



AUSTRALIAN BEEF EATING QUALITY INSIGHTS 2017



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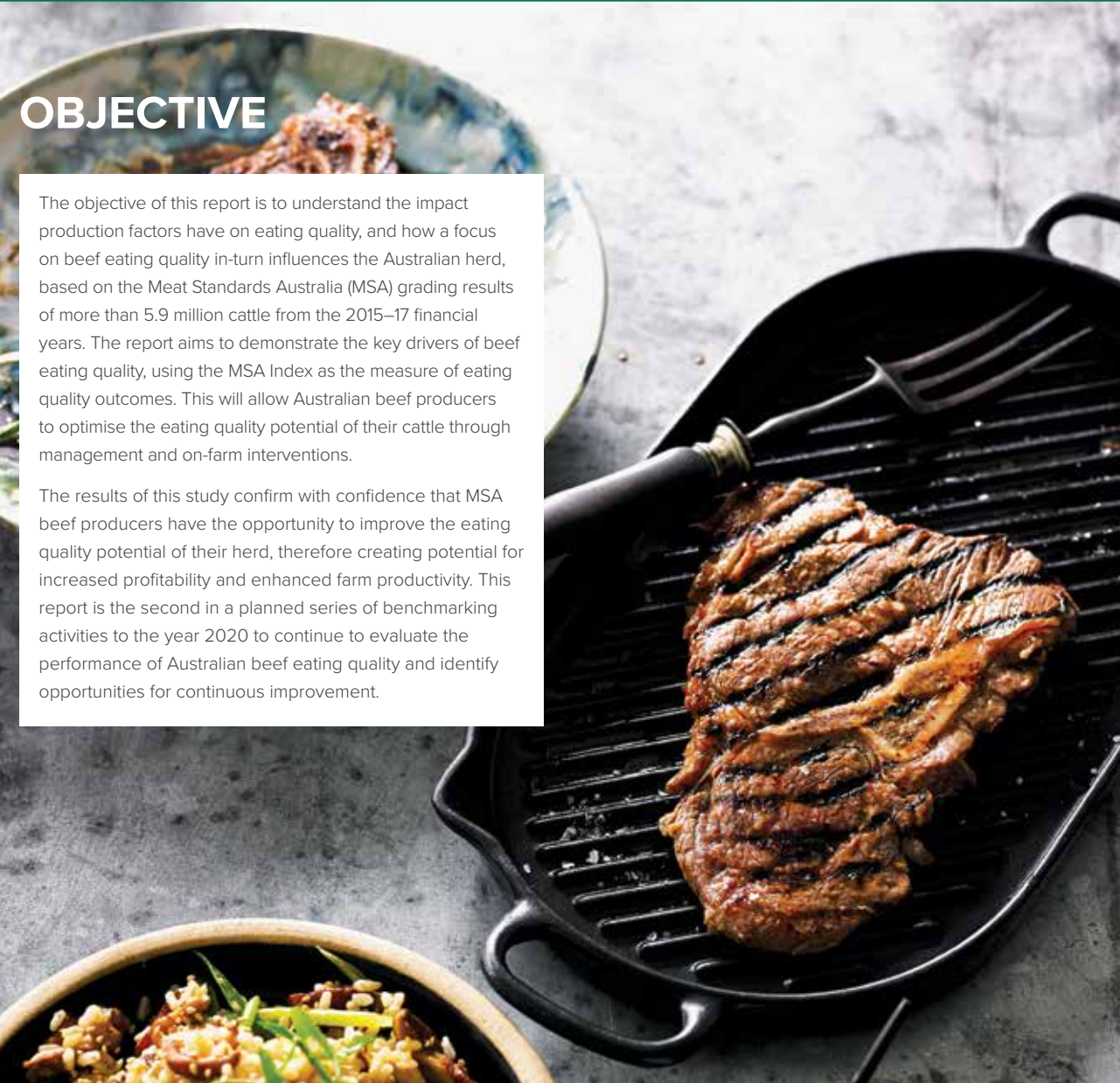
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OBJECTIVE

The objective of this report is to understand the impact production factors have on eating quality, and how a focus on beef eating quality in-turn influences the Australian herd, based on the Meat Standards Australia (MSA) grading results of more than 5.9 million cattle from the 2015–17 financial years. The report aims to demonstrate the key drivers of beef eating quality, using the MSA Index as the measure of eating quality outcomes. This will allow Australian beef producers to optimise the eating quality potential of their cattle through management and on-farm interventions.

The results of this study confirm with confidence that MSA beef producers have the opportunity to improve the eating quality potential of their herd, therefore creating potential for increased profitability and enhanced farm productivity. This report is the second in a planned series of benchmarking activities to the year 2020 to continue to evaluate the performance of Australian beef eating quality and identify opportunities for continuous improvement.

INTRODUCTION

The *2017 Australian Beef Eating Quality Insights* report has been generated from the analysis of MSA grading results for more than 5.9 million cattle, processed and graded through 42 MSA-licensed processors across the country during the 2015–17 fiscal years.

MSA is Australia's eating quality grading system for beef and is a global leader in its ability to predict the eating quality of cuts within a carcase for the end consumer.

Understanding what drives the eating quality of beef is important in being able to implement continuous improvement strategies and create opportunities for improved returns to flow through the value chain to the farm gate.

This report will form an important platform for establishing new benchmarks and identifying opportunities for improvement. These benchmarks will also be a useful tool in informing educational and resource development efforts from industry service providers, including Meat & Livestock Australia.

This is only the second time this benchmarking exercise has been conducted in Australia, following the *2015 Australian Beef Eating Quality Audit*, which established a baseline from which to benchmark the national herd and was made possible with the introduction of the MSA Index in 2014. The MSA Index is a valuable tool in providing feedback on the potential eating quality of an animal, influenced only by on-farm, genetic and management factors.

The producer is largely in control of improving the MSA Index and subsequent eating quality potential of carcasses.

Production of an Eating Quality Insights report occurring biennially provides the Australian beef industry with a resource to measure its improvements and identify shortfalls.

Methodology

The 2017 Australian Beef Eating Quality Insights report was generated through data analysis of all MSA-graded cattle in 2015–17. The report uses quantitative objective and subjective data collected by MSA-accredited graders and submitted to MLA during this period.

All data analysis related to the MSA Index outcomes are based on the location of the MSA-registered property from which the cattle were consigned, rather than the location of the processor. This method was chosen to give a more accurate indication of state-based production opportunities and challenges.

In 2015–17, 5.9 million cattle were graded against MSA Standards. Carcases that were compliant to MSA minimum requirements (ultimate pH and fat coverage) were eligible to receive an MSA Index score. This report uses the MSA Index scores of 5.5 million cattle.



FACT

The MSA model predicts the eating quality of 169 cut x cook combinations in a carcase using the measurements collected by accredited MSA graders.

NEW TO MSA PRODUCERS: benchmark yourself

myMSA – the home of carcase feedback

myMSA is the home for MSA grading feedback. myMSA was released in mid-2014 and in the years since more than 6,200 producers have used the system a total of almost 30,000 times to access carcase grading feedback.

myMSA offers producers the ability to:

- create full sets of carcase feedback – as soon as the grader has uploaded the information
- look at trends in compliance – both MSA and company specifications over time
- create customised datasets to determine the impact on compliance by various attributes
- download data to import into farm software
- use the MSA Index calculator to determine the potential change in eating quality with on-farm management changes
- benchmark the performance of their herd against the average for their region, state or nationally and by selecting for feed type and hormonal growth promotant (HGP) status

myMSA Benchmarking

The myMSA Benchmarking tool is available online. It provides producers with the opportunity to benchmark their cattle's compliance and eating quality performance, as represented by the MSA Index, against other producers in their region, state or across the country.

Producers can see if they are matching, lagging or exceeding industry averages for MSA performance by selecting for region, feed type and hormonal growth promotant (HGP) status – this provides producers with much more meaningful feedback about their own enterprise and performance.

Producers can access the myMSA Benchmarking tool through their myMSA account (at www.mymssa.com.au).

Why benchmarking is important

Benchmarking, as an industry or as an individual enterprise, provides the ability to identify strengths and weaknesses of a business. The myMSA Benchmarking tool enables informed decision-making to better meet customer specifications.

myMSA BENCHMARKING ALLOWS USERS TO:

- measure and compare current compliance and eating quality performance
- identify areas of performance where improvement can be made
- identify the key drivers of eating quality to guide on-farm decisions for animal and business management practices

SNAPSHOT (TO 30 JUNE 2017)

48,005 MSA registered producers

42 MSA-licensed
beef processors

3,668 MSA-licensed end users (foodservice,
supermarkets, butchers, wholesalers)

156 MSA-licensed beef brands

Since its commercial implementation in 1999, the MSA program has experienced significant growth, with 5.9 million head of cattle presented for MSA grading in 2015–17 (Figure 1). This represented 38% and 40% of all adult cattle slaughter in 2015–16 and 2016–17 respectively (Figure 2).

Meat & Livestock Australia acknowledge the MSA-accredited graders across 42 MSA-licensed processors who have collected the carcase measurements used in this report.

FIGURE 3 MSA-GRADED CATTLE IN 2015–17 BY STATE OF PRODUCTION

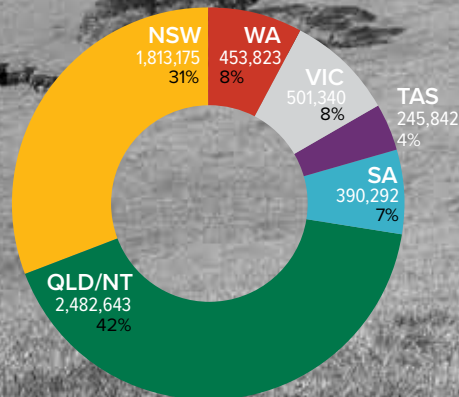
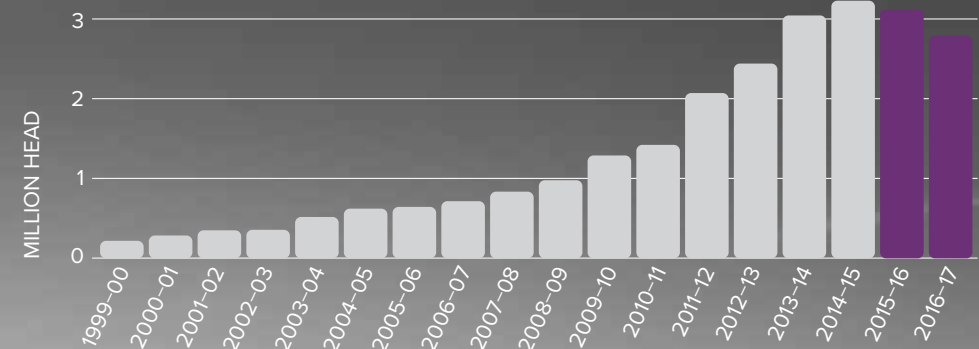


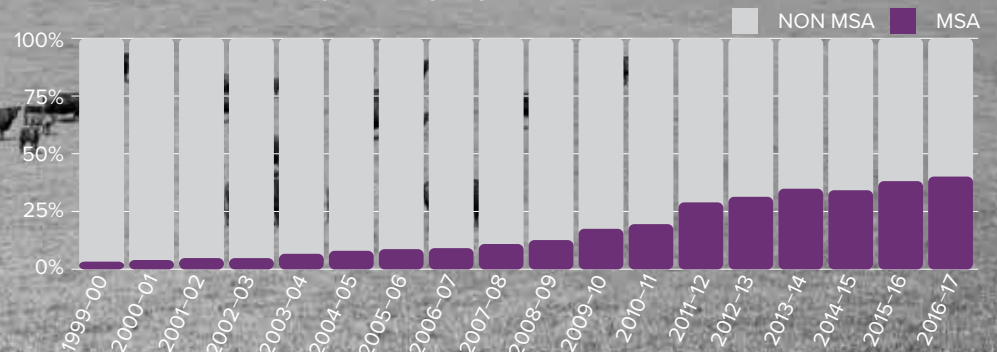
FIGURE 1 NATIONAL MSA BEEF GRADING



Source: Meat & Livestock Australia

FIGURE 2 PROPORTION OF AUSTRALIAN ADULT CATTLE SLAUGHTER PRESENTED FOR MSA GRADING

Note that total adult cattle includes all adult cattle and selling pathways. Some of these animals would not be eligible for MSA grading.



Source: ABS and Meat & Livestock Australia

SETTING EATING QUALITY BENCHMARKS WITH THE MSA INDEX

What is the MSA Index?

The MSA Index is a single number and standard national measure of the predicted eating quality potential of a carcass. The MSA Index is a number between 30 and 80 expressed to two decimal places (i.e. 54.62) to represent the eating quality potential of a whole carcass.

The MSA Index is independent of any processing inputs and is calculated using only attributes influenced by pre-slaughter production. It reflects the impact on eating quality of management, environmental and genetic differences between cattle at the point of slaughter. It is a consistent benchmark that can be used across all processors, geographic regions and over time.

The value of MSA compliance

In many instances there is financial incentive for improved MSA compliance and meeting eating quality specifications of individual processors and brand owners.

In 2015–17, young cattle (typically grassfed and 0–2 tooth categories) that met MSA and company requirements on average, potentially received an additional \$0.24/kg over-the-hooks (OTH) compared with their non-MSA counterparts. With an average carcass weight of 281kg, this has the potential to provide an additional \$67.44 per head.

Carcasses that met MSA specifications and requirements for grainfed categories potentially received on average an additional \$0.13/kg OTH compared with their non-MSA counterparts. With an average carcass weight of 306kg, this has the potential to provide an estimated return of almost \$40 per head. Understanding the drivers of MSA compliance and factors impacting on eating quality performance holds a significant value in potentially increasing farm gate returns.

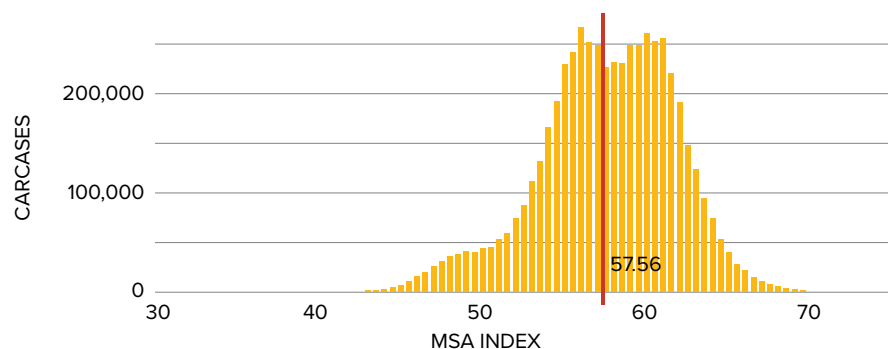
Source of OTH prices: MLA National Livestock Reporting Service

TABLE 1 THE EFFECT OF CARCASS ATTRIBUTES ON THE MSA INDEX

CARCASS INPUT	SIZE OF EFFECT ON THE MSA INDEX (UNITS)	CLARIFICATION OF EFFECT	RELATIVE IMPORTANCE OF THESE TRAITS IN CHANGING THE MSA INDEX*
Hormonal growth promotant (HGP) status	5	The MSA Index of carcasses with no HGP implant is about five index units higher	Very high
Milk-fed vealer	4	The MSA Index of milk-fed vealer carcasses is about four index units higher	Very high
Saleyard	5	Carcasses that were consigned directly to slaughter and NOT processed through a saleyard have an MSA Index about five index units higher	Very high
MSA marbling	0.15	As MSA marbling score increases by 10, the MSA Index increases by about 0.15 index units	High
Hump height (for cattle greater than 0% TBC)**	−0.7	As hump height increases by 10mm, the MSA Index decreases by about 0.7 units. In carcasses that have no TBC, hump height has no impact on MSA Index	High
Tropical breed content (TBC)**	0% = 0.0 12% = −1.6 18% = −3.2 25% = −3.9 38% = −4.7 50% = −5.2 75% = −5.5 100% = −6.3	As declared TBC content increases from 0 to 100%, the MSA Index decreases by up to 6.3 units	High
Ossification score	0.6	As ossification score decreases by 10, the MSA Index increases by 0.6 index units	High
Rib fat	0.1	As rib fat increases by 1mm, the MSA Index increases by 0.1 index units	Medium
Hot standard carcass weight (HSCW)	0.01	As HSCW increases by 1kg, the MSA Index increases by less than 0.01 index units	Low
Sex	0.3	With low ossification values, females have a higher index value than steers by about 0.3 index units	Low

The values presented in Table 1 are the average effect calculated for 2.8 million carcasses across all states of Australia. * Relative importance indicates the size of effect that changing that trait will have on the MSA Index within a herd if all other traits remained the same. Some traits may have a large impact but are difficult for a producer to alter.

** Hump height can be used in conjunction with carcass weight as the determinant or verification of TBC during MSA grading.

FIGURE 4 NATIONAL MSA INDEX DISTRIBUTIONS 2015–17

Current Australian eating quality performance

The average MSA index for 2015–17 was 57.56. Figure 4 shows the national distribution of the MSA Index for MSA-graded carcasses throughout 2015–17. MSA Index values of the 5.5 million MSA-compliant carcasses ranged from 31.5 to 75.5.

The two peaks in the MSA Index distribution as seen on Figure 4 and Figure 6 (page 9), indicate two distinct 'populations' (known statistically as the 'bimodal peaks') on the graph. This is attributed to a range of fixed and variable on-farm management interventions including, but not limited to, the impact of hormonal growth promotants, marbling, ossification and tropical breed content on the MSA Index.

Figure 5 illustrates the change in the MSA Index of the national herd when calculated for all MSA-compliant carcasses since July 2010. The MSA Index scale has improved by 0.84 points (or 1.5%) since 2010–11. This change in the MSA Index is likely to be reflective of changes in on-farm management interventions.

