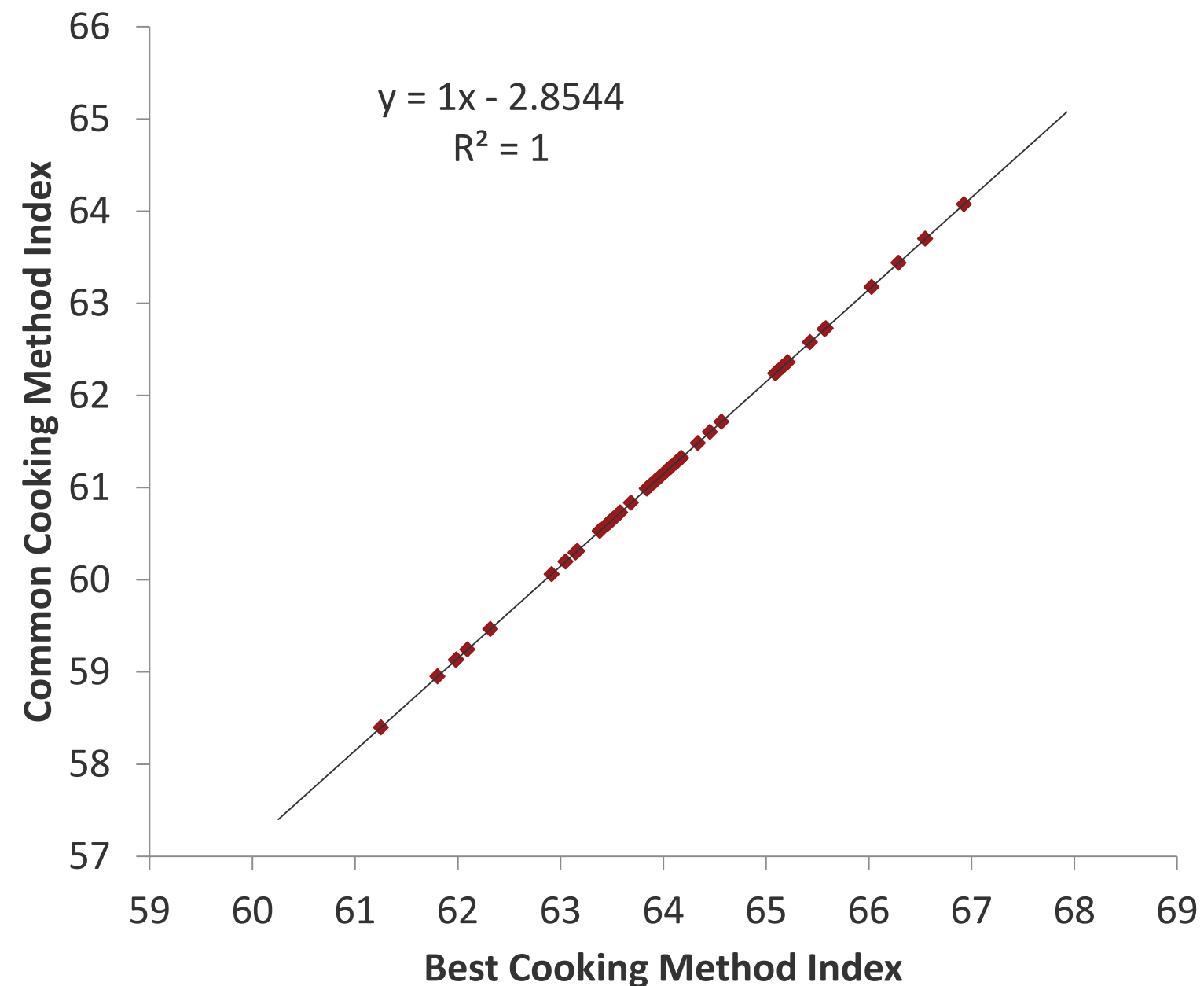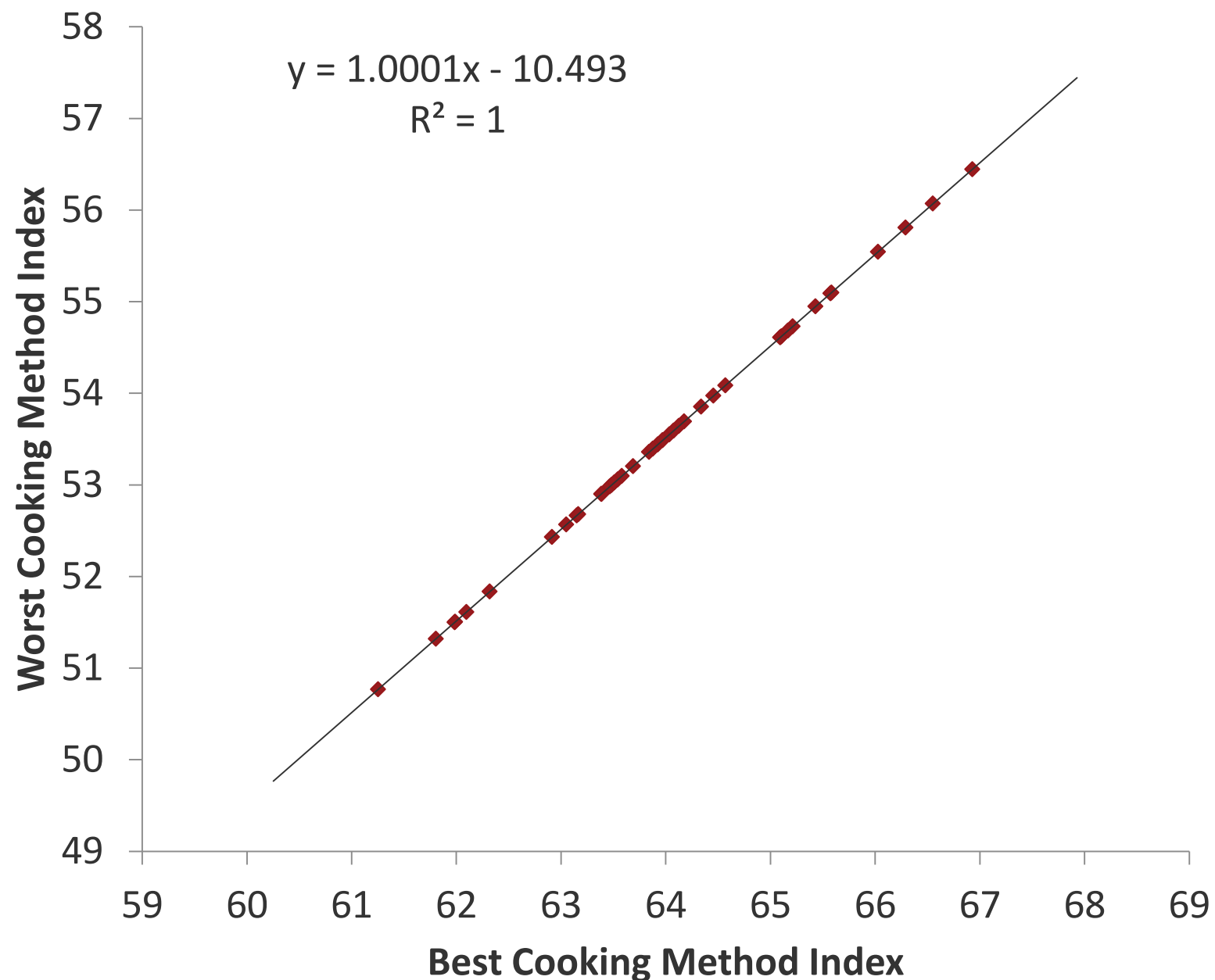
Single Indicator Muscle Index (Striploin) (x-axis, 52 to 67)

