



2023

# AUSTRALIAN BEEF EATING QUALITY INSIGHTS

Delivering consumer  
confidence in eating quality





Meat Standards Australia (MSA) was developed by the Australian red meat industry to improve the eating quality consistency of beef and sheepmeat. The system is based on almost 1.7 million consumer taste tests by more than 250,000 consumers from 13 countries, and takes into account all factors that affect eating quality from the paddock to plate.



Meat & Livestock Australia (MLA) supports MSA program participants through creating opportunities for businesses to adopt eating quality principles.



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## Meat Standards Australia



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MLA acknowledges the matching funds provided by the Australian Government to support the research and development detailed in the *MSA Australian Beef Eating Quality Insights*.

# Introduction

The **2023 Australian Beef Eating Quality Insights (ABEQI)** report is generated from the analysis of **Meat Standards Australia (MSA)** grading results of 6.33 million cattle, processed and graded through **39 MSA licenced processors nationally** during the 2021–22 and 2022–23 financial years.

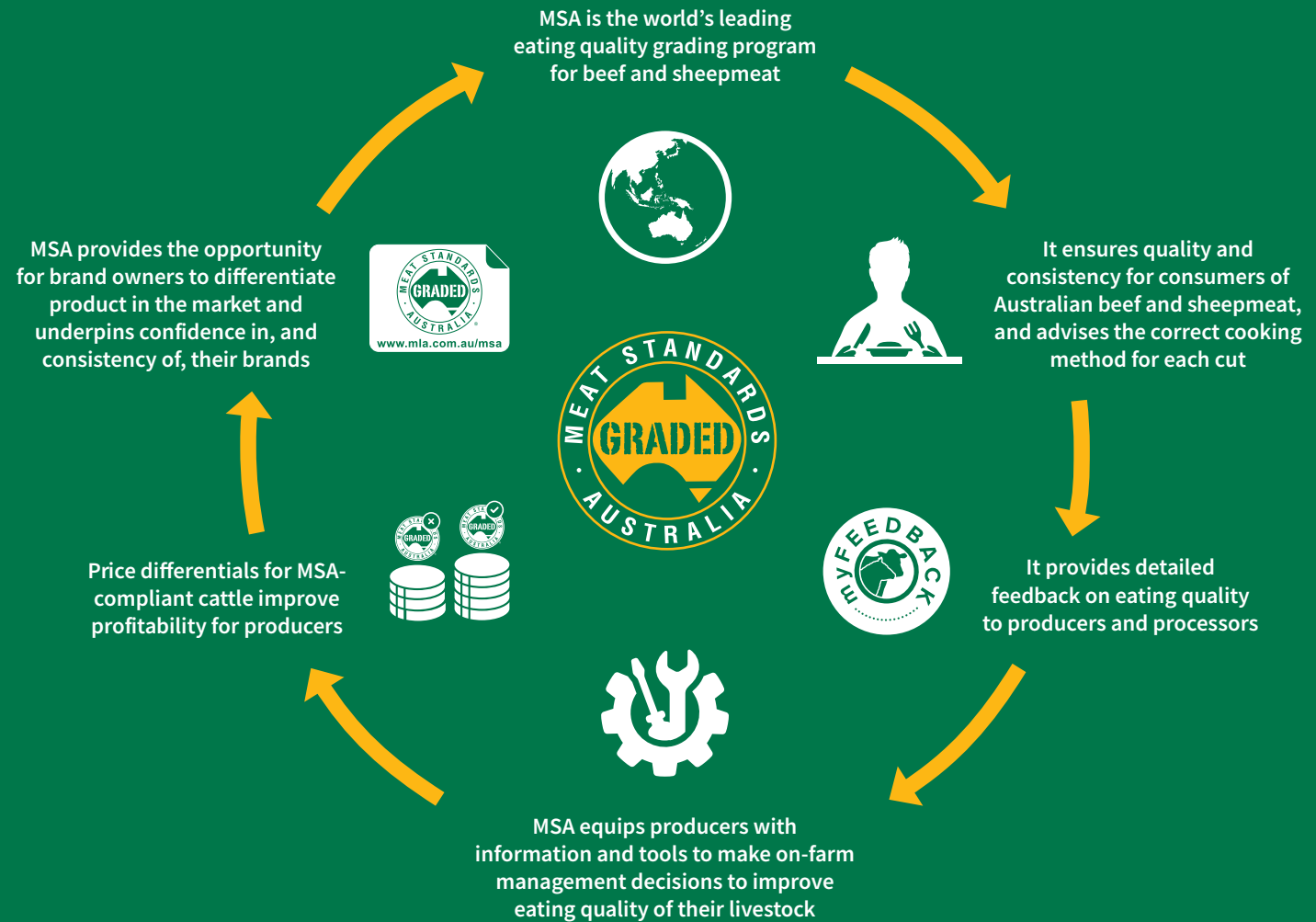
After the introduction of the MSA Index in 2014, the *Australian Beef Eating Quality Audit* was published and every two years since, *The Australian Beef Eating Quality Insights* has been reporting on benchmarking.

This report aims to help beef producers optimise the eating quality of their cattle by demonstrating the impact of various production factors on the MSA Index and enables the Australian beef industry to measure its improvements and identify areas where further gains can be made.

The 2023 report reflects the ongoing improvements MSA registered producers are making to raise the eating quality of their cattle and ultimately, meet consumer expectations. The average MSA Index in 2021–23 is 57.45, a decrease from the 2019–21 average of 57.69.

MSA graded cattle continue to represent more than half of the national adult cattle slaughter, comprising 54% at 30 June 2023 for the 2022–23 financial year.

This report also includes information on lean meat yield (LMY%) and insights relating to animal disease and defect impacts on the MSA Index, and ultimately, eating quality.