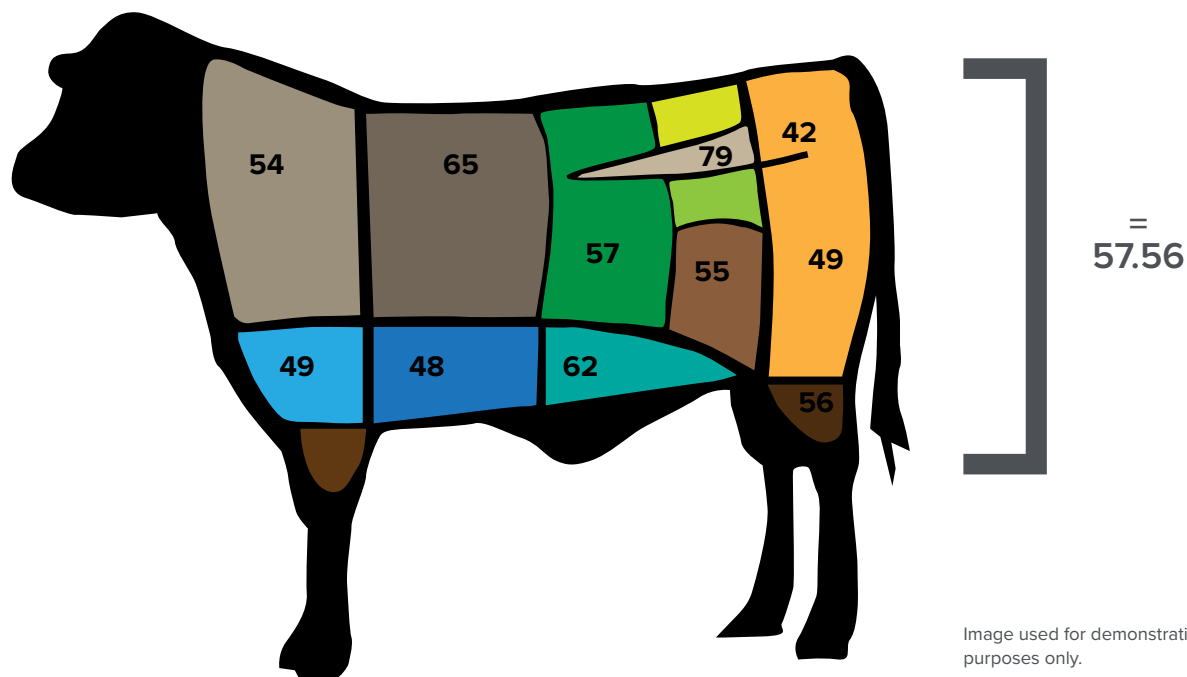
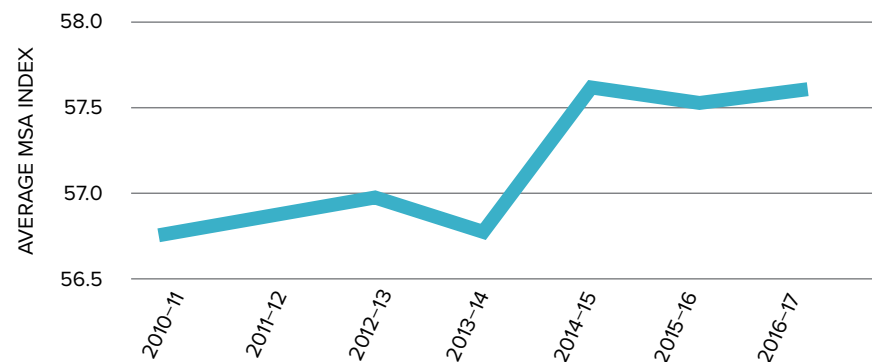
FIGURE 5 CHANGE IN NATIONAL MSA INDEX SINCE 2010–11

Image used for demonstrative purposes only.

Benchmarking individual MSA Index performance

This report uses a ranking system to provide the ability to benchmark performance against the rest of the carcase population within a category.

What are the MSA Index percentile bands?

An MSA Index percentile band provides an indication of an individual's average MSA Index performance relative to the performance of others.

Table 2 provides the MSA Index percentile bands for all MSA-compliant carcasses in Australia. The table allows producers to benchmark their MSA Index performance to the current range in the industry.

This is also visualised as a graph in Figure 6. For example, this tells us that having an average MSA Index of greater than 62.53 places your cattle in the top 10% of eating quality in Australia.

Understanding the specific carcase attributes that determine a percentile band allows producers to consider what production areas to target in order to improve their performance. This is further explored in following sections.

How do I use percentile bands?

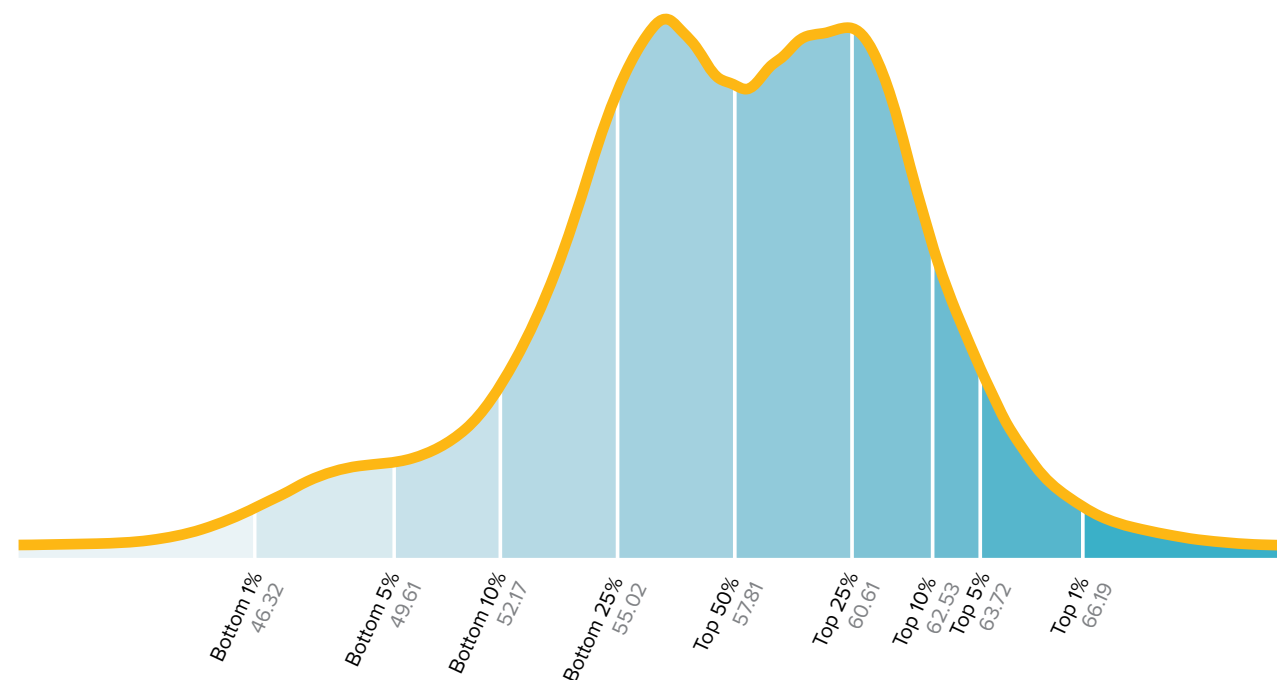
If your average MSA Index results were 61, your cattle have eating quality results in the top 25% of MSA-graded cattle in Australia.

Percentile bands are commonly used in a range of industries. Producers may be familiar with the use of them in livestock genetic evaluation, describing weather patterns and even in education systems to rank performance.

TABLE 2 NATIONAL MSA INDEX PERCENTILE BANDS 2015–17

PRODUCER STATE	BOTTOM 1%	BOTTOM 5%	BOTTOM 10%	BOTTOM 25%	TOP 50%	TOP 25%	TOP 10%	TOP 5%	TOP 1%
NSW	47.08	51.68	53.57	55.31	57.29	60.14	62.05	63.2	65.36
QLD/NT	45.53	48.05	49.93	53.34	56.33	59.06	61.19	62.59	65.49
SA	51.93	55.08	56.56	59.18	60.92	62.38	63.79	64.58	65.99
TAS	47.10	51.34	56.01	58.71	60.51	62.17	63.78	64.89	66.83
VIC	51.23	53.8	54.88	57.14	59.85	61.66	63.15	64.07	65.91
WA	50.48	54.43	55.48	57.72	60.72	62.43	64.42	66.19	68.95
NATIONAL	46.32	49.61	52.17	55.02	57.81	60.61	62.53	63.72	66.19

FIGURE 6 VISUALISING MSA INDEX RANKINGS



MSA COMPLIANCE

In 2015–17, 93% of carcasses met MSA minimum requirements. The main reason for non-compliance was associated with high ultimate pH levels. Fat cover (less than 3mm of rib fat) was the second most common reason for non-compliance. Figure 7 illustrates reasons for non-compliance throughout the year.

Company specifications are additional specifications determined by the processor or brand owner. The additional specifications can be based on eating quality, represented by the MSA Index, or other carcass attributes such as carcass weight range specifications.

Critical times of the year for non-compliance vary by state and region based on several factors. This can be found in the State Snapshots from page 21.

MSA minimum requirements

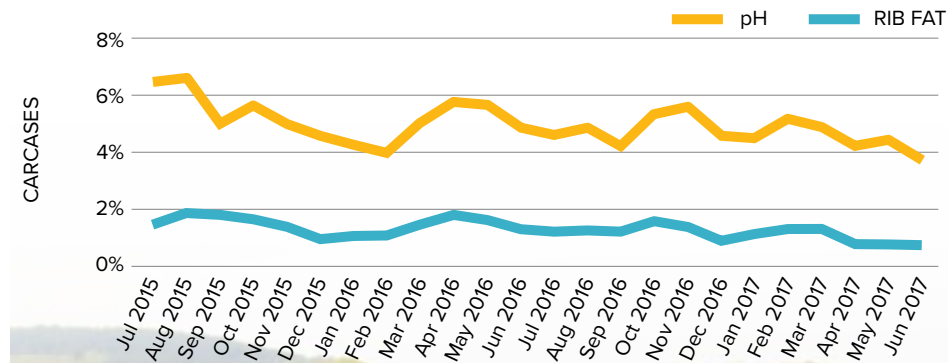
TO BE ELIGIBLE FOR AN MSA INDEX SCORE, MSA-GRADED CARCASSES MUST HAVE:

- met MSA pre-slaughter requirements
- pH less than 5.71
- minimum rib fat of 3mm
- adequate fat coverage over all major primals
- meat colour between and including 1B – 3*

*As of 30 June 2017 meat colour is no longer an MSA minimum requirement.

FIGURE 7 NATIONAL NON-COMPLIANCE 2015–17

Note: Carcasses can be recorded as not meeting specifications for multiple attributes.



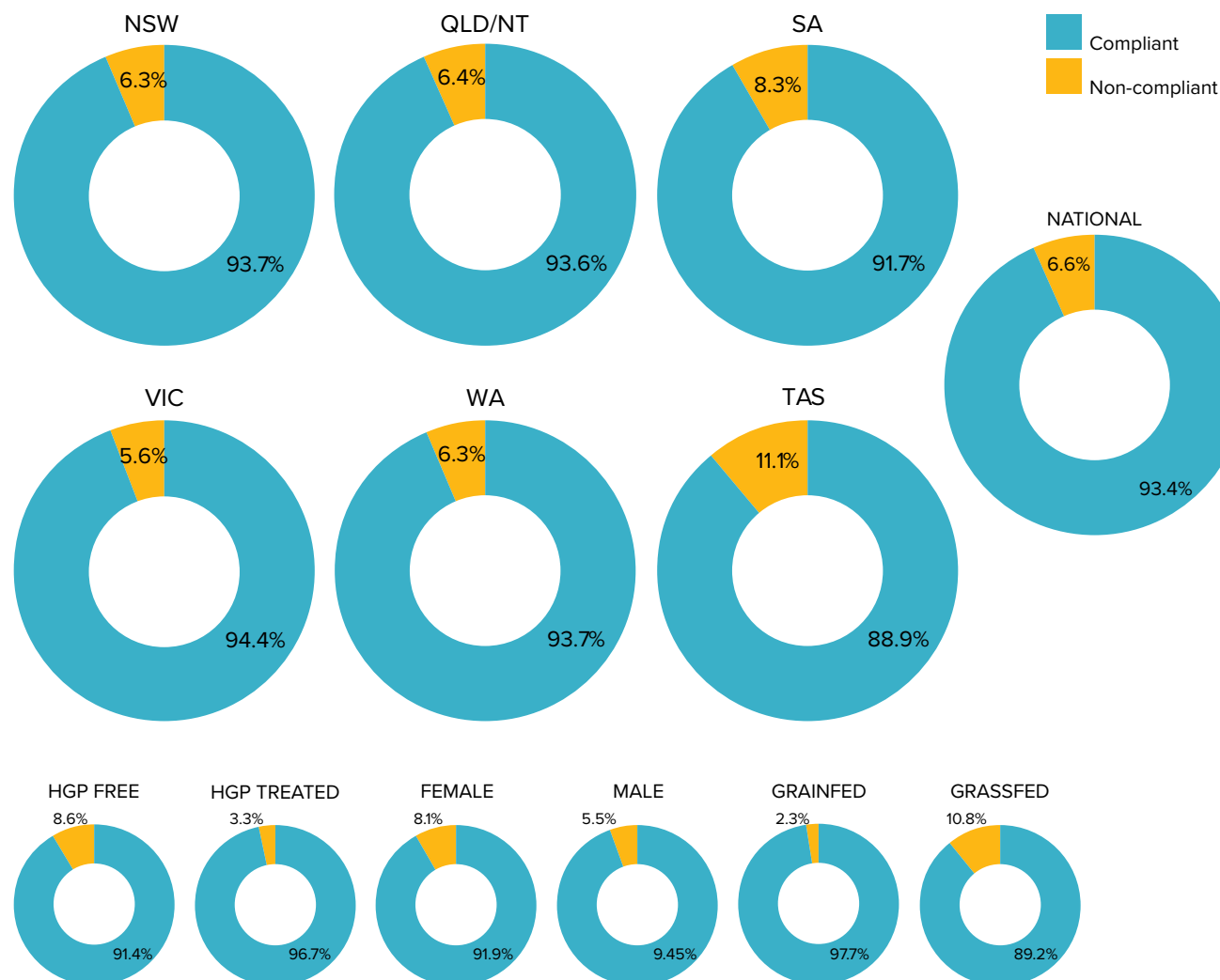
National non-compliance to the MSA minimum requirements for 2015–16 and 2016–17 was 7.0% and 6.3% respectively. Victoria had the highest compliance overall at 94.4%, and Tasmania had the lowest compliance at 88.9%. The high compliance in New South Wales, Queensland, South Australia, Victoria and Western Australia may be attributed to the higher proportion of grainfed animals in these states, which have an inherently high compliance to MSA minimum requirements due to the consistent, high-energy balanced ration they are fed prior to slaughter. Tasmania's pasture-based production system is more variable, being more greatly affected by climatic conditions on pasture growth. Each state presents peaks and troughs in compliance rates throughout the year, largely a reflection of seasonal variation in pasture-based production systems.

South Australia, Tasmania and Western Australia tend to have periods of high non-compliance (see State Snapshots from page 21), which is thought to be linked.

HGPs appear to have an effect on compliance, with HGP-free cattle having a lower rate of compliance compared with HGP-treated cattle (8.6% and 3.3% respectively). It is possible to explain this by noting that the majority of HGP-treated cattle are also grainfed cattle, which have higher rates of compliance to MSA minimum requirements.

The higher incidence of non-compliance in females may be attributed to the finishing system. Only 36% of grainfed cattle are female, as opposed to 49% in the grassfed sector. A further explanation is that heifers in oestrous are more susceptible to having a high pH reading due to the extra activity that they are experiencing prior to slaughter.

FIGURE 8 COMPLIANCE TO MSA MINIMUM REQUIREMENTS BY STATE AND PRODUCTION TYPES 2015–17



MSA PERFORMANCE BY FEED TYPE

Feed type effects on MSA performance

In 2015–17, 51% of MSA-graded cattle were classified as grassfed, while the remaining 49% met requirements for grainfed categories (Figure 10, page 13). Figure 9 shows the proportion of each feed type produced for the MSA program in each state.

Queensland has the largest proportion of grainfed cattle supplied to MSA, with 59%, while Tasmania shows MSA grading dominated by cattle from grassfed production systems.

5.5 million cattle were turned off Australian feedlots during 2015–17. Of these it is estimated 55% were MSA-graded and categorised as grainfed.

MSA compliance by feed type

Compliance to MSA minimum requirements differs between feed type groups.

In 2015–17, 10.8% of MSA-graded grassfed carcasses did not meet MSA requirements compared with 2.3% of grainfed cattle. Figure 11 (page 13) shows the difference in compliance by month for each feed type group. A distinct observation is the difference in monthly variation in compliance, with grainfed cattle maintaining a consistent compliance rate throughout the year.

Grassfed cattle, while having consistently higher rates of non-compliance, also demonstrate fluctuations in compliance throughout the year. This is not surprising given the seasonal challenges and fluctuations in the nutritional environment of a grassfed production system.