MSA Quality Index is for the whole carcass….

So it makes sense to use the 39 muscles in the MSA model

BEST, WORST OR COMMON COOK?

$y = 1.0001x - 10.493$
$R^2 = 1$

Worst Cooking Method Index

Best Cooking Method Index

$y = 1x - 2.8544$
$R^2 = 1$

Common Cooking Method Index

Best Cooking Method Index

Cook method doesn't matter….

So lets use the most common cook method

BONE-OUT OF THE HIGH AND LOW MUSCLING STEER CARCASSES

- steers from high (n=14) /low (n=13) muscling lines, plus myostatin (n=13) steers slaughtered off pasture at domestic weights

- Carcasses boned into untrimmed primals, transported to UNE, CT scanned and then primals broken into 40 MSA cuts

8
TOP
TOP073
46164

8
CUB
CUB045
46155

8
CHK
CHK078
46165

Financial Year Index Distribution Breakdown
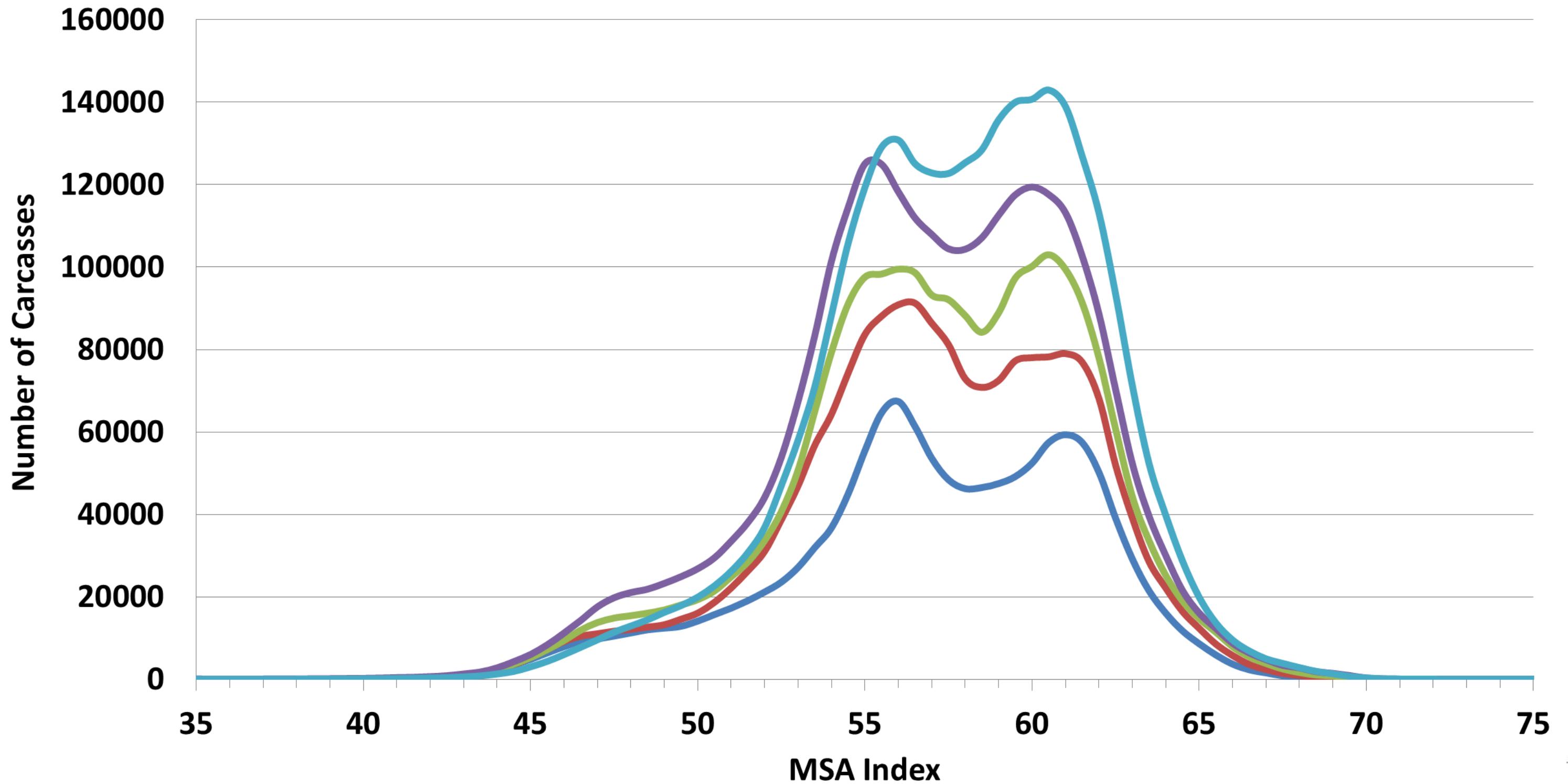
FORMATION OF THE MSA INDEX

- Use all 39 muscles

- Use the most common cook method

- Use fixed cut proportions to calculate the MSA index

- Hang method, pH_u and ageing time not to impacted by producer – fixed as AT, 5.5 and 5 days ageing

- The MSA quality index can be used by industry to monitor changes in whole carcass quality