# Performance snapshot 2021-23



**\$463 million**

farm gate returns over the past two years

(\$204 million in 2021-22 and \$259 million in 2022-23)



**40,754**

MSA registered beef producers



**6.64 million**

head of cattle presented for MSA grading

(Figure 1)



**39**

MSA licenced beef processors



**57.45**

average MSA Index

(2021-23)



**54%**

of the national adult cattle slaughter that was MSA graded

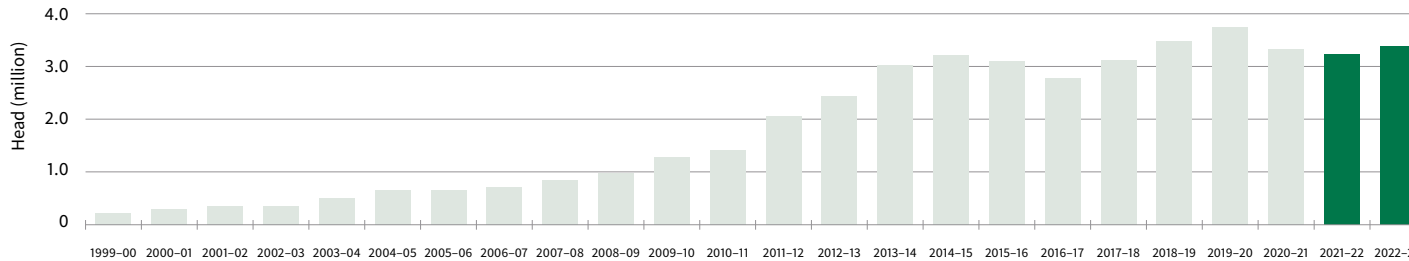
(2021-23)



**194**

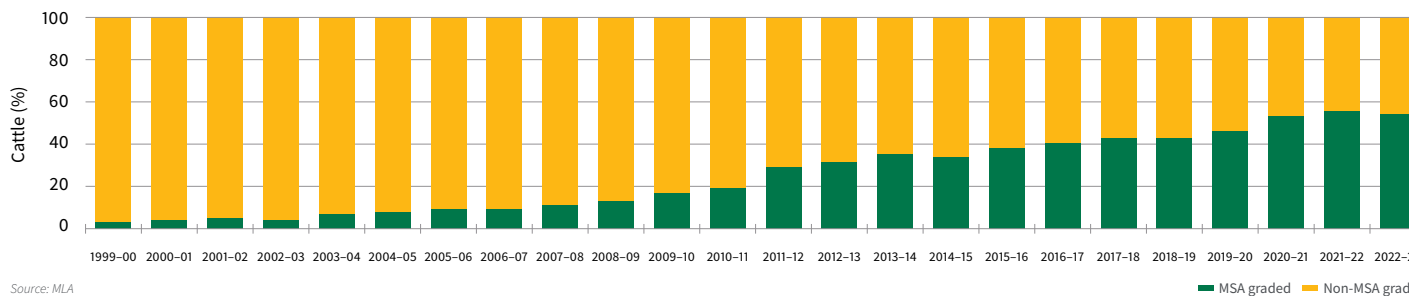
MSA licenced beef brands

**Figure 1:** Number of MSA graded cattle – national



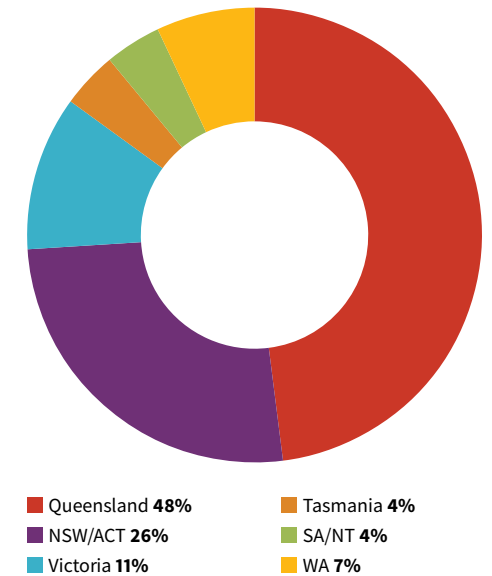
Source: MLA

**Figure 2:** Australian adult cattle slaughter



Source: MLA

**Figure 3:** Proportion of MSA graded cattle by state



Queensland 48%  
 NSW/ACT 26%  
 Victoria 11%  
 Tasmania 4%  
 SA/NT 4%  
 WA 7%

# Using this report

## Methodology

This report was generated through the analysis of all MSA graded cattle in the 2021–22 and 2022–23 financial years using data collected by MSA-accredited graders, along with additional data from sources such as the National Livestock Reporting Service and further information such as animal disease and defects.

All data analysis related to the MSA Index outcomes are based on the location of the MSA-registered property that the cattle were consigned from, rather than the location of the processor.

This method was chosen to give a more accurate indication of state-based production opportunities and challenges.

From July 2021 to June 2023 inclusive, 6.64 million cattle were presented for MSA grading. Based on MSA requirements, carcasses which meet the minimum specifications receive an MSA Index score. This report uses the MSA Index scores of 6.33 million compliant carcasses.

## Why benchmarking is important

Benchmarking is the process of measuring performance, as an industry or individual business, with the objective to identify opportunities for improvement. It provides producers with the ability to identify strengths and weaknesses within their business, enabling them

to make informed decisions and to better meet customer specifications.

The benchmarking data presented in this report, tools available on myMSA and, myFeedback platform allow producers to:

- measure and compare current compliance and eating quality performance
- identify key drivers of eating quality to inform on-farm decisions, for example, genetic selection.