FIGURE 9 PROPORTION OF GRAINFED AND GRASSFED MSA-GRADED CATTLE BY STATE DURING 2015–17

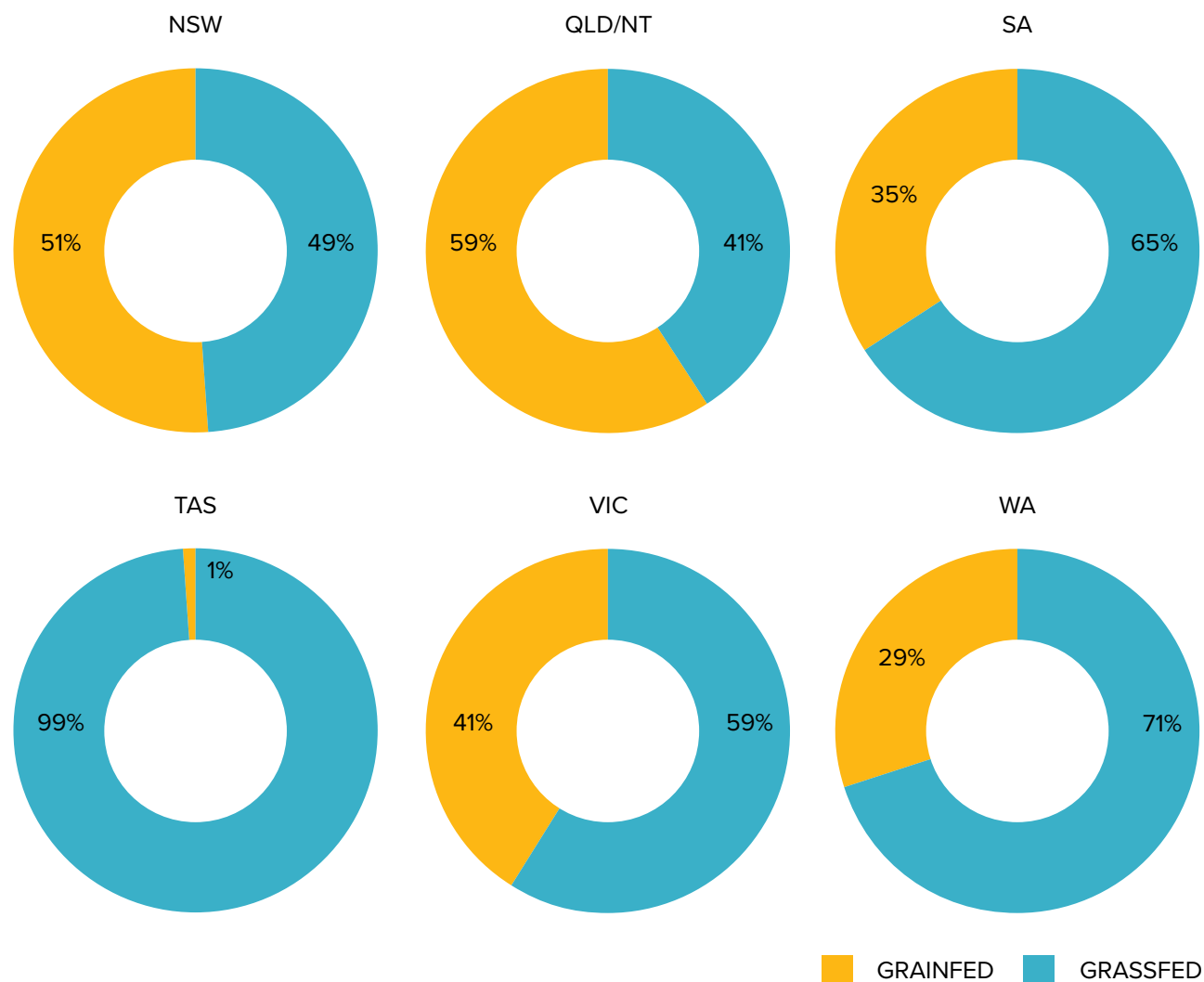




FIGURE 10 PROPORTION OF MSA GRASSFED AND GRAINFED CARCASSES IN 2015–17

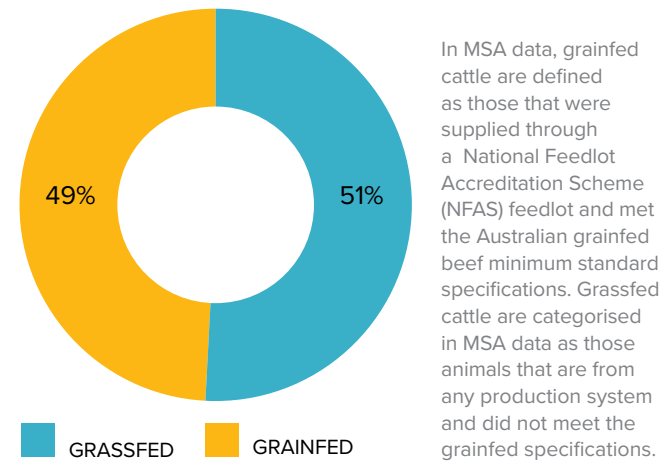
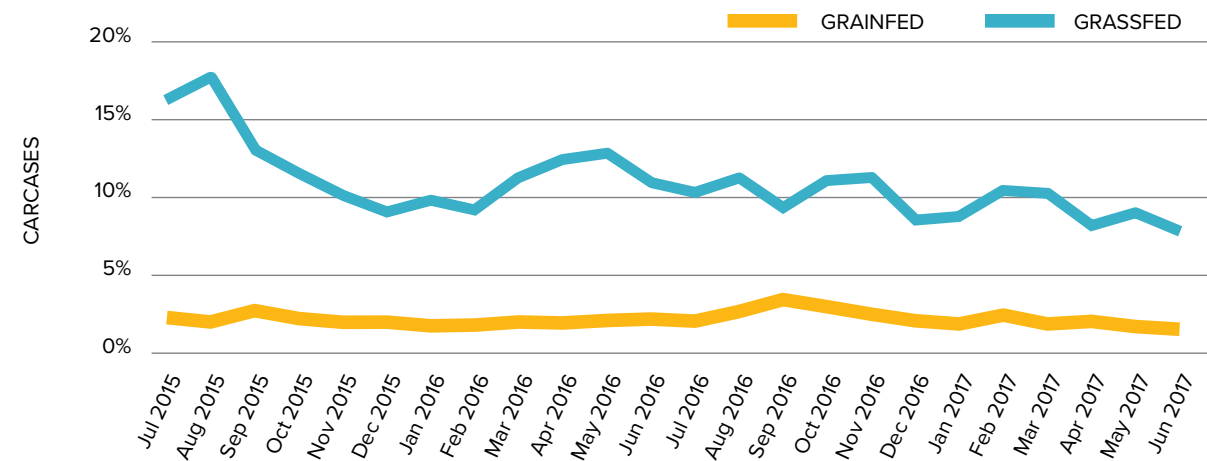


FIGURE 11 2015–17 MSA NON-COMPLIANCE BY FEED TYPE



While each state will experience differences in seasonal conditions, on average there was an increased incidence of high pH in grassfed cattle in July–August 2015 and then elevated again in May 2016.

Grainfed cattle are less impacted by seasonal variation due to the consistency in nutrition levels provided through a high-energy balanced ration.



FIGURES 12 AND 13 REASONS FOR NON-COMPLIANCE FOR GRASSFED AND GRAINFED CATTLE IN 2015–17

Note: carcasses can be recorded as not meeting specifications for multiple attributes.

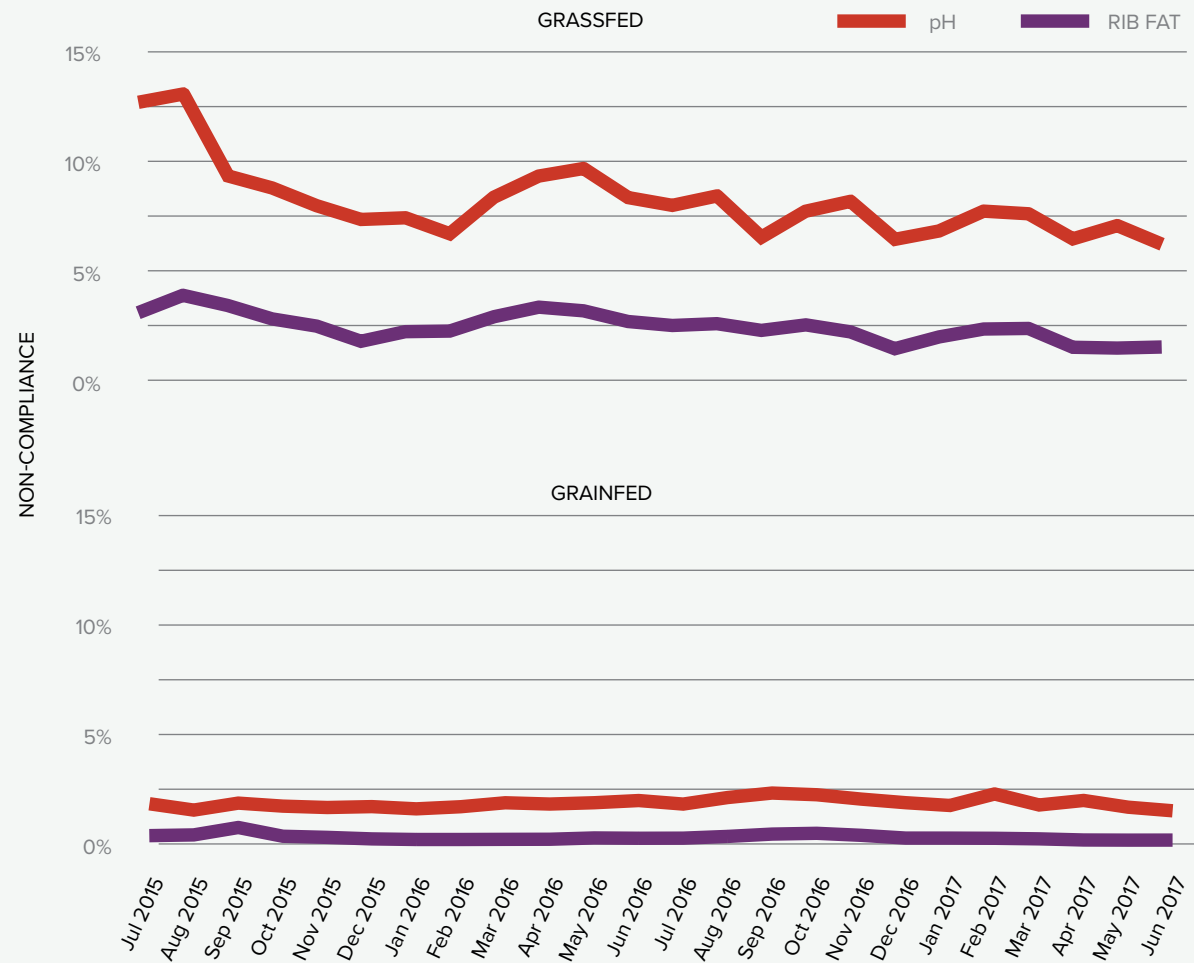


TABLE 3 AVERAGE TRAITS FOR MSA-COMPLIANT CARCASSES FOR EACH FEED TYPE

FEED TYPE	STAT	CARCASE WEIGHT (KG)	HUMP HEIGHT (MM)	OSSIFICATION	MSA MARBLING	RIB FAT (MM)	MSA INDEX
GRAINFED	Top 5%	412	35	120	520	16	63.67
	Average	306	75	160	350	8	56.66
	Bottom 5%	223	130	200	210	4	48.74
GRASSFED	Top 5%	364	35	120	480	14	63.77
	Average	281	65	170	330	8	58.48
	Bottom 5%	219	110	250	190	3	51.16

Feed type and the MSA Index

Grassfed cattle had an average MSA Index of 58.48.

Grainfed cattle had an average MSA Index of 56.66.

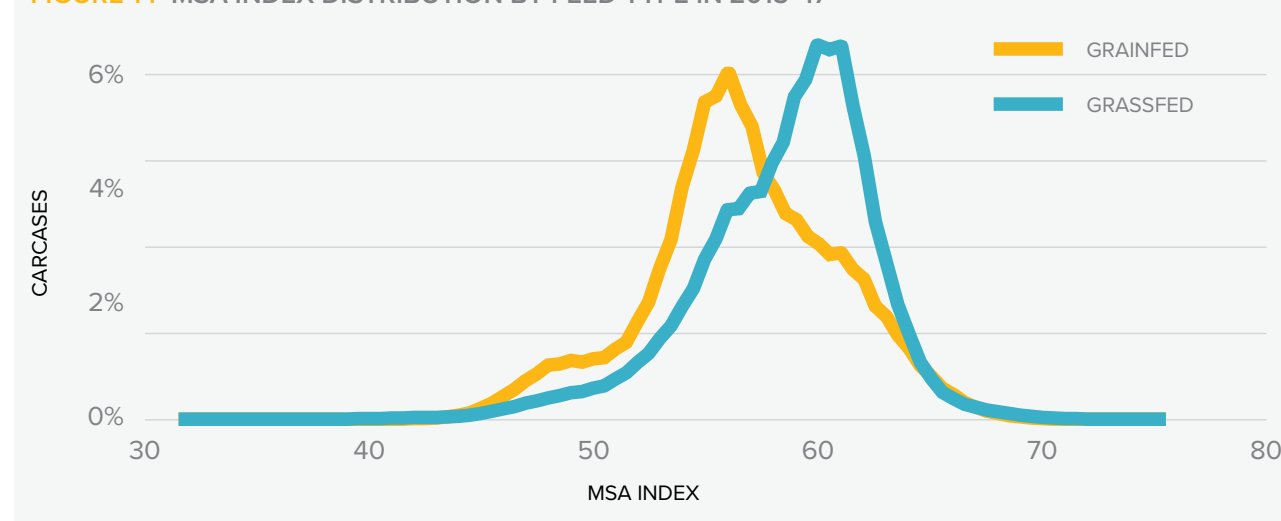
Table 3 provides an indication of the average and range of carcass attributes for both grain and grassfed MSA carcasses. This information shows that, on average, grainfed carcasses were 25kg heavier than grassfed carcasses with similar average marbling, ossification and fat coverage measurements.

However, the average MSA Index was 1.82 index points higher for grassfed cattle. This is likely due to the difference in the proportionate use of HGP treatments between the groups. The grainfed group had 61% use of HGPs compared with 15% within the grassfed group.

Both feed types follow a similar distribution pattern as the national distribution, with both groups experiencing two peaks. These peaks may be attributed to HGP usage or, to a lesser extent:

- populations of animals with higher ossification
- populations of animals with lower marbling

This analysis identifies that there is a higher percentage of grassfed cattle with MSA Index values greater than 60.

FIGURE 14 MSA INDEX DISTRIBUTION BY FEED TYPE IN 2015-17**TABLE 4 MSA INDEX PERCENTILE BANDS BY FEED TYPE**

FEED TYPE	BOTTOM 1%	BOTTOM 5%	BOTTOM 10%	BOTTOM 25%	TOP 50%	TOP 25%	TOP 10%	TOP 5%	TOP 1%
GRAINFED	46.09	48.74	51.11	54.23	56.51	59.56	62.26	63.67	66.07
GRASSFED	46.79	51.16	53.41	56.26	59.13	61.12	62.71	63.77	66.33



FACT

Increasing carcass weight and minimising maturity or ossification development is a key factor in optimising eating quality performance.

CARCASE TRAITS IMPACTING ON THE MSA INDEX BY FEED TYPE

The following figures show ranges and distribution of various carcass traits that have an impact on the MSA Index.

KEY POINTS

- Grassfed cattle had a larger proportion of cattle with ossification scores 150 or less at 56% of the population compared with 48% of grainfed carcasses.
- Differences in marbling distribution were small with a slightly larger proportion of grassfed cattle having marbling scores under MSA marble score 400.
- There is a noticeably larger proportion of grassfed cattle at lighter carcass weights than grainfed cattle.



Ossification

Ossification refers to the physiological maturity of the carcass, and is measured on a scale of 100–590, where 100 is the youngest score. As an animal ages the cartilage on the vertebrae slowly turns to bone, or ossifies. Animals that are able to reach market weight at a younger age are likely to have lower ossification scores. Ossification is linked to an increased amount of connective tissue in the muscles, which has a negative effect on tenderness.



FIGURE 15 OSSIFICATION DISTRIBUTION BY FEED TYPE

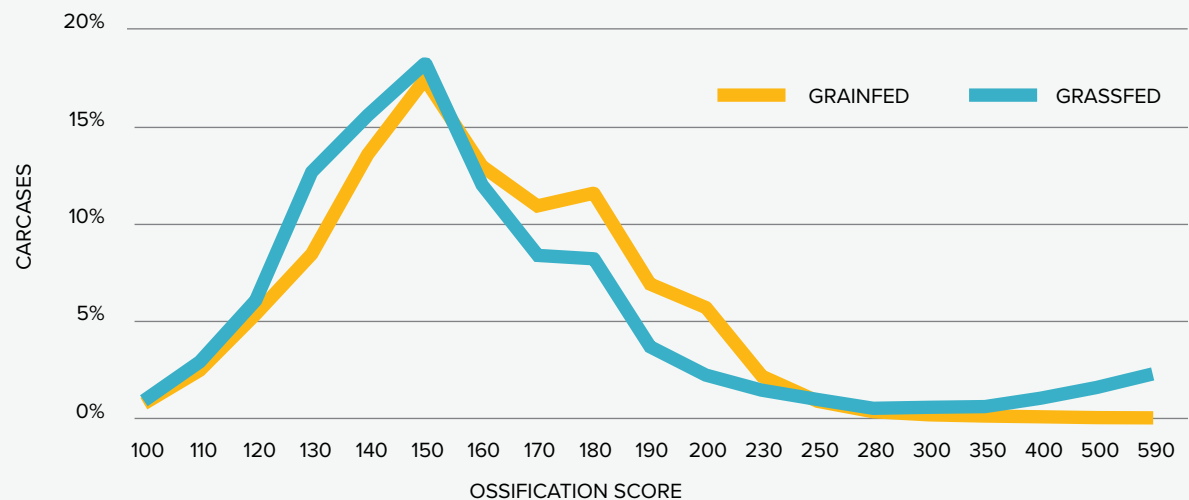


FIGURE 16 MARBLING DISTRIBUTION BY FEED TYPE

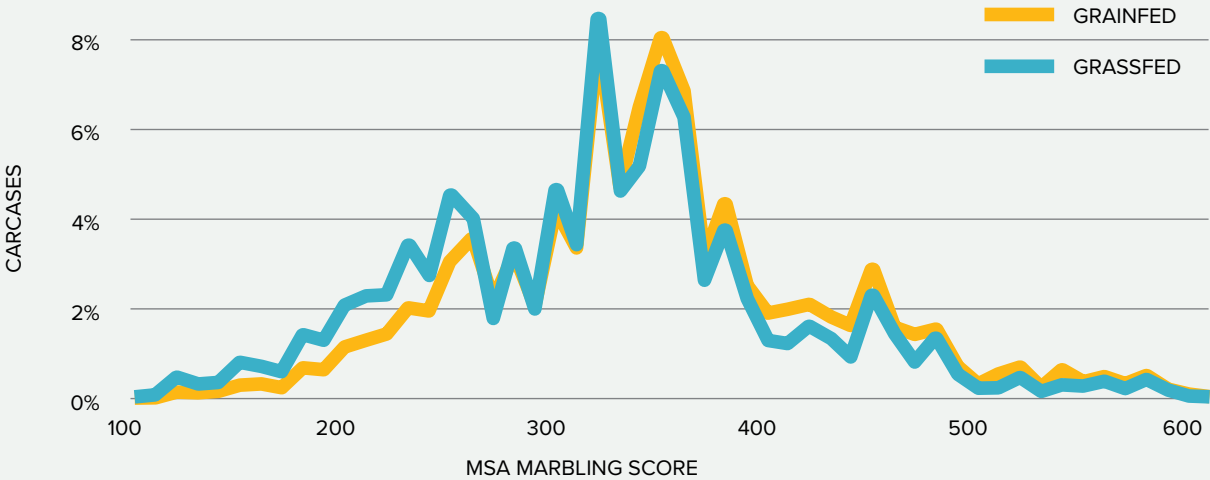
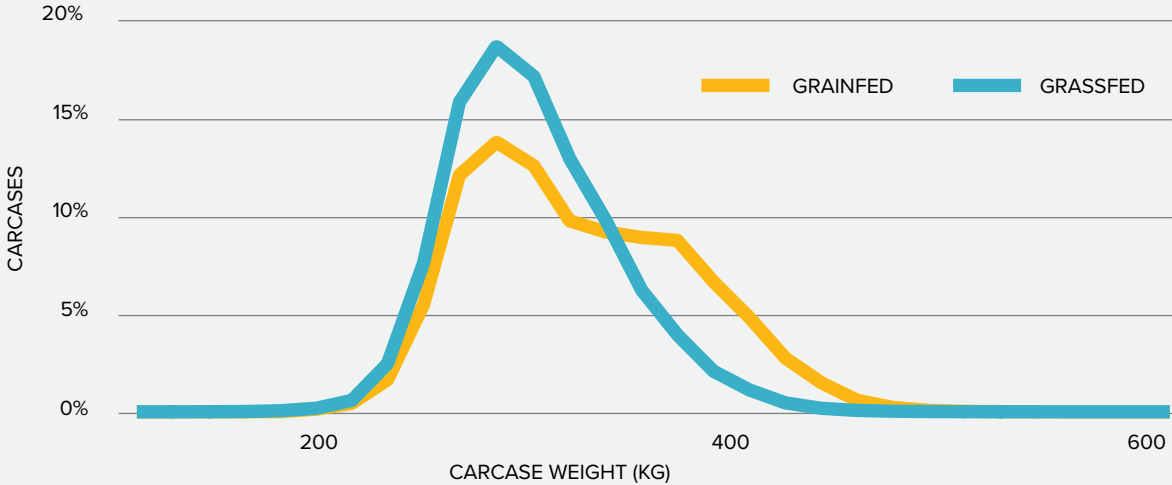


FIGURE 17 CARCASS WEIGHT DISTRIBUTION BY FEED TYPE



Marbling

Grainfed cattle show a slightly higher average MSA marbling score of 350, compared with 330 for grassfed cattle. This difference is likely due to the consistently high-energy ration that grainfed cattle receive. As marbling is the last fat to be deposited in the animal's body, cattle need good quality feed prior to slaughter to assist with the expression of marbling.

Carcass weight

At 306kg average hot standard carcass weight, grainfed MSA cattle were 25kg heavier than their grassfed counterparts at 281kg. This difference in average weights is likely driven by the markets and brands, underpinned by feed type specifications, that MSA cattle are targeted at.

TABLE 5 PROPORTION OF MSA MARBLING SCORE RANGES BY FEED TYPE (%)

MSA MARBLING SCORE RANGE	GRAINFED	GRASSFED
100–200	3.91	8.25
210–300	24.83	30.88
310–400	48.86	44.94
410–500	16.09	11.83
510–600	4.24	2.83
610–700	1.03	0.72
710–800	0.49	0.27
810–900	0.25	0.13
910–1,000	0.14	0.06
1,010–1,090	0.08	0.03
1,110–1,190	0.07	0.01

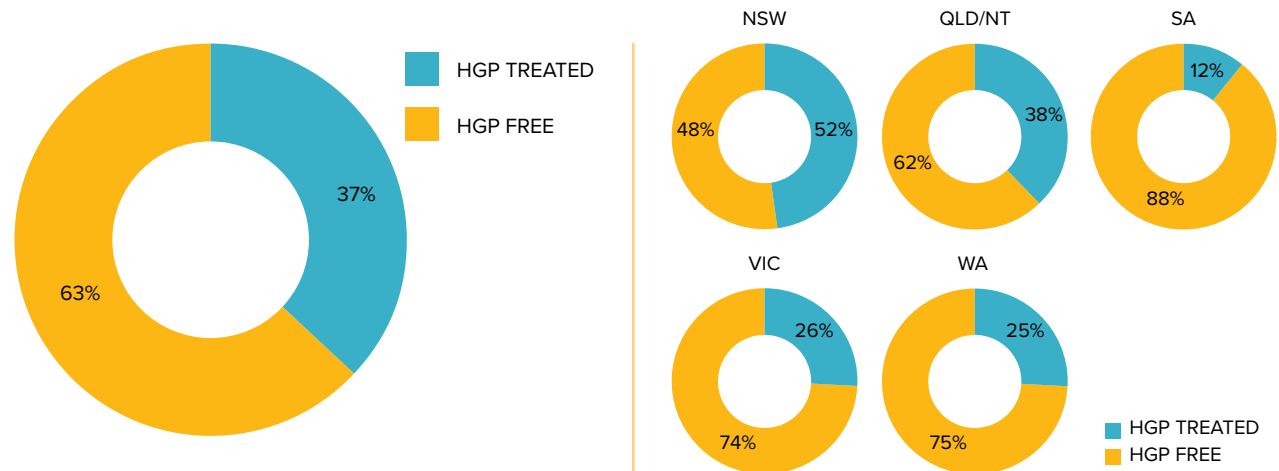
HORMONAL GROWTH PROMOTANT IMPACTS ON THE MSA INDEX

In 2015–17, 37% of MSA-graded cattle received hormonal growth promotant (HGP) treatment.

HGPs have been proven to help increase productivity through weight gain and feed conversion efficiency.

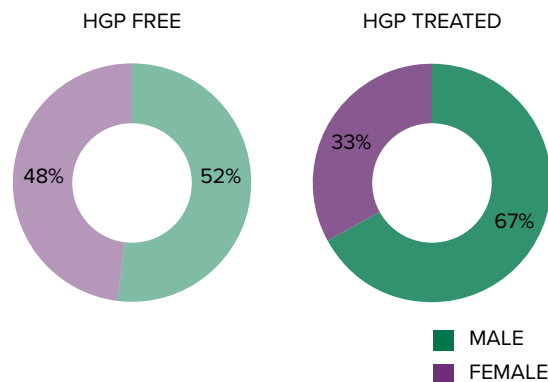
Consumer sensory testing has validated that HGP treatment has a negative impact on eating quality. In addition to this, carcass attributes are also impacted by HGP treatment. An example of this is ossification, which increases with HGP use. The impact of HGP on ossification is variable depending on the timing of the implant. There is also a reduction in marbling at a constant weight.

FIGURE 18 PROPORTION OF HGP TREATMENT OF MSA-GRADED CATTLE IN 2015–17



Note: All beef production in Tasmania is HGP-free, therefore there is no graph showing the proportion of Tasmanian cattle.

HGP TREATMENT BY GENDER



HGP TREATMENT BY FEED TYPE

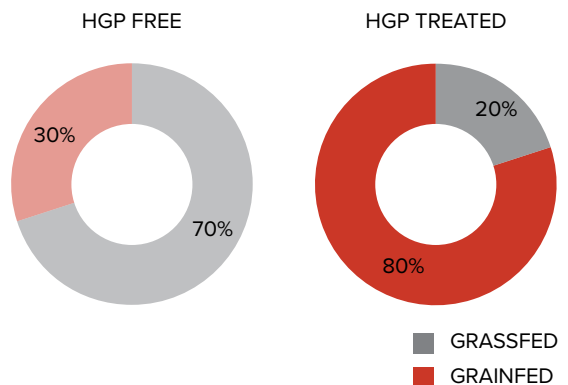




FIGURE 19 MSA INDEX DISTRIBUTION BY HGP TREATMENT IN 2015–17

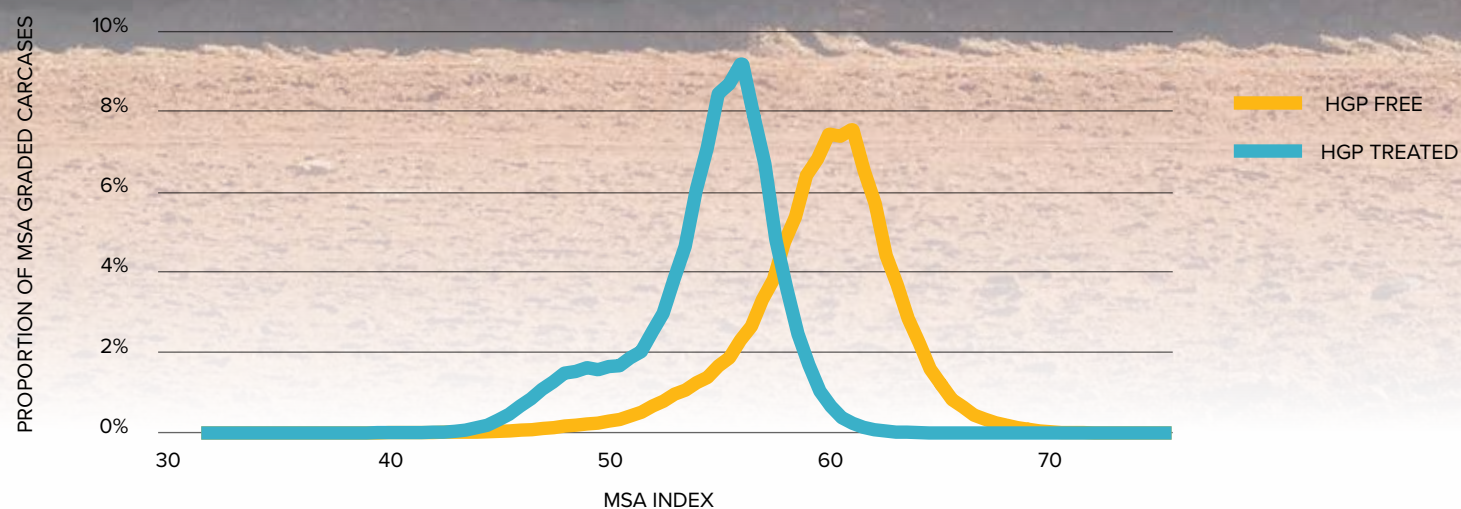


Figure 19 shows the distribution of the MSA Index for HGP status. The peaks of the HGP treated and HGP free populations are approximately five MSA Index points apart, reflective of the varying but combined impact of HGP on each cut in the carcass.

TABLE 6 AVERAGE CARCASS TRAITS BY HGP STATUS

HGP STATUS	STAT	CARCASS WEIGHT (KG)	HUMP HEIGHT (MM)	OSSIFICATION	MSA MARBLING	RIB FAT (MM)	MSA INDEX
HGP FREE	Top 5%	374	35	110	520	15	64.48
	Average	282	65	170	330	8	59.53
	Bottom 5%	215	110	280	190	3	53.05
HGP TREATED	Top 5%	413	35	130	500	16	58.59
	Average	312	75	170	350	8	54.38
	Bottom 5%	229	135	230	230	4	47.70



TIP

HGP status has a 'very high' importance rating for its ability to change the MSA Index (see page 7). Optimising other carcass traits of implanted cattle such as marbling and ossification is important when aiming to increase MSA Index results

CARCASE TRAITS IMPACTING ON THE MSA INDEX BY HGP STATUS

The following figures show ranges and distribution of various carcass traits between HGP treatment groups that have an impact on the MSA Index.

KEY POINTS

- HGP-treated cattle had a larger proportion of animals with heavier carcass weights, reflected in the average 30.4 kg difference between the two groups.
- The HGP-free group had 73% of cattle with an ossification of less than 170, compared to 51% in the HGP-treated group.
- The HGP-free group had 59% of cattle with an MSA marble score of less than 350, compared to 50% in the HGP-treated group. This effect is likely due to an interaction between HGP usage and feed type. Although more grainfed cattle are HGP treated, they also tend to have higher marble scores.

FIGURE 20 OSSIFICATION DISTRIBUTION BY HGP STATUS

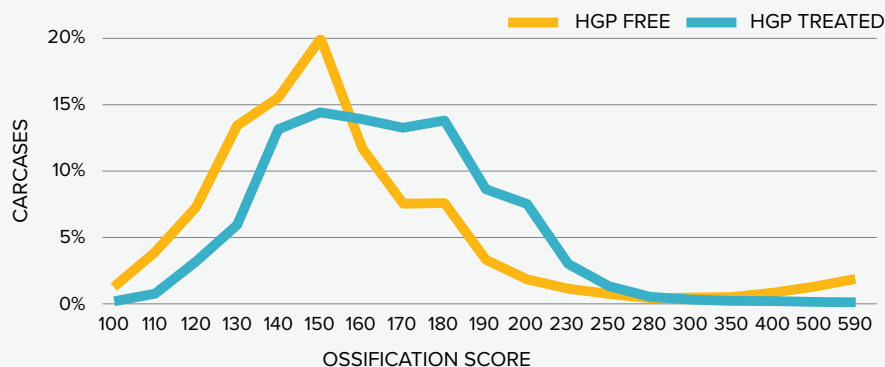


FIGURE 21 MARBLING DISTRIBUTION BY HGP STATUS

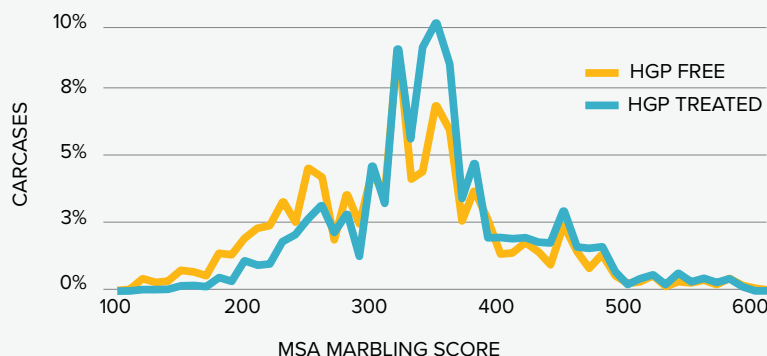


FIGURE 22 CARCASS WEIGHT DISTRIBUTION BY HGP STATUS

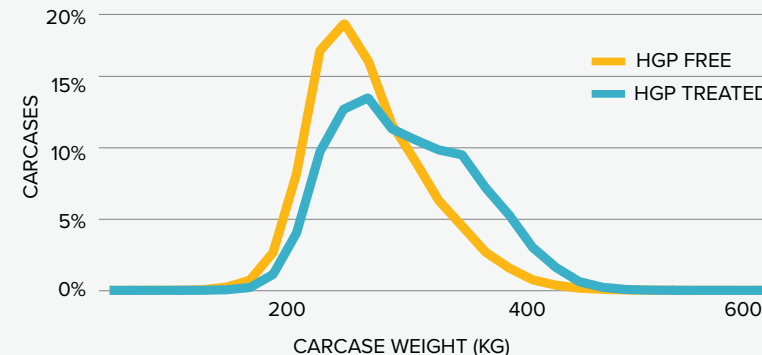


TABLE 7 MSA INDEX PERCENTILE BANDS BY HGP TREATMENT

HGP STATUS	BOTTOM 1%	BOTTOM 5%	BOTTOM 10%	BOTTOM 25%	TOP 50%	TOP 25%	TOP 10%	TOP 5%	TOP 1%
HGP free	48.74	53.05	55.05	57.81	59.93	61.69	63.38	64.48	66.89
HGP treated	45.42	47.7	49.36	52.93	55.07	56.52	57.77	58.59	60.20

STATE SNAPSHOTS



NEW SOUTH WALES AND AUSTRALIAN CAPITAL TERRITORY

MSA CATTLE PRODUCED
IN NEW SOUTH WALES AND ACT
IN 2015–17:

59% male

47% HGP free

49% grassfed

Cattle produced in New South Wales and the Australian Capital Territory represent 31% of all MSA-graded cattle in Australia in 2015–17.

37% of MSA-registered cattle producers reside in New South Wales and the ACT. This equates to 15,404 MSA-registered beef producers, with more than 5,200 of these producers consigning cattle to the MSA program in 2015–17.

Since 2010–11 the number of cattle graded in New South Wales and the ACT has increased, with more than 1.7 million MSA graded in 2015–17, representing 57% of all adult cattle processed in the state and territory (Figure 24).