## myFeedback

MLA has developed a system which brings together data from multiple sources into one single login for producers, processors and brand owners.

myFeedback combines the functionality of Integrity System Company's (ISC) Livestock Data Link (LDL) with MSA's myMSA benchmarking system, bringing together carcass, eating quality and disease and defect data.

myFeedback is available to all producers with linked LPA property identification codes (PICs) to their myMLA account. Additionally, there are options to add associate users to your own account, such as farm employees, agents, advisors, and veterinarians.

Animal disease and defect information will only be available from participating processors.



**From July 2021 to June 2023 inclusive, 6.33 million cattle of 6.64 million presented for grading, were MSA compliant.**

# Setting eating quality benchmarks with the MSA Index

## What is the MSA Index?

The MSA Index is a number between 30 and 80 expressed to two decimal places and is a weighted average of the predicted MSA eating quality scores of 39 cuts in a carcass.

The MSA Index is a standard measure of the predicted eating quality and potential merit of a whole carcass, and is calculated using only attributes influenced by pre-slaughter production.

It reflects the impact of management, environmental and genetic differences between cattle at the point of slaughter and can be used across all processors, geographic regions and over time.

The MSA Index is calculated

for all carcasses that meet minimum MSA requirements (refer to page 9). It is calculated once grading is completed.

## The value of supplying MSA cattle

In many instances, processors and brand owners offer financial incentives for meeting minimum MSA compliance and eating quality specifications.

In 2021–23, non-grainfed cattle that met MSA and company requirements, potentially received on average an additional \$0.36/kg over-the-hooks (OTH) compared with non-MSA cattle.

The average non-grainfed cattle consigned for MSA grading

in 2021–23 weighed 306.0kg, which potentially equated to an additional \$110 per head.

Likewise, the premium for grainfed cattle that met MSA and company requirements, received an additional \$0.15/kg compared with non-MSA grainfed cattle.

Average grainfed cattle consigned for MSA grading in 2021–23 weighed 347.0kg, which potentially equated to an additional \$51 per head.

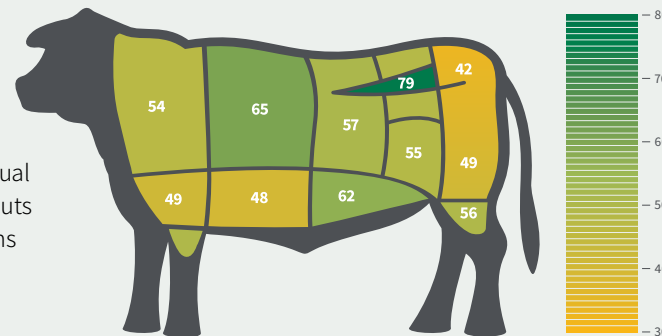
Premiums for MSA compliant cattle, combined with growing numbers of cattle being MSA graded, and increasing carcass weights, have resulted in record estimated farm gate returns of \$204 million in 2021–22 and \$259 million in 2022–23.

Figure 4: Understanding the MSA Index

# 57.45

The numbers on each muscle illustrate the individual predicted eating quality scores for each of the 39 cuts across the carcass. Improving the MSA Index means the eating quality scores of each cut also improve.

Illustration is for example purposes only.



## Non-grainfed – MSA graded

# \$0.36/kg

 over the hooks

potential additional income received for young non-grainfed MSA cattle compared to non-MSA cattle.

# \$110

potential additional income per head for young non-grainfed MSA cattle with an average weight of 306kg.

## Grainfed – MSA graded

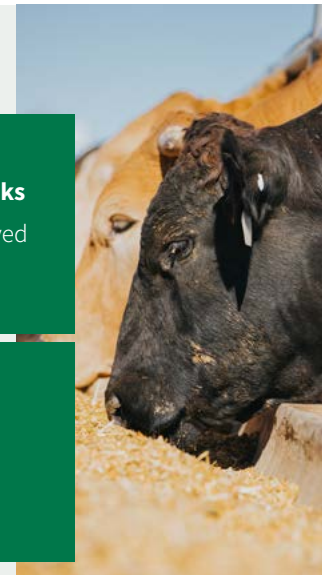
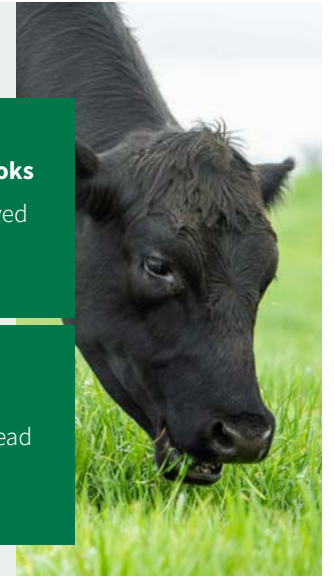
# \$0.15kg

 over the hooks

potential additional income received for grainfed MSA cattle compared to non-MSA grainfed cattle.

# \$51

potential additional income per head for grainfed MSA cattle with an average weight of 347kg.





**Table 1:** Effects of carcass attributes on the MSA Index

Carcass input	Effect on the MSA Index (units)	Clarification of effect	Relative importance of these traits in changing the MSA Index*
HGP status	5.00	The MSA Index of carcasses with no HGP implant is about five index units higher	Very high
Milk-fed vealer	4.00	The MSA Index of milk-fed vealer carcasses is about four index units higher	Very high
Saleyard	5.00	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	0.70	As hump height increases by 10mm, the MSA Index decreases by about 0.70 units	High
Ossification score	0.60	As ossification score increases by 10, the MSA Index decreases by 0.60 index units	High
Rib fat	0.10	As rib fat increases by 1mm, the MSA Index increases by 0.10 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	0.30	With low ossification values, females have a higher index value than steers by about 0.30 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.