FIGURE 23 MSA GRADING IN
NEW SOUTH WALES AND THE ACT

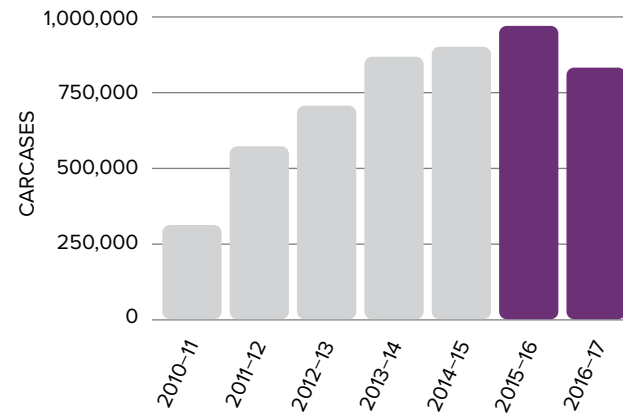
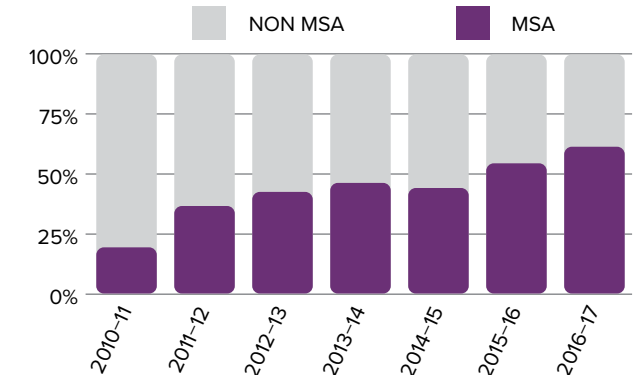


FIGURE 24 PROPORTION OF NEW SOUTH WALES
AND THE ACT ADULT CATTLE SLAUGHTER
PRESENTED FOR MSA GRADING



Source: ABS and Meat & Livestock Australia.

FIGURE 25 MONTHLY NON-COMPLIANCE TO MSA SPECIFICATIONS OF CATTLE PRODUCED
IN NEW SOUTH WALES AND THE ACT THROUGHOUT 2015–17

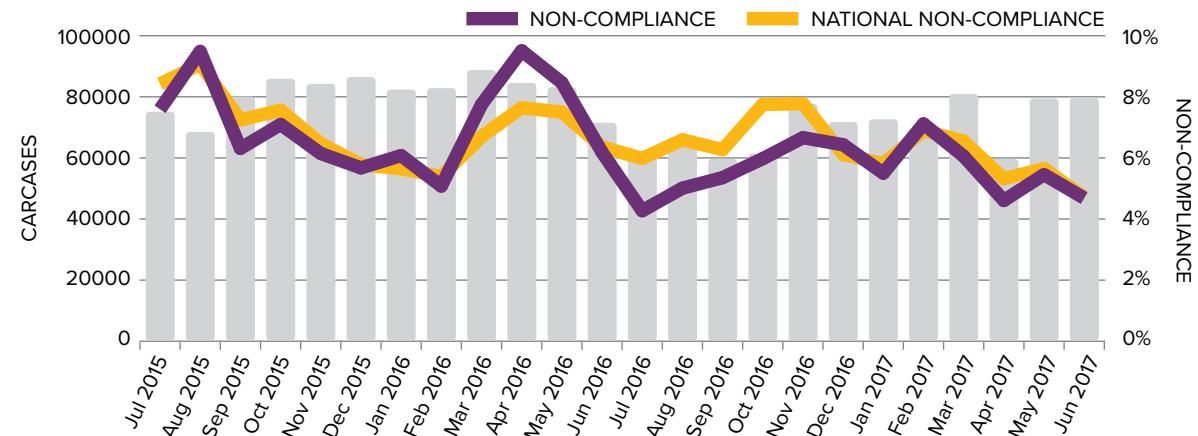


FIGURE 26 MONTHLY NON-COMPLIANCE TO MSA SPECIFICATIONS BY ATTRIBUTE IN NEW SOUTH WALES AND THE ACT THROUGHOUT 2015–17

Note: carcasses can be recorded as not meeting specifications for multiple attributes.

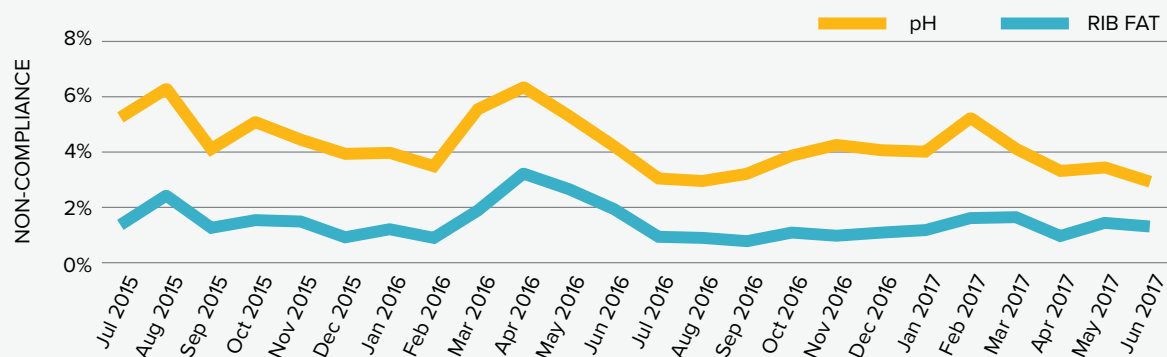


FIGURE 27 2015–17 NEW SOUTH WALES AND THE ACT MSA INDEX DISTRIBUTION

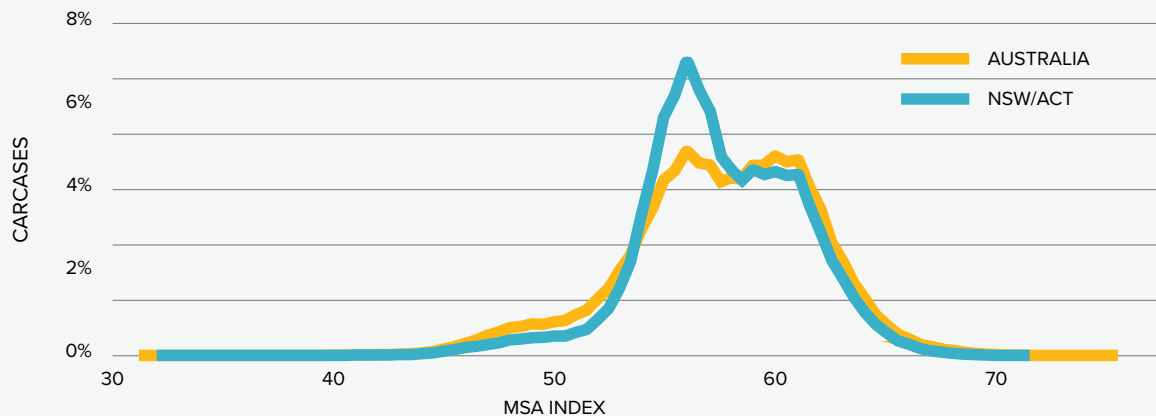


Figure 25 shows the number of cattle consigned from New South Wales and the ACT per month throughout 2015–17 and the corresponding percentage of non-compliance for that month. New South Wales and the ACT recorded 6.3% non-compliance to the MSA minimum requirements, with non-compliance being greatest through winter in 2015 and peaking again around the autumn period in 2016. This may have been driven by lower pasture quality causing a deficit in glycogen reserves leading to high pH as well as increasing the difficulty for animals to deposit enough fat in their finishing stages. Rib fat and pH share a similar pattern of non-compliance, as shown in Figure 26.

Figure 27 indicates that the MSA Index results for cattle produced in New South Wales and the ACT have a similar and minimum range as the national population. However, New South Wales and the ACT have a higher proportion of cattle within the range of 55 and 57. This suggests that there may be a higher percentage of animals with consistently similar carcass characteristics being supplied in the state and territory.

TABLE 8 CARCASS ATTRIBUTES OF MSA CARCASSES IN NEW SOUTH WALES IN 2015–17

STAT	CARCASS WEIGHT (KG)	HUMP HEIGHT (MM)	OSSIFICATION	MSA MARBLING	RIB FAT (MM)	MSA INDEX
Top 5%	397	35	120	500	15	63.20
Average	300	60	170	350	8	57.52
Bottom 5%	228	90	200	210	4	51.68

QUEENSLAND AND THE NORTHERN TERRITORY

MSA CATTLE PRODUCED IN QUEENSLAND AND NT IN 2015-17:

54% male

61% HGP free

41% grassfed

Cattle produced in Queensland and the Northern Territory represent 42% of all MSA-graded cattle in Australia in 2015-17.

18% of MSA-registered producers reside in Queensland and the Northern Territory accounting for more than 7,675 individual registrations. Of the number of individual registrations, more than 2,900 producers consigned MSA-eligible cattle in 2015-17.

Since 2010-11 the proportion of MSA-graded cattle in Queensland and the Northern Territory has increased to represent 37% of the state's adult cattle slaughter in 2015-17 (Figure 29) while the total number of MSA-graded cattle has increased by more than 500,000 head (Figure 28).

FIGURE 28 MSA GRADING IN QUEENSLAND AND THE NORTHERN TERRITORY

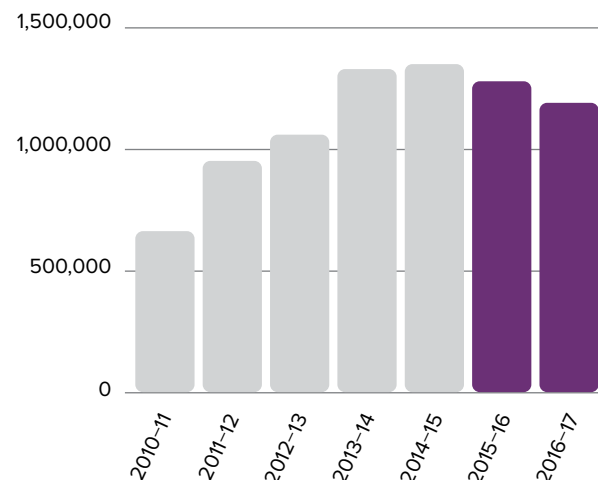
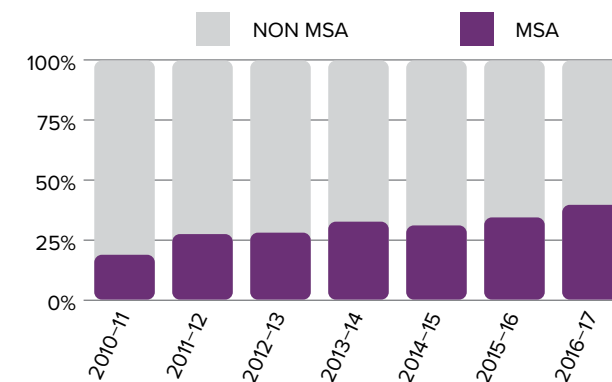


FIGURE 29 PROPORTION OF QUEENSLAND AND THE NORTHERN TERRITORY ADULT CATTLE SLAUGHTER PRESENTED FOR MSA GRADING



Source: ABS and Meat & Livestock Australia

FIGURE 30 MONTHLY NON-COMPLIANCE TO MSA SPECIFICATIONS OF CATTLE PRODUCED IN QUEENSLAND AND THE NORTHERN TERRITORY THROUGHOUT 2015-17

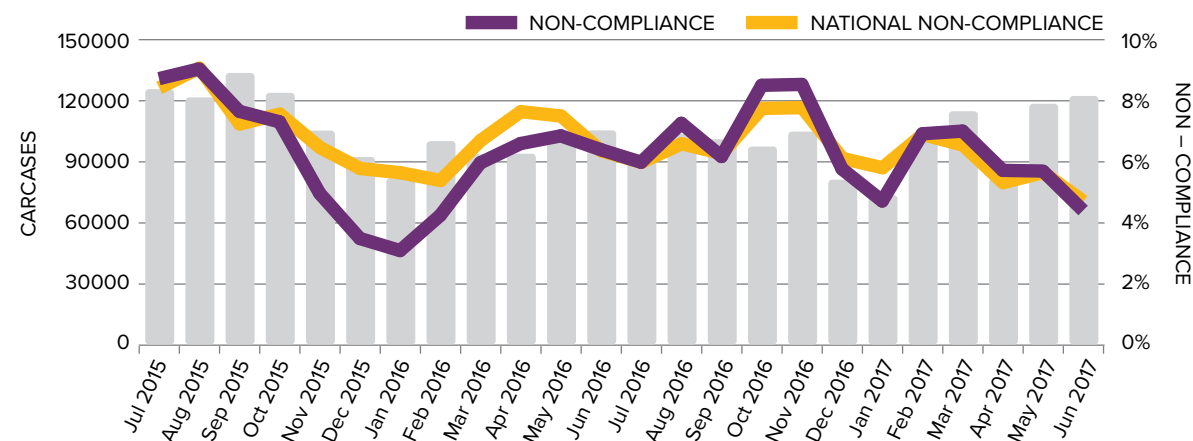


FIGURE 31 MONTHLY NON-COMPLIANCE TO MSA SPECIFICATIONS BY ATTRIBUTE IN QUEENSLAND AND THE NORTHERN TERRITORY THROUGHOUT 2015–17

Note: carcasses can be recorded as not meeting specifications for multiple attributes.

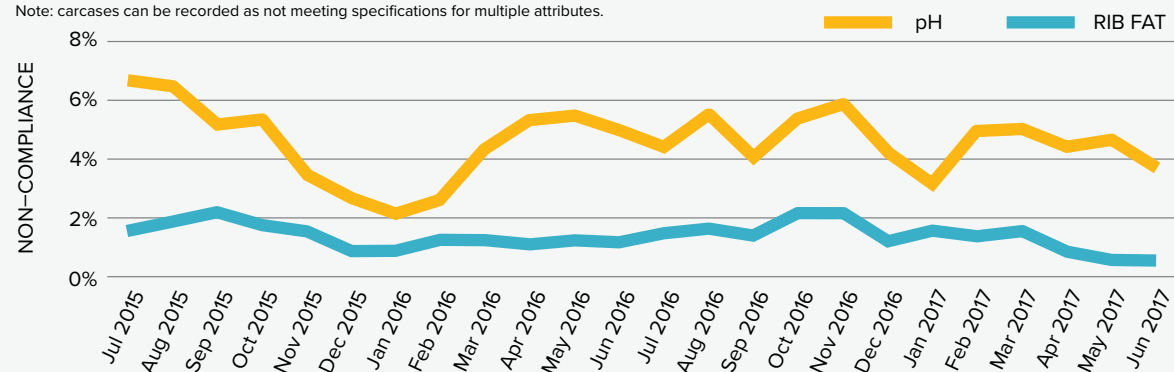


Figure 30 shows the number of cattle consigned per month from Queensland and the Northern Territory throughout 2015–17 and the corresponding percentage of non-compliance. Queensland and the Northern Territory recorded 6.2% non-compliance to the MSA minimum requirements.

Non-compliance to fat coverage requirements remained relatively consistent throughout both years with greater fluctuation in compliance to pH requirements, as shown in Figure 31.

Figure 32 illustrates that the greatest proportion of Queensland and the Northern Territory cattle fall between the MSA Index scores of 55 and 61, accounting for more than 50% of animals.

The Queensland and the Northern Territory distribution of MSA Index values tracked closely to the national distribution. This is partially due to the high proportion of MSA carcasses that originate in Queensland driving the national index distribution.

FIGURE 32 2015–17 QUEENSLAND AND THE NORTHERN TERRITORY MSA INDEX DISTRIBUTION

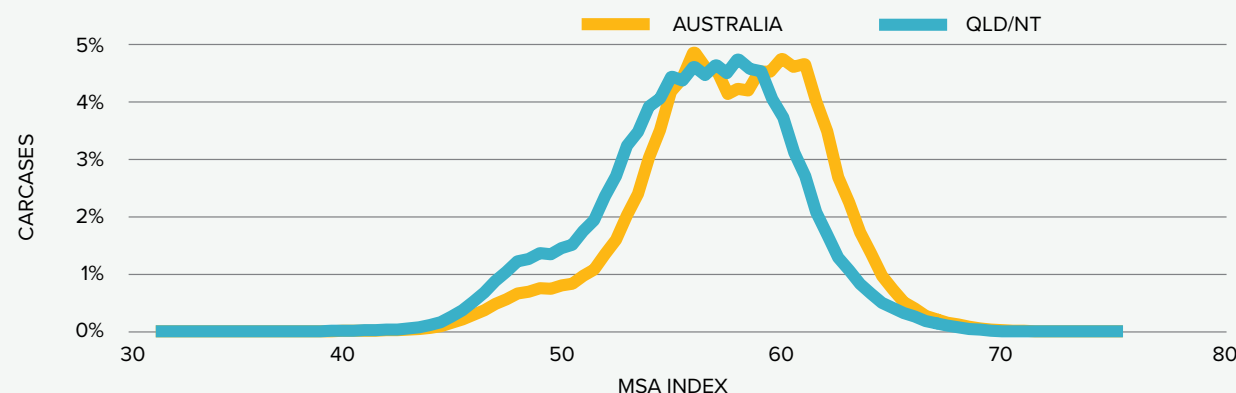
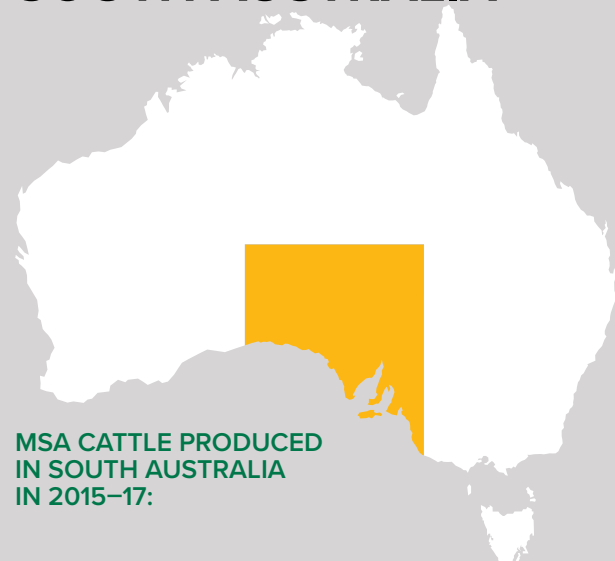


TABLE 9 CARCASS ATTRIBUTES OF MSA CARCASSES IN QUEENSLAND AND NORTHERN TERRITORY IN 2015–17

STAT	CARCASS WEIGHT (KG)	HUMP HEIGHT (MM)	OSSIFICATION	MSA MARBLING	RIB FAT (MM)	MSA INDEX
Top 5%	404	50	120	480	15	62.59
Average	293	85	160	320	8	56.02
Bottom 5%	217	140	230	190	3	48.05

SOUTH AUSTRALIA



MSA CATTLE PRODUCED
IN SOUTH AUSTRALIA
IN 2015–17:

61% male

88% HGP free

65% grassfed

Cattle produced in South Australia represent 7% of all MSA-graded cattle in Australia in 2015–17. MSA-graded cattle in 2015–17 represented 51% of all adult cattle processed in South Australia (Figure 34).

10% of MSA-registered beef producers reside in SA, accounting for 4,045 individual registrations. Of the registered population, 760 producers consigned cattle to the MSA program in 2015–17.

More than 380,000 cattle were MSA-graded in South Australia in 2015–17 (Figure 33). Figure 34 shows the growth and fluctuations in MSA grading in South Australia since 2010–11.

FIGURE 33 MSA GRADING IN SOUTH AUSTRALIA

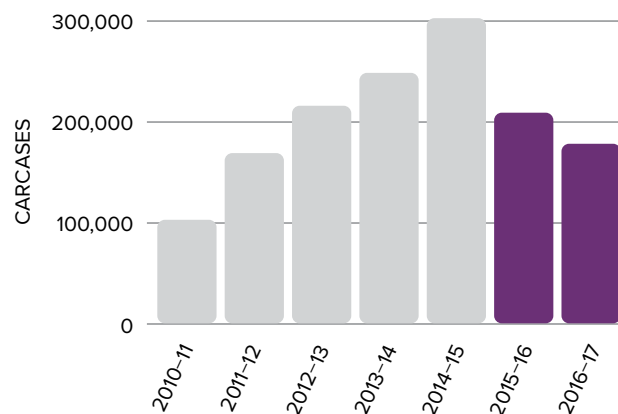
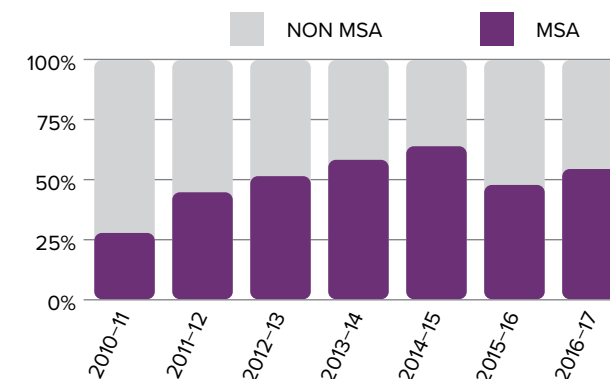


FIGURE 34 PROPORTION OF SOUTH AUSTRALIAN ADULT CATTLE SLAUGHTER PRESENTED FOR MSA GRADING



Source: ABS and Meat & Livestock Australia.

FIGURE 35 MONTHLY NON-COMPLIANCE TO MSA SPECIFICATIONS OF CATTLE PRODUCED IN SOUTH AUSTRALIA THROUGHOUT 2015–17

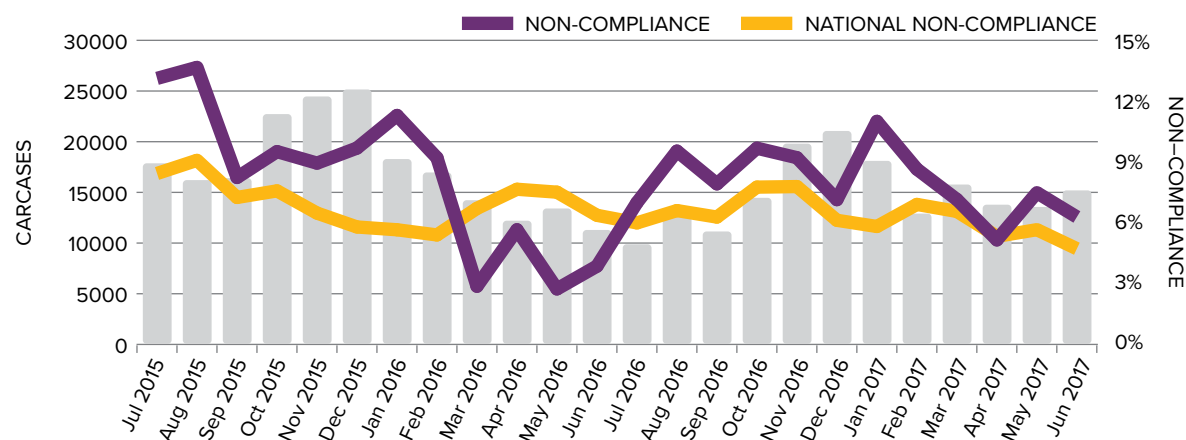


FIGURE 36 MONTHLY NON-COMPLIANCE TO MSA SPECIFICATIONS BY ATTRIBUTE IN SOUTH AUSTRALIA THROUGHOUT 2015–17

Note: carcasses can be recorded as not meeting specifications for multiple attributes.

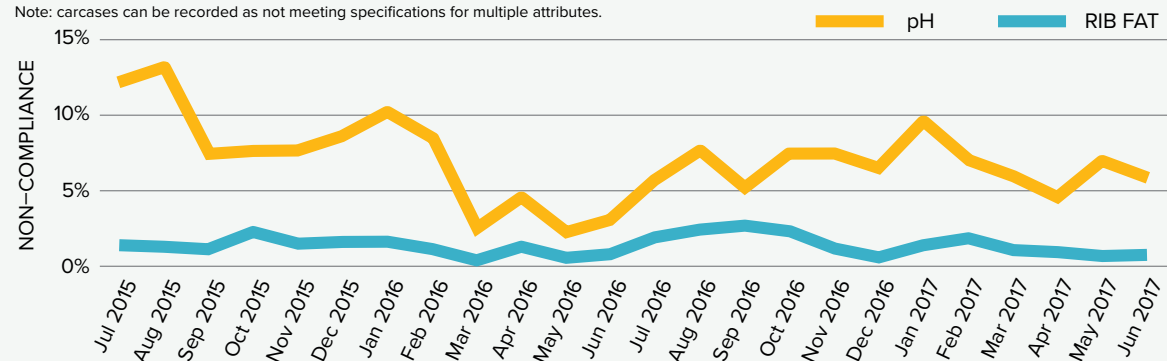


Figure 35 shows the number of cattle consigned from South Australia per month throughout 2015–17 and the corresponding percentage of non-compliance. South Australia recorded an average of 8% non-compliance to the MSA requirements, with non-compliance greatest in July 2015 and noticeable peaks in January across both years. These peaks may have been driven by increased non-compliance to pH in grassfed cattle.

The main reason for non-compliance during these months is attributed to high pH levels. Non-compliance to fat coverage is below the national average, remaining consistent throughout this time period.

In comparison to the national distribution, a larger proportion of cattle in South Australia had MSA Index values greater than 60 with more than 40% of having MSA Index values between 60 and 62.

FIGURE 37 2015–17 SOUTH AUSTRALIA MSA INDEX DISTRIBUTION

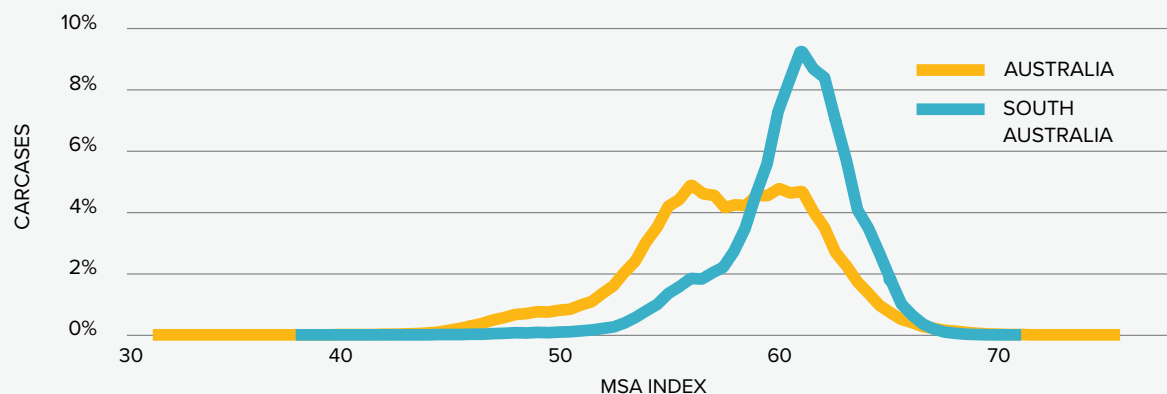
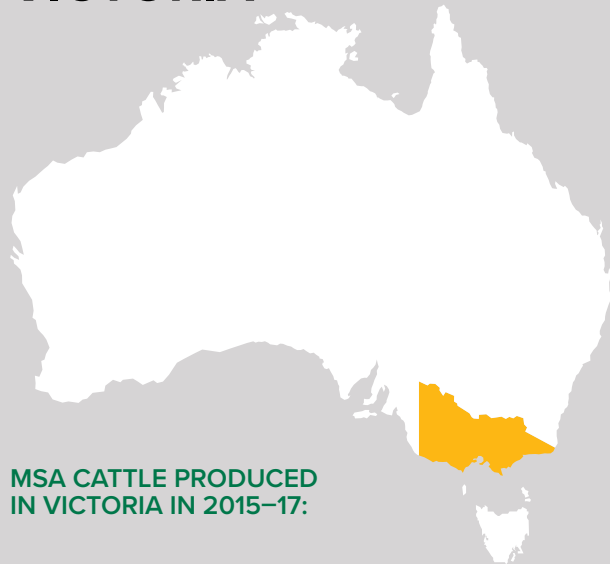


TABLE 10 CARCASS ATTRIBUTES OF MSA CARCASSES IN SOUTH AUSTRALIA IN 2015–17

STAT	CARCASS WEIGHT (KG)	HUMP HEIGHT (MM)	OSSIFICATION	MSA MARBLING	RIB FAT (MM)	MSA INDEX
Top 5%	379	35	120	550	15	64.58
Average	296	55	150	370	9	60.54
Bottom 5%	223	75	190	230	4	55.08

VICTORIA



MSA CATTLE PRODUCED
IN VICTORIA IN 2015–17:

61% male

74% HGP free

59% grassfed

Cattle produced in Victoria represent 8% of all MSA-graded cattle in Australia in 2015–17. 14% of MSA-registered beef producers reside in Victoria, which equates to 5,849 MSA-registered beef producers. In 2015–17 more than 1,320 of these producers consigned cattle to the MSA program.

Since 2010–11 the number of cattle graded in Victoria has increased with more than 230,000 cattle MSA graded in 2015–17, representing 19% of all adult cattle processed in the state (Figure 39).

FIGURE 38 MSA GRADING IN VICTORIA

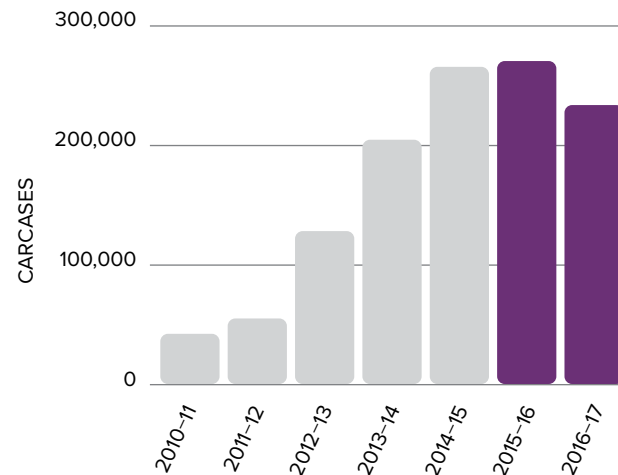
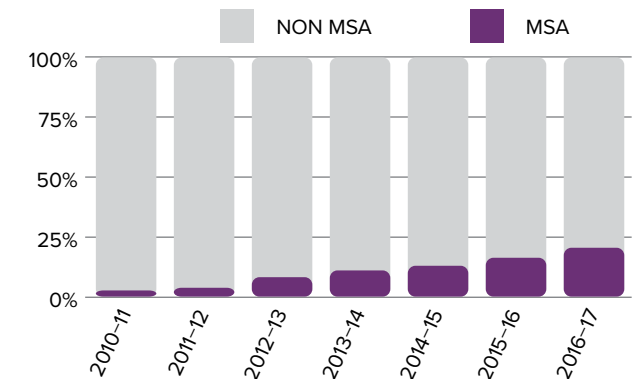


FIGURE 39 PROPORTION OF VICTORIA ADULT CATTLE SLAUGHTER PRESENTED FOR MSA GRADING



Source: ABS and Meat & Livestock Australia.

FIGURE 40 MONTHLY NON-COMPLIANCE TO MSA SPECIFICATIONS OF CATTLE PRODUCED IN VICTORIA THROUGHOUT 2015–17

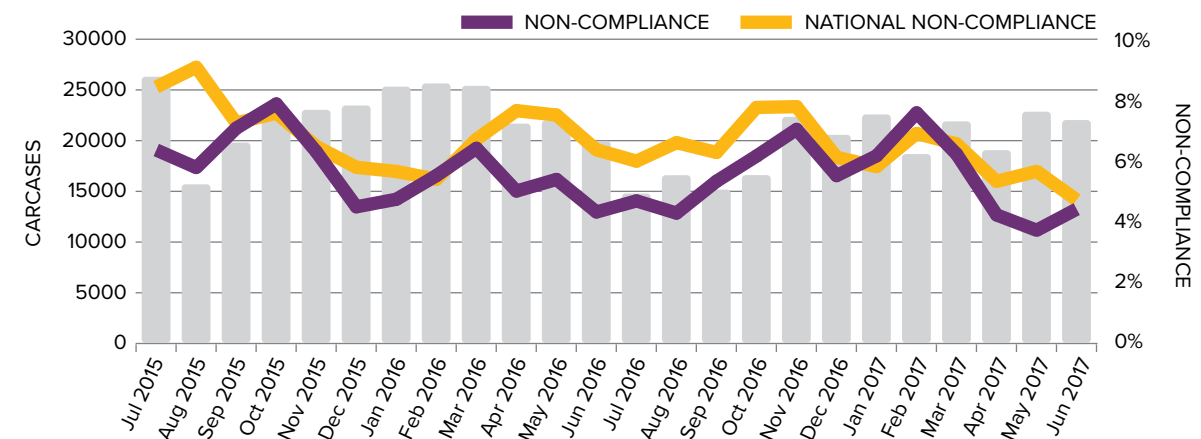


FIGURE 41 MONTHLY NON-COMPLIANCE TO MSA SPECIFICATIONS BY ATTRIBUTE IN VICTORIA THROUGHOUT 2015–17

Note: Carcasses can be recorded as not meeting specifications for multiple attributes.

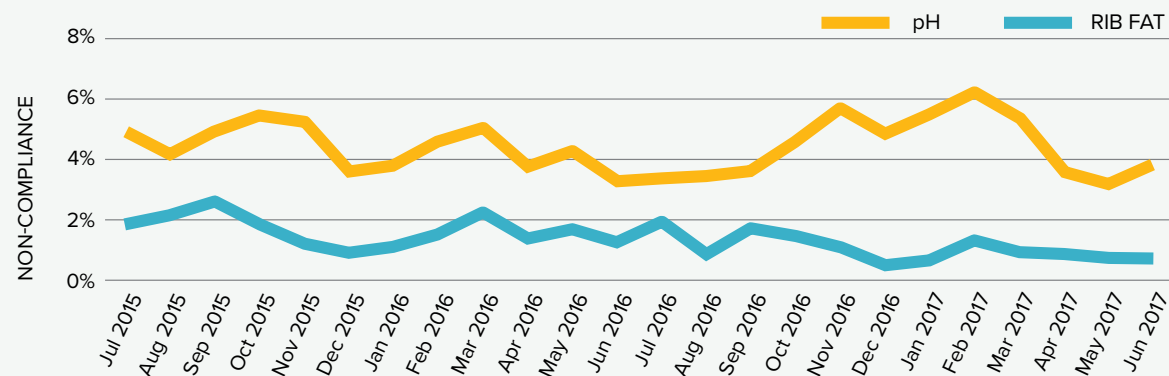


Figure 40 shows the number of cattle consigned from Victoria per month throughout 2015–17 and the corresponding percentage of non-compliance. Victoria recorded 5.6% non-compliance to the MSA minimum requirements, with non-compliance remaining relatively stable throughout the two financial years. This is possibly due to the high proportion of grainfed cattle compared to the other southern states.

Figure 41 illustrates the primary reason for non-compliance relates to high pH levels.