# Current Australian eating quality performance

## The average MSA Index for 2021–23 was 57.45.

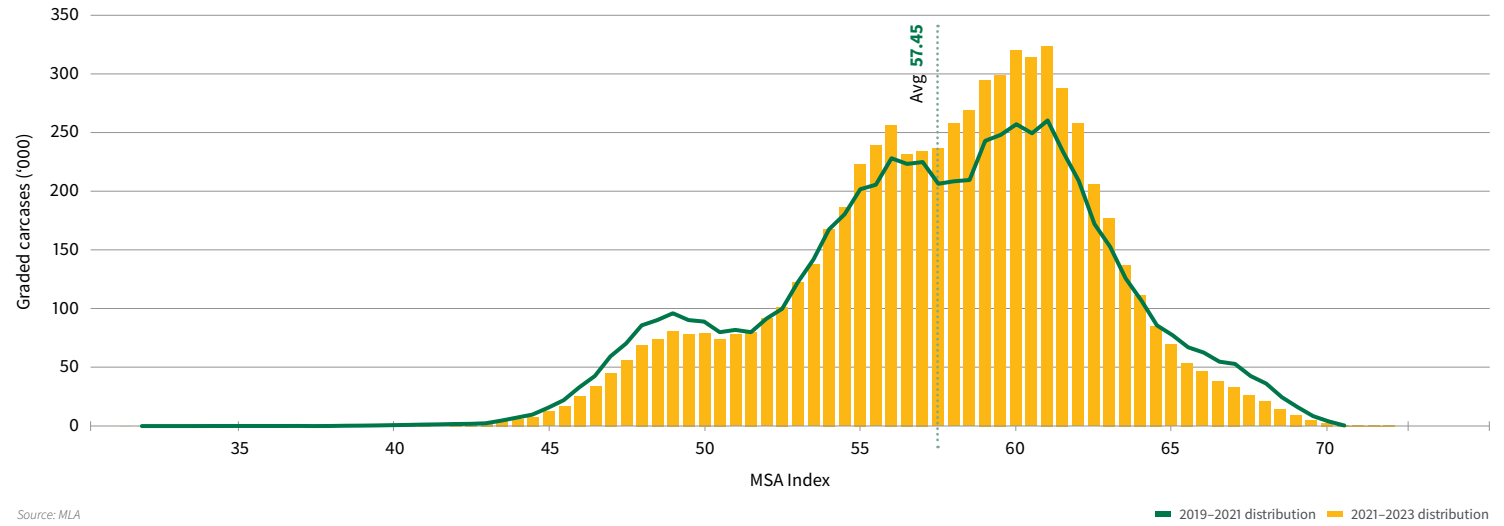
**Figure 5** shows the national distribution of the MSA Index for MSA graded carcasses throughout 2021–23. MSA Index values from the 6.33 million MSA-compliant carcasses ranged from 31.00 to 73.50. The distribution of the grey bars shows the proportion, or number, of carcasses relative to the MSA Index received over 2021–23. The green line shows the comparative distribution observed in the previous two financial years (2019–21).

The three peaks in the MSA Index distribution as seen on **Figure 5** and **Figure 7**, are indicative of the different populations and can be attributed to a range of on-farm management interventions and carcass traits including, but not limited to, the impact of hormonal growth promotants (HGPs), marbling, ossification, and hump height.

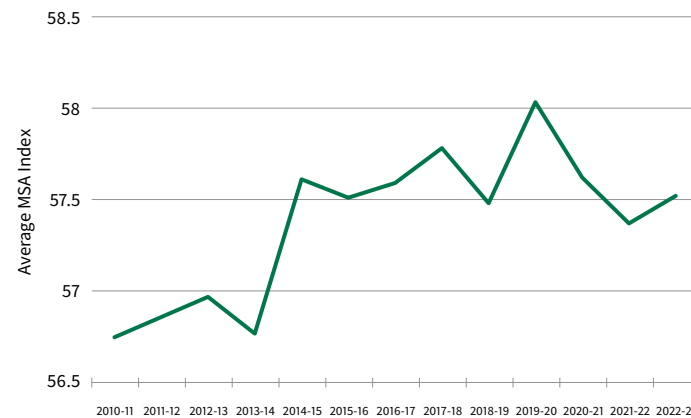
The average MSA Index of the national herd has improved by approximately one index point since 2010–11 (**Figure 6**).

This improvement is reflective of changes in on-farm management and genetic decisions.

**Figure 5:** National MSA Index distribution 2021–23



**Figure 6:** Change in national MSA Index since 2010–11



**Table 2:** Carcass attributes of all MSA graded carcasses 2021–23

	Top 5%	Average	Bottom 5%
Carcass weight (kg)	441.5	330.3	237.8
Hump height (mm)	45	80	150
Ossification	120	180	300
MSA marbling	650	370	210
Rib fat (mm)	18	9	3
Lean meat yield (%)	62.9	58.5	51.7

# Benchmarking individual MSA Index performance

This report ranks carcasses by percentile bands, from the bottom 1% to the top 1%, to allow producers to benchmark how their cattle are performing against others in their state.

## What are the MSA Index percentile bands?

The MSA Index percentile bands provide an indication of an individual's MSA Index performance relative to the performance of others (Table 3). For example, an average MSA Index greater than 63.81 places a herd in the top 10% of producers in Australia for eating quality performance (Figure 7). Understanding the specific carcass attributes that determine the MSA Index, and ultimately the performance indicated by the percentile band, provides producers with the tools to improve their herd's performance. These attributes by state and production system can be found in the individual state analyses.

### What is the difference between median MSA Index and average MSA Index?

The median MSA Index is the middle value of the population, which is the same as the top 50% value.

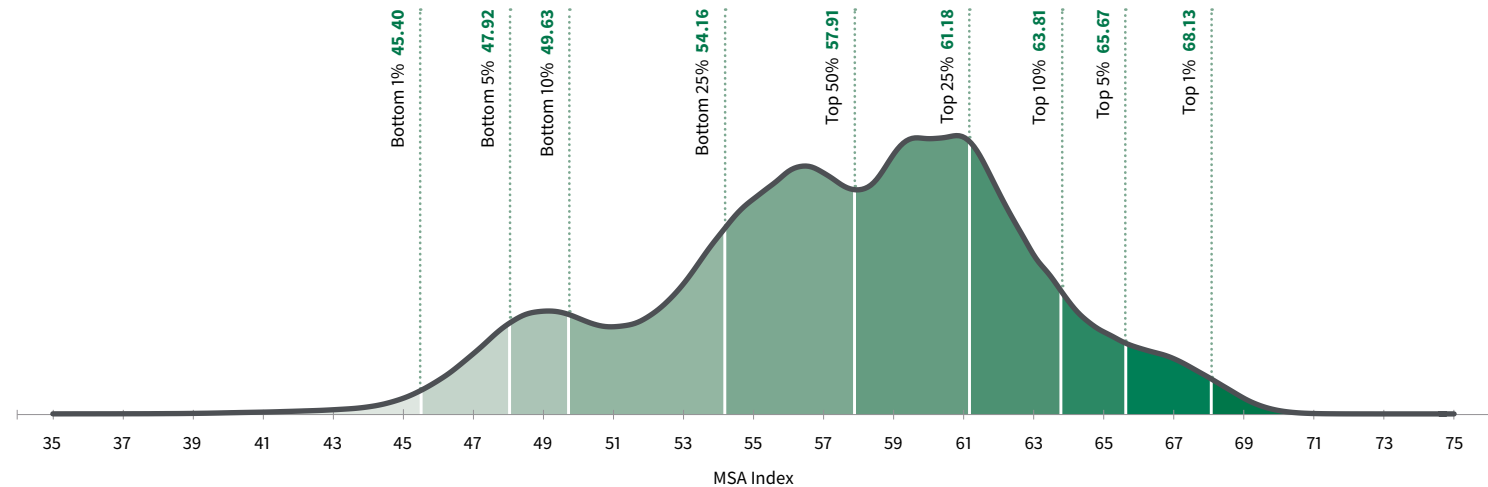
The average MSA Index is the mean or average of the population.



Table 3: National MSA Index percentile bands by state 2021–23

	Top 1%	Top 5%	Top 10%	Top 25%	Top 50%	Bottom 25%	Bottom 10%	Bottom 5%	Bottom 1%
NSW/ACT	68.13	66.15	64.64	62.03	59.35	56.58	54.50	52.90	48.21
QLD	68.31	65.47	62.47	58.51	54.98	50.91	48.04	46.87	44.46
SA/NT	67.59	65.76	64.57	62.68	61.00	58.93	56.16	54.17	47.56
TAS	66.35	64.55	63.58	62.09	60.43	58.40	55.61	53.48	49.03
VIC	67.55	65.19	63.93	62.09	60.30	58.10	55.05	53.49	49.64
WA	68.27	65.82	64.14	62.18	60.50	58.78	55.90	54.69	51.31
TOTAL	68.13	65.67	63.81	61.18	57.91	54.16	49.63	47.92	45.40

Figure 7: The distribution of national MSA Index percentile bands 2021–23



# MSA compliance

## In 2021–23, 95.3% of carcasses met the MSA minimum requirements.

The primary reason for non-compliance was high ultimate pH (greater than or equal to 5.71), followed by inadequate rib fat depth (less than 3mm of rib fat). **Figure 8** illustrates the reasons for non-compliance by month for the two-year period.

At both a national and a state level, variation in compliance observed across the year is driven predominantly by non-grainfed systems that are impacted by seasonal variation.

NSW/ACT achieved the highest overall compliance at 97.2%, followed by SA/NT at 97.1% and Victoria at 97.0% compliance to MSA minimum requirements, followed closely by WA at 95.8% and Tasmania with 94.5%. Queensland had the lowest MSA compliance rate of 93.9%.

There was a small improvement in national compliance in 2021–23 of 95.3% representing an 0.4% increase on the 2019–21 compliance rate of 94.9%.

Compliance to MSA minimum requirements

is influenced by a variety of factors including nutrition and handling pre-slaughter.

Grainfed cattle have an inherently higher compliance to MSA minimum requirements due to the consistent, high-energy ration they are fed leading up to slaughter.

**Figure 9** also shows that cattle treated with hormonal growth promotants (HGPs) have a higher rate of compliance compared to those without (96.8% and 94.3% respectively).

The majority of HGP-treated cattle are also grainfed cattle, which have a higher average rate of compliance to MSA minimum requirements, compared to non-grainfed cattle (97.9% and 91.4% respectively).

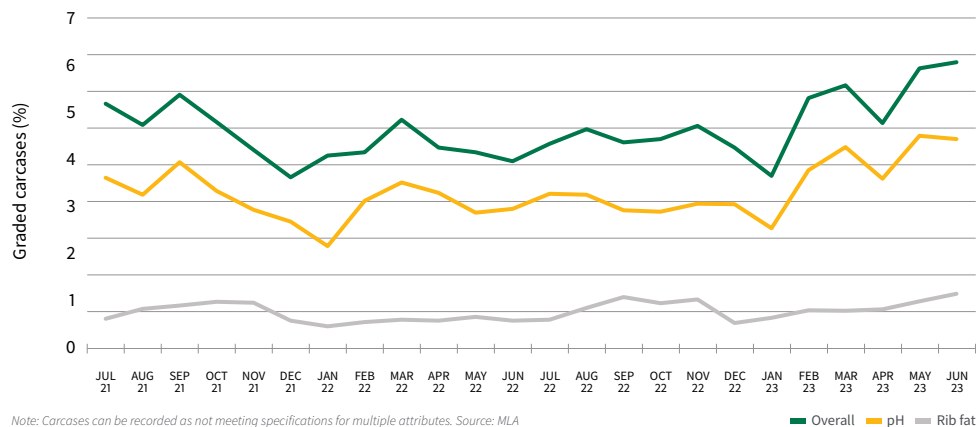
Females had a lower compliance at 93.6% compared to males at 96.1%. One of the factors affecting non-compliance by finishing system may be sex. Only 24% of MSA graded grainfed cattle are female, while 45% of non-grainfed cattle are female. Females in oestrous are also more susceptible to high ultimate pH due to extra pre-slaughter activity and stress.