FIGURE 42 2015–17 VICTORIA MSA INDEX DISTRIBUTION

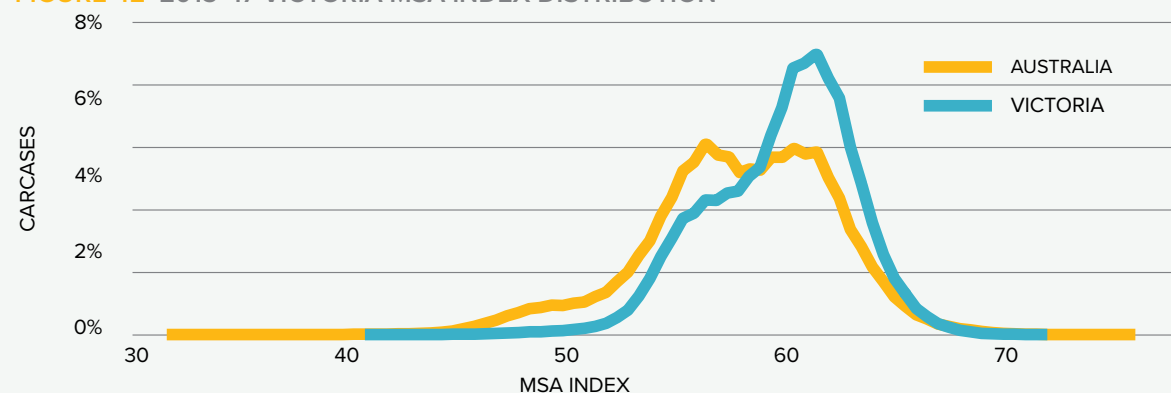
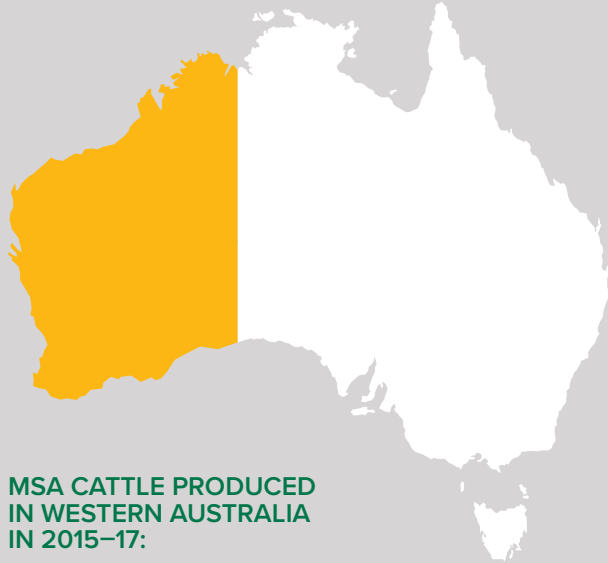


TABLE 11 CARCASS ATTRIBUTES OF MSA CARCASSES IN VICTORIA IN 2015–17

STAT	CARCASS WEIGHT (KG)	HUMP HEIGHT (MM)	OSSIFICATION	MSA MARBLING	RIB FAT (MM)	MSA INDEX
Top 5%	392	30	110	520	15	64.07
Average	298	50	160	350	8	59.37
Bottom 5%	227	75	200	210	3	53.80

WESTERN AUSTRALIA



**MSA CATTLE PRODUCED
IN WESTERN AUSTRALIA
IN 2015–17:**

61% male

75% HGP free

70% grassfed

Cattle produced in Western Australia represent 8% of all MSA-graded cattle in Australia in 2015–17. 10% of MSA-registered beef producers reside in Western Australia, represented by 4,357 MSA-registered beef producers. In 2015–17 more than 1,800 of these producers consigned cattle to the MSA program.

Figure 44 shows a 23% increase in the proportion of MSA-graded cattle in Western Australia since 2010–11.

In 2015–17 MSA-graded cattle represented 62% of the state's adult cattle slaughter.

FIGURE 43 MSA GRADING IN WESTERN AUSTRALIA

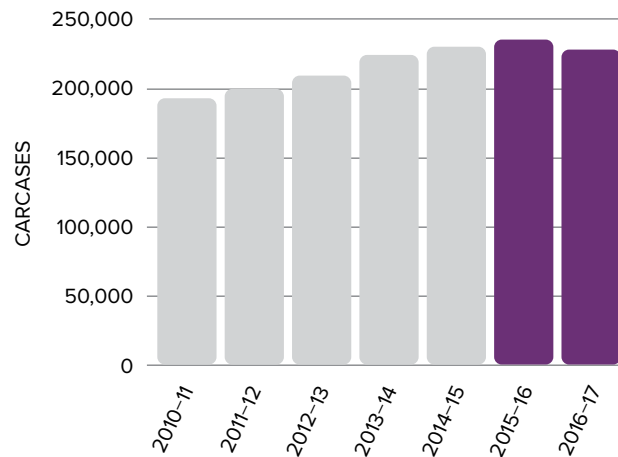
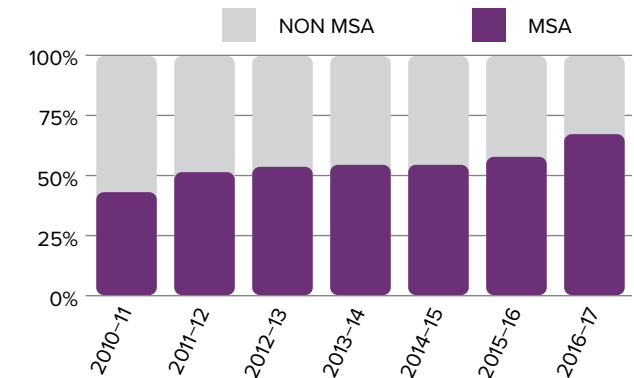


FIGURE 44 PROPORTION OF WESTERN AUSTRALIAN ADULT CATTLE SLAUGHTER PRESENTED FOR MSA GRADING



Source: ABS and Meat & Livestock Australia.

FIGURE 45 MONTHLY NON-COMPLIANCE TO MSA SPECIFICATIONS OF CATTLE PRODUCED IN WESTERN AUSTRALIA THROUGHOUT 2015–17

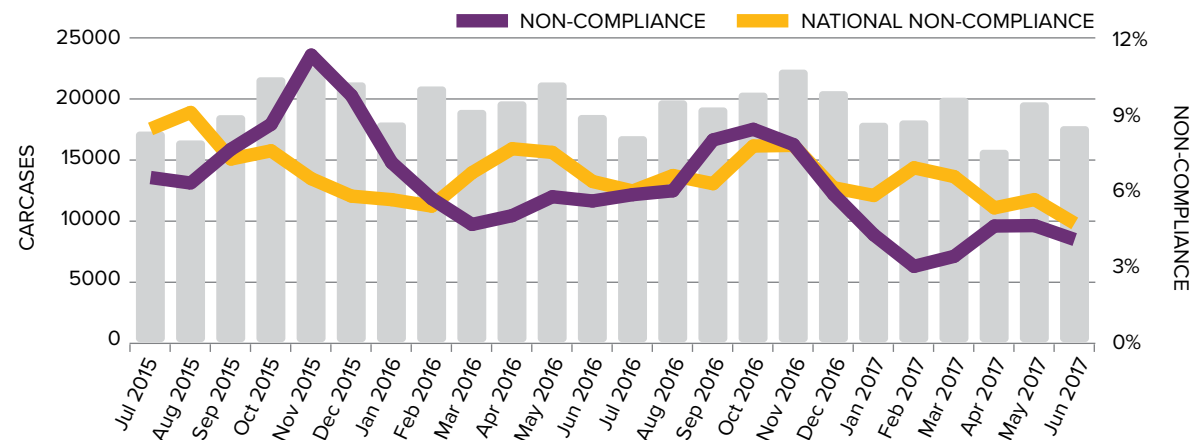


FIGURE 46 MONTHLY NON-COMPLIANCE TO MSA SPECIFICATIONS OF CATTLE PRODUCED IN WESTERN AUSTRALIA THROUGHOUT 2015-17

Note: carcasses can be recorded as not meeting specifications for multiple attributes.

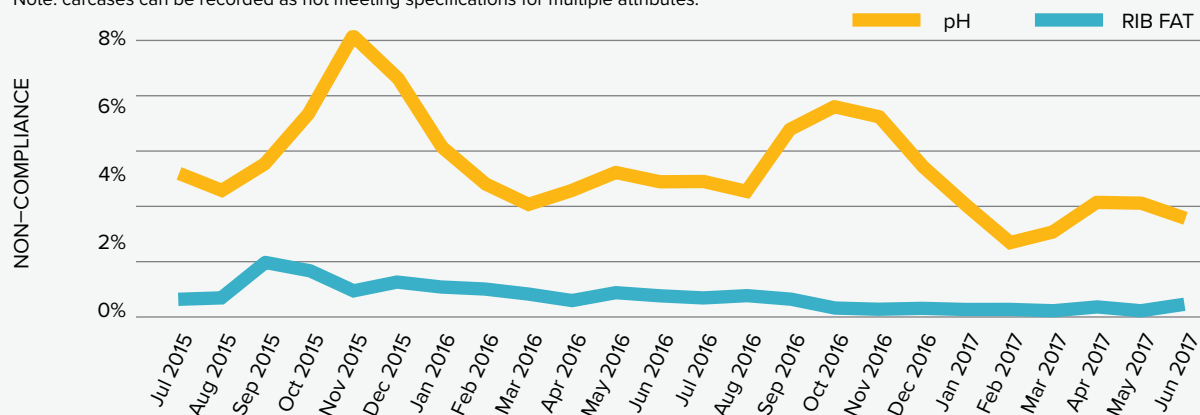


Figure 45 (page 30) shows the number of cattle consigned from Western Australia per month throughout 2015-17 and the corresponding percentage of non-compliance. Western Australia recorded 6.2% non-compliance to the MSA minimum requirements, with a strong non-compliance trend emerging from late spring to late summer.

Figure 46 illustrates that the elevated levels of non-compliance are a result of high pH levels. Non-compliance to fat coverage requirements is consistently low throughout the year.

In comparison to the national distribution, a larger proportion of cattle in Western Australia had MSA Index values greater than 60. The two distinct peaks in the Western Australia distribution graphs are likely to be representing HGP treatments.

FIGURE 47 2015-17 WESTERN AUSTRALIA MSA INDEX DISTRIBUTION

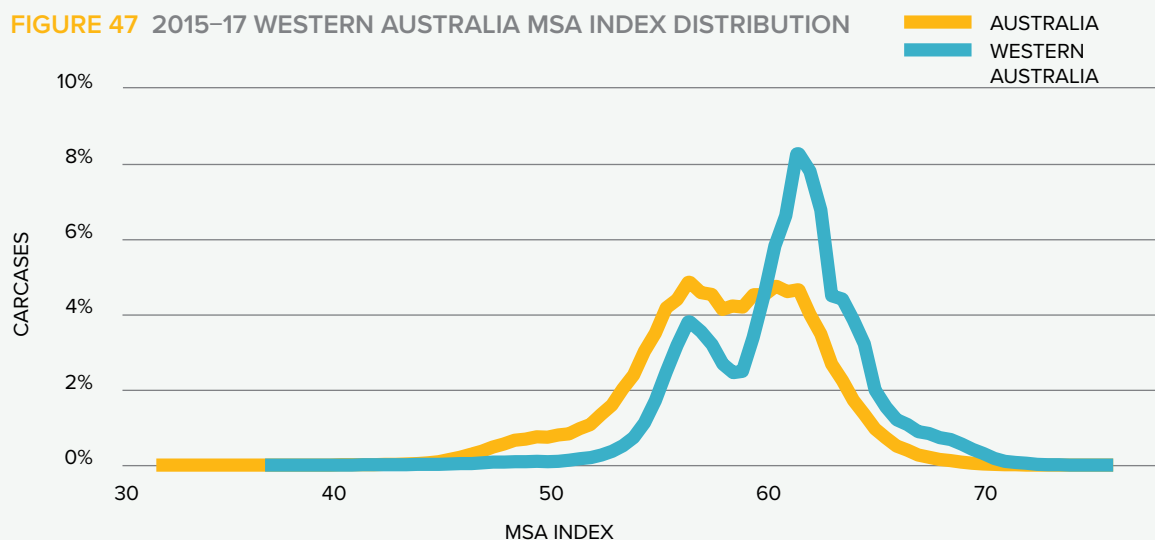


TABLE 12 CARCASS ATTRIBUTES OF MSA CARCASSES IN WEST AUSTRALIA IN 2015-17

STAT	CARCASS WEIGHT (KG)	HUMP HEIGHT (MM)	OSSIFICATION	MSA MARBLING	RIB FAT (MM)	MSA INDEX
Top 5%	359	45	110	490	16	66.19
Average	273	60	150	360	9	60.25
Bottom 5%	211	85	180	270	3	54.43

TASMANIA

MSA CATTLE PRODUCED
IN TASMANIA IN 2015–17:

51% male

100% HGP free

99% grassfed

Cattle produced in Tasmania represented 4% of all MSA-graded cattle in Australia in 2015–17. 10% of MSA-registered beef producers reside in Tasmania, equating to 4,366 registered beef producers. In 2015–17 more than 2,070 of these producers consigned MSA cattle.

246,940 cattle were MSA graded in Tasmania in 2015–17 (Figure 48), representing 62% of the state's adult cattle slaughter for the same period. Figure 49 shows there has been a 13% increase in the proportion of MSA-graded cattle in Tasmania since 2010–11.

FIGURE 48 MSA GRADING IN TASMANIA

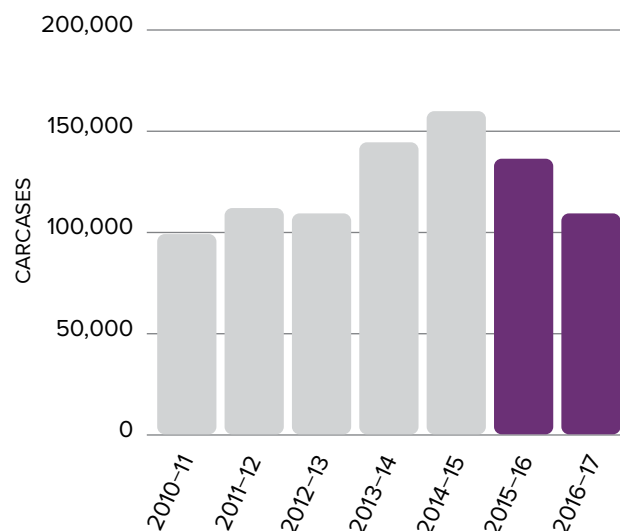


FIGURE 49 PROPORTION OF TASMANIA ADULT CATTLE SLAUGHTER PRESENTED FOR MSA GRADING

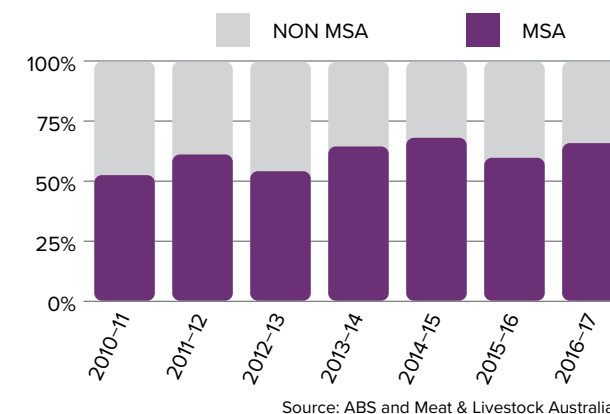


FIGURE 50 MONTHLY NON-COMPLIANCE TO MSA SPECIFICATIONS OF CATTLE PRODUCED IN TASMANIA THROUGHOUT 2015–17

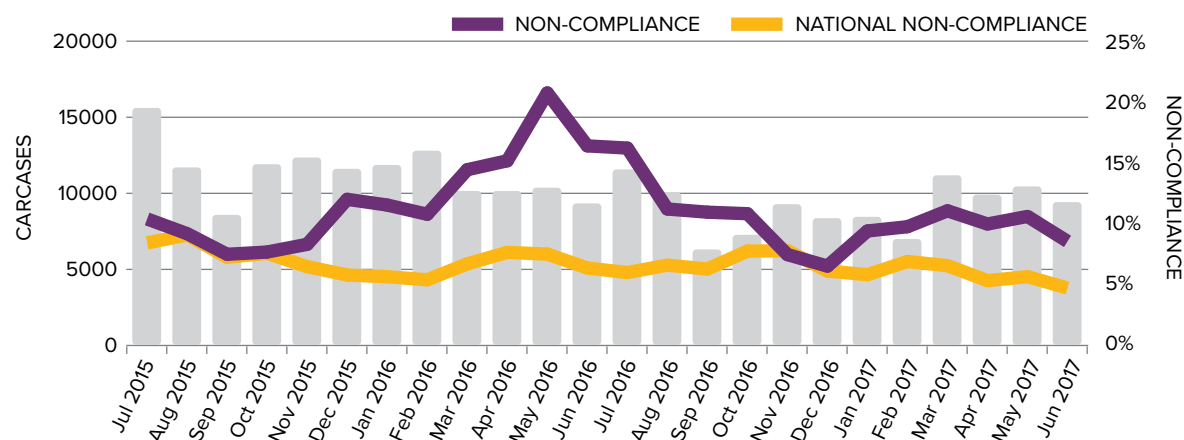
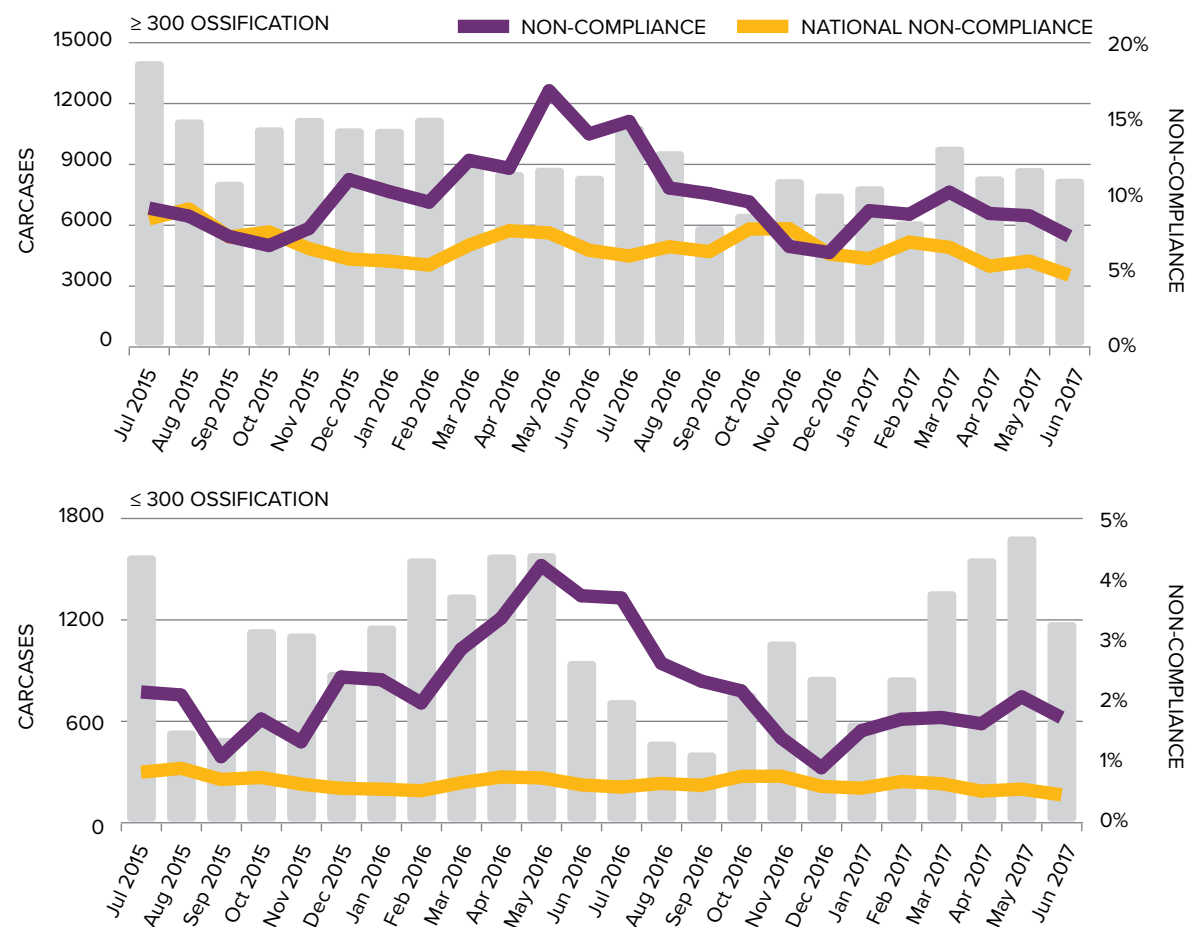