### MSA minimum requirements

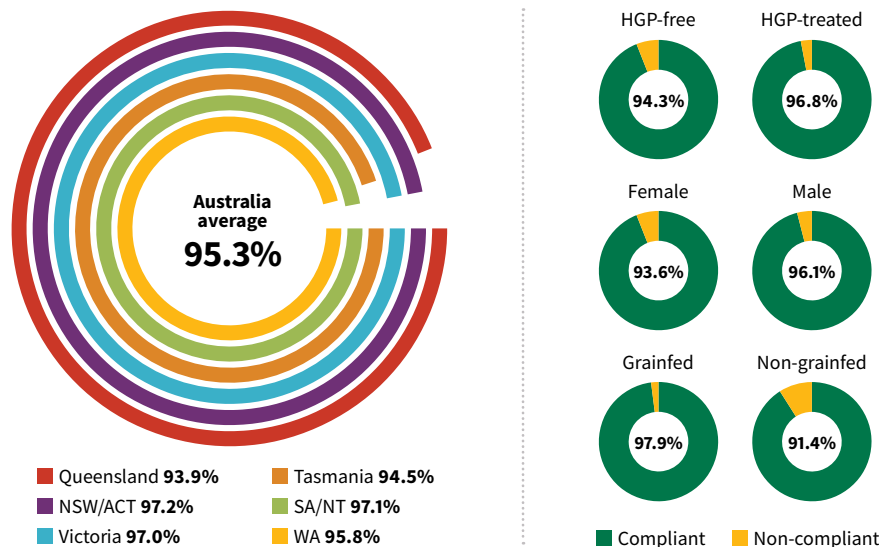
To be eligible for an MSA Index score, MSA graded carcasses must have:

- ✓ Met MSA pre-slaughter requirements
- ✓ pH less than 5.71
- ✓ Minimum rib fat of 3mm
- ✓ Adequate fat coverage over major primals.

**Figure 8:** National non-compliance by attribute 2021–23



**Figure 9:** Compliance to MSA minimum requirements by state and production variables (HGP, sex and feed type) 2021–23



# Lean meat yield

Lean meat yield (LMY%) is the proportion of a carcass that is lean meat (muscle) as opposed to fat or bone and is expressed as a percentage.

LMY% is calculated with a predictive equation using hot standard carcass weight (HSCW) and rib fat depth.

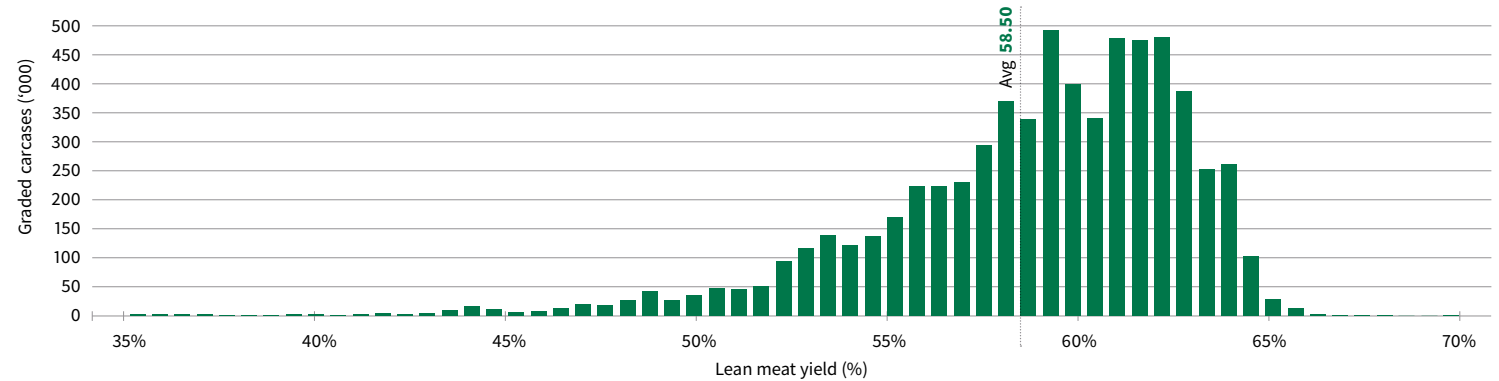
Research has shown that there is a minor negative relationship between LMY% and eating quality, therefore it is important for producers to balance factors which impact these outcomes. Producers can manage LMY% through genetics and on-farm management such as nutrition.

**Figure 10** shows the national distribution of LMY%, which had an average of 58.5 LMY%.

In 2021–23, non-grainfed MSA graded carcasses averaged 59.5 LMY% and grainfed MSA graded carcasses averaged 57.9 LMY%.