FIGURE 51 MONTHLY NON-COMPLIANCE TO MSA SPECIFICATIONS OF CATTLE PRODUCED IN TASMANIA THROUGHOUT 2015-17 BY OSSIFICATION SCORE



Unique to Tasmania, a much larger proportion of the state's MSA-graded cattle is made up of older female animals. The MSA Model has the ability to accurately predict the eating quality of these animals and identify opportunities to extract value from these cattle types. For the purpose of this report, these animals have been defined as having an ossification score of more than 300 and as such comprises 10.3% of the state's MSA-graded animals.

Figure 50 shows MSA non-compliance by month of all cattle produced in Tasmania throughout 2015-16 and 2016-17. The chart shows the number of cattle consigned per month and the corresponding percentage of non-compliance.

Figure 51 shows the non-compliance to MSA specifications for cattle below and above an ossification score of 300:

- 22% of cattle with ossification scores greater than 300 did not meet the MSA minimum requirements
- This is in comparison to 10% of cattle with ossification scores less than or equal to 300 that did not meet MSA minimum requirements. This difference between the groups was consistent across all months

TABLE 13 MSA INDEX PERCENTILE BANDS FOR TASMANIA

	BOTTOM 1%	BOTTOM 5%	BOTTOM 10%	BOTTOM 25%	TOP 50%	TOP 25%	TOP 10%	TOP 5%	TOP 1%
≤ 300 OSSIFICATION	54.66	56.93	57.85	59.26	60.79	62.35	63.93	65.02	66.93
≥ 300 OSSIFICATION	44.81	46.22	47.01	48.72	51.02	54.01	56.52	58.03	60.90
NATIONAL	46.32	49.61	52.17	55.02	57.81	60.61	62.53	63.72	66.19

The critical times of year when non-compliance was elevated were the same for each group, being late autumn and early winter.

Figure 52 shows the non-compliance for all Tasmanian cattle to the MSA minimum requirements by month and identifies that pH is the main contributor to non-compliance. The reasons for non-compliance were consistent between the younger and older cattle groups.

In comparison to the national distribution, a larger proportion of cattle in Tasmania had MSA Index values greater than 60 and a tighter range of MSA Index values.

Within the two cattle populations in Tasmania, the average MSA Index for cattle with ossification greater than 300 was 51.02 compared to 57.81 for the younger group.



FACT

Ossification is a measure of physiological maturity of the beef carcass. As an animal matures, cartilage present around bones gradually fills with blood and develops into bone.

Tasmanian data has been separated into 'above 300 ossification' and 'below ossification 300' categories due to a higher proportion of animals with an ossification score above 300 compared to other states.

FIGURE 52 MONTHLY NON-COMPLIANCE TO MSA SPECIFICATIONS OF CATTLE PRODUCED IN TASMANIA THROUGHOUT 2015-17

Note: carcasses can be recorded as not meeting specifications for multiple attributes.

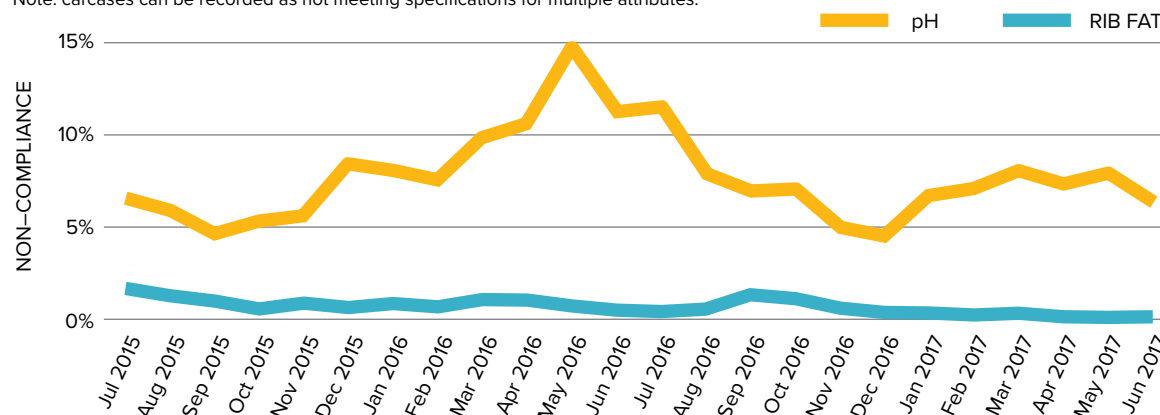


FIGURE 53 MSA INDEX PERFORMANCE OF CATTLE PRODUCED IN TASMANIA BY OSSIFICATION SCORE

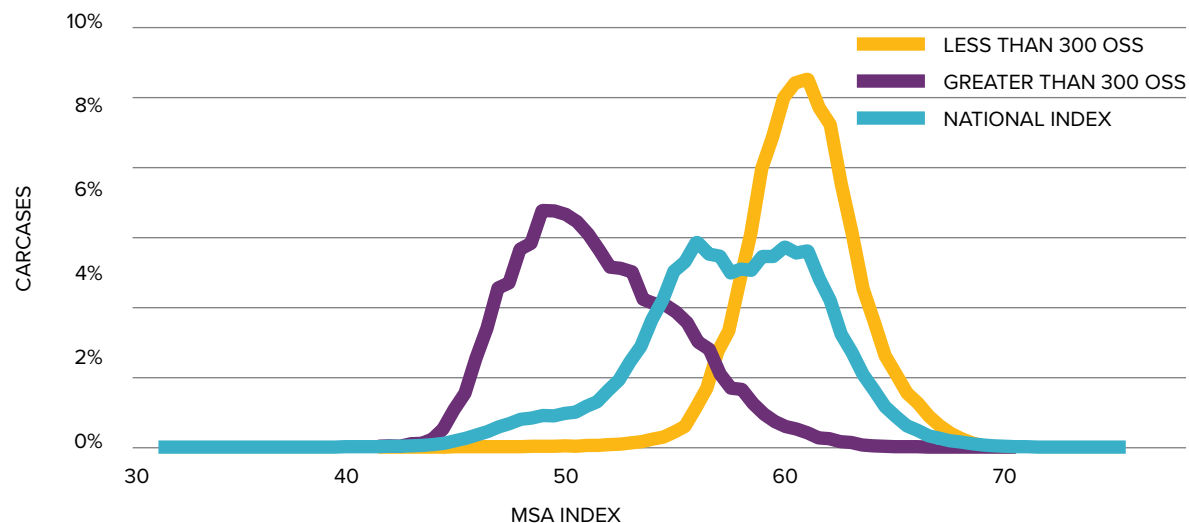


TABLE 14 CARCASS ATTRIBUTES OF ALL MSA CATTLE PRODUCED IN TASMANIA 2015-17

STAT	CARCASS WEIGHT (KG)	HUMP HEIGHT (MM)	OSSIFICATION	MSA MARBLING	RIB FAT (MM)	MSA INDEX
Top 5%	392	30	110	520	15	64.07
Average	298	50	160	350	8	59.37
Bottom 5%	227	75	200	210	3	53.80



**EATING QUALITY BENCHMARKS
FOR MSA-GRADED CATTLE**

EATING QUALITY BENCHMARKS FOR MSA-GRADED CATTLE

How to identify my performance ranking and opportunities for improvement

The following tables are summaries of all attributes impacting on the MSA Index, distinguished by feed type and hormonal growth promotant (HGP) treatment groups. They should allow an individual producer to identify their current performance among a category of similar carcasses. The tables provide insight into the improvement in a producer's MSA Index performance within a herd.

Example:

- Grassfed producer
- Produces steers for MSA
- Does not use HGPs
- During 2015–17 had an average MSA Index of 61, ranking them in the 50% percentile band
- They want to get into the top 25% or are aiming to meet a specification of a minimum MSA Index of 62

In this scenario, a key factor to improving the MSA Index score is to increase marbling, with slight increases of fat coverage and carcass weight for the same ossification scores.

BENCHMARK TABLE 1 ATTRIBUTES OF HGP-FREE, GRASSFED OR NON-FEEDLOT CATTLE

SEX	BAND	MSA INDEX	CARCASS WEIGHT (KG)	HUMP HEIGHT (MM)	OSSIFICATION	MSA MARBLING	RIB FAT (MM)
FEMALE	Bottom 1%	46.29	255	90	530	260	7
MALE	Bottom 1%	51.53	297	130	180	220	5
FEMALE	Bottom 5%	50.23	271	70	470	290	7
MALE	Bottom 5%	53.60	306	120	160	260	6
FEMALE	Bottom 10%	53.09	270	85	320	300	8
MALE	Bottom 10%	55.25	307	110	150	280	6
FEMALE	Bottom 25%	56.74	256	70	210	280	7
MALE	Bottom 25%	58.29	301	80	150	280	6
FEMALE	Middle 50%	59.02	257	55	170	310	7
MALE	Middle 50%	60.35	300	60	140	320	7
FEMALE	Top 25%	60.79	261	50	150	370	8
MALE	Top 25%	61.91	304	55	130	380	8
FEMALE	Top 10%	62.25	263	50	150	420	9
MALE	Top 10%	63.44	307	60	130	440	9
FEMALE	Top 5%	63.28	264	50	150	470	10
MALE	Top 5%	64.50	308	60	130	510	10
FEMALE	Top 1%	65.44	246	50	140	510	12
MALE	Top 1%	67.40	262	60	110	470	11

BENCHMARK TABLE 2 ATTRIBUTES OF HGP-FREE, GRAINFED CATTLE

SEX	BAND	MSA INDEX	CARCASS WEIGHT (KG)	HUMP HEIGHT (MM)	OSSIFICATION	MSA MARBLING	RIB FAT (MM)
FEMALE	Bottom 1%	51.92	246	120	220	260	7
MALE	Bottom 1%	52.91	274	135	160	250	6
FEMALE	Bottom 5%	54.66	240	105	180	270	7
MALE	Bottom 5%	55.59	280	120	150	290	7
FEMALE	Bottom 10%	55.95	241	85	170	280	7
MALE	Bottom 10%	57.26	275	95	150	280	7
FEMALE	Bottom 25%	57.74	244	70	160	270	7
MALE	Bottom 25%	59.50	278	70	140	280	6
FEMALE	Middle 50%	59.35	252	60	160	310	7
MALE	Middle 50%	61.48	308	60	140	350	8
FEMALE	Top 25%	60.93	268	55	150	370	9
MALE	Top 25%	63.26	329	65	130	440	10
FEMALE	Top 10%	62.39	278	55	150	420	10
MALE	Top 10%	64.83	341	65	130	520	11
FEMALE	Top 5%	63.46	298	60	150	530	13
MALE	Top 5%	65.80	356	70	130	630	12
FEMALE	Top 1%	65.96	357	70	160	790	22
MALE	Top 1%	67.67	379	70	130	820	15

BENCHMARK TABLE 3 ATTRIBUTES OF HGP-TREATED, GRASSFED OR NON-FEEDLOT CATTLE

SEX	BAND	MSA INDEX	CARCASE WEIGHT (KG)	HUMP HEIGHT (MM)	OSSIFICATION	MSA MARBLING	RIB FAT (MM)
FEMALE	Bottom 1%	44.08	258	105	470	280	7
MALE	Bottom 1%	45.14	287	140	230	210	5
FEMALE	Bottom 5%	49.34	254	105	220	280	7
MALE	Bottom 5%	47.04	300	130	200	250	6
FEMALE	Bottom 10%	51.87	255	80	180	290	7
MALE	Bottom 10%	48.51	306	125	180	280	7
FEMALE	Bottom 25%	54.18	259	55	170	300	7
MALE	Bottom 25%	52.37	311	100	170	290	7
FEMALE	Middle 50%	55.64	264	50	160	340	9
MALE	Middle 50%	55.20	293	65	150	320	7
FEMALE	Top 25%	56.79	268	50	150	400	10
MALE	Top 25%	56.59	289	60	140	370	9
FEMALE	Top 10%	58.02	268	50	140	420	10
MALE	Top 10%	57.98	284	60	130	400	10
FEMALE	Top 5%	58.77	270	50	140	470	11
MALE	Top 5%	59.09	276	60	130	440	11
FEMALE	Top 1%	60.38	267	55	140	520	13
MALE	Top 1%	61.32	262	60	110	460	12

BENCHMARK TABLE 4 ATTRIBUTES OF HGP-TREATED, GRAINFED CATTLE

SEX	BAND	MSA INDEX	CARCASE WEIGHT (KG)	HUMP HEIGHT (MM)	OSSIFICATION	MSA MARBLING	RIB FAT (MM)
FEMALE	Bottom 1%	45.04	256	135	250	240	6
MALE	Bottom 1%	45.74	307	150	220	220	5
FEMALE	Bottom 5%	47.80	264	130	190	290	7
MALE	Bottom 5%	47.69	320	145	190	280	6
FEMALE	Bottom 10%	49.97	270	110	180	300	7
MALE	Bottom 10%	49.12	332	135	180	310	7
FEMALE	Bottom 25%	53.11	276	80	180	300	7
MALE	Bottom 25%	52.65	337	105	170	310	8
FEMALE	Middle 50%	54.97	275	60	170	340	8
MALE	Middle 50%	54.96	331	70	170	340	8
FEMALE	Top 25%	56.31	274	50	150	380	9
MALE	Top 25%	56.54	354	65	170	420	10
FEMALE	Top 10%	57.43	280	50	150	420	9
MALE	Top 10%	57.82	367	65	170	460	11
FEMALE	Top 5%	58.28	276	50	140	430	8
MALE	Top 5%	58.63	386	65	170	530	12
FEMALE	Top 1%	59.47	290	50	140	520	10
MALE	Top 1%	60.19	403	70	180	660	13

USEFUL FURTHER RESOURCES

MSA tips and tools

To assist producers to achieve their desired MSA Index score, MLA has developed the *Tips & Tools Meat Standards Australia Beef Information Kit*.

Opposite are a list of the individual titles.

To access this tool visit www.mla.com.au/msa.

MSA Index calculator

Use the MSA Index Calculator to see the impact of on-farm changes on the MSA Index at

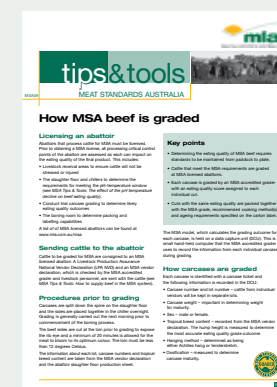
www.mysa.com.au/msamobile



Tips & Tools Meat Standards Australia Beef Information Kit.

- MSA01 What is MSA?
- MSA02 How MSA grades are determined
- MSA03 MSA requirements for handling cattle
- MSA04 How to supply beef in the MSA system
- MSA05 The effect of tropical breeds on beef eating quality
- MSA06 The effect of ossification on beef eating quality
- MSA07 The effect of marbling on beef eating quality
- MSA08 The effect of pH on beef eating quality
- MSA09 How MSA beef is graded
- MSA10 The effect of the pH-temperature decline on beef eating quality
- MSA11 How tenderstretch affects beef eating quality
- MSA12 How ageing affects beef eating quality
- MSA13 The effect of cooking on beef eating quality
- MSA14 Fat distribution and eating quality
- MSA15 Selling cattle through an MSA saleyard
- MSA16 The effect of growth promotants on beef eating quality
- MSA17 Maximising eating quality with tropical breed cattle
- MSA18 Using the MSA Index to optimise beef eating quality

All MSA Tips & Tools are available at www.mla.com.au/msa



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