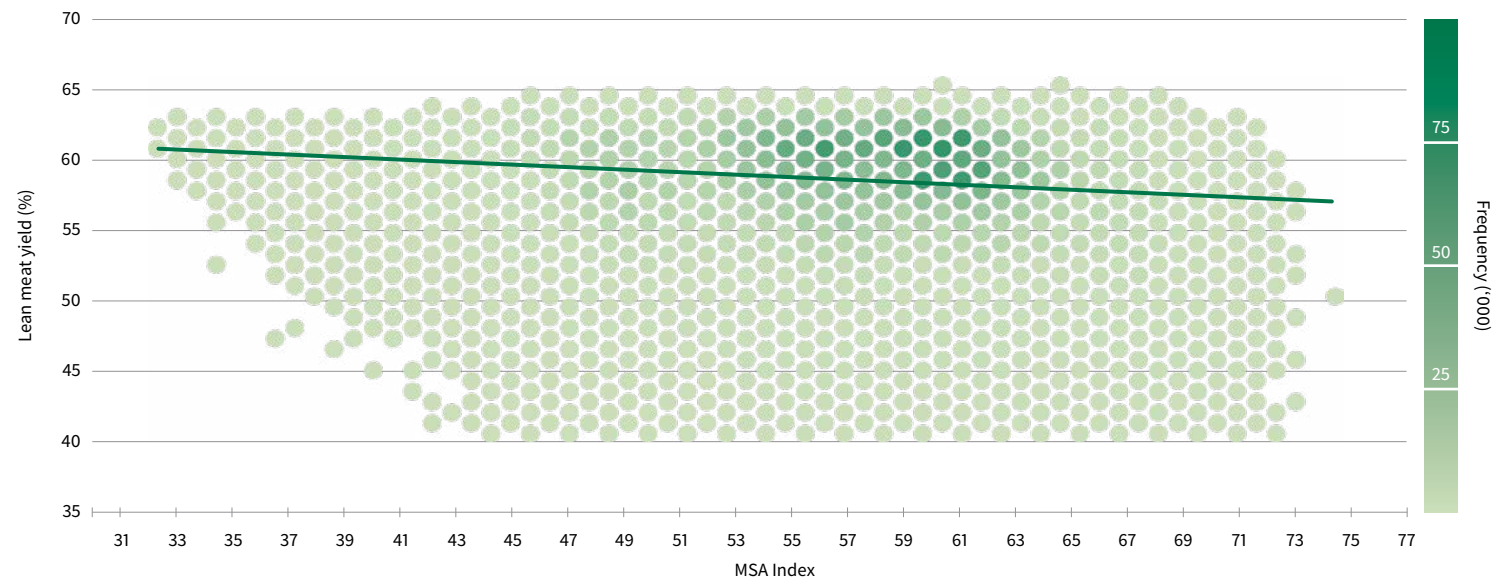
**Figure 11** shows the national MSA Index by LMY%. There is a minor trend, whereby as MSA Index increases, LMY% decreases. The darker green area on the graph indicates where a higher number of cattle lie for LMY% and MSA Index.

**Figure 10:** National distribution of lean meat yield (%) 2021–23



Source: MLA

**Figure 11:** National MSA Index by lean meat yield (%) 2021–23



Source: MLA

— The relationship between MSA index and LMY% for MSA-graded carcasses 2021–2023

# Animal disease and defect impacts

In addition to providing eating quality and carcass traits, the myFeedback platform provides disease and defect data. Beef producers have the ability to investigate seasonal trends as well as analyse data by production traits and disease incidence – a disease or defect within a carcass or organs from a specified list of diseases.

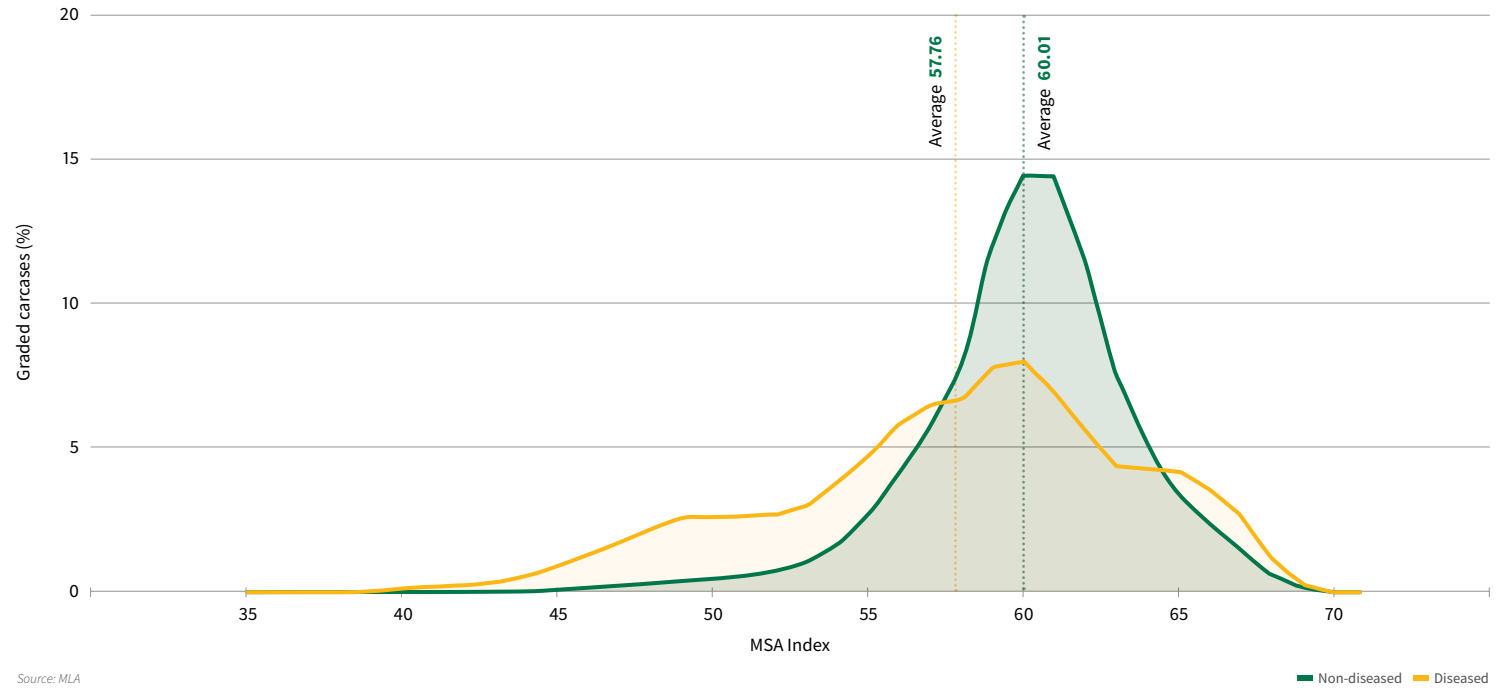
This information provides clarity on potential lost opportunity costs to farm gate associated with disease. Animal disease and defect information is only available from participating processors.

Disease status impacted MSA Index, with cattle classified as non-diseased found to have a higher average MSA Index compared to diseased cattle (**Figure 12**).

Based on data from five processors, 280,000 non-diseased cattle had an average MSA Index over 60, representing 85% compared to 90,000, representing 15% diseased cattle.

- The average MSA Index for diseased cattle was 57.76.
- The average MSA Index for non-diseased cattle was 60.01.
- Of all cattle with a MSA Index of equal to or greater than 60.00, 75% came from non-diseased cattle.

**Figure 12:** MSA Index by disease status 2021–23



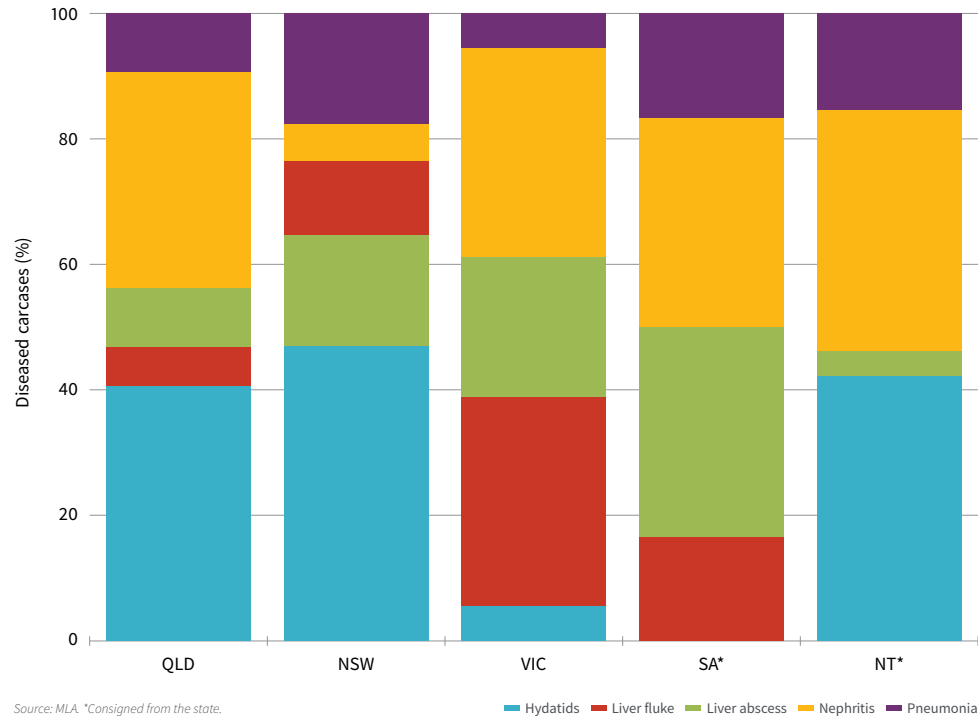
Based on the available data, 78% of grainfed carcasses assessed in Queensland were classified as non-diseased compared to 41% of non-grainfed cattle. Nephritis was the prominent health condition for Queensland grainfed cattle (7%) while hydatids was the prominent health condition for non-grainfed cattle (48%).

In New South Wales, 90% of grainfed cattle were non-diseased compared to 88% of non-grainfed cattle. For grainfed, the most prominent health condition was pneumonia (4%), while for non-grainfed carcasses, the highest disease incidence was hydatids (6%).

In Victoria, 99% of grainfed cattle were non-diseased, while 87% of non-grainfed were non-diseased. The main health condition for non-grainfed cattle was nephritis (5%).

It should be noted that no processing plants in South Australia and Western Australia are supplying animal disease and defect data, and incidences in **Figure 13** for SA and NT are from cattle consigned from the state.

**Figure 13:** Proportion of disease or defect condition for diseased cattle by state 2021–23



**Table 4:** Average MSA Index by disease incidence, feed type and sex 2021–23

Diseased			
	Grainfed		Non-grainfed
Female	59.97	Female	52.69
Male	59.57	Male	59.57

Non-diseased			
	Grainfed		Non-grainfed
Female	60.33	Female	58.91
Male	60.29	Male	60.81

**Table 4** shows the average MSA Index by disease status, feed type and sex. Male diseased cattle were 0.7 and 1.2 MSA Index points lower than non-diseased, for grainfed and non-grainfed respectively. Diseased female cattle were 0.4 to 6.2 MSA Index points lower, for grainfed and non-grainfed respectively. The large difference for non-grainfed female cattle may be attributed to a greater proportion of older cattle consigned as cull cows therefore showing a greater incidence of liver fluke and hydatids, evidenced as active or inactive cases of the disease at inspection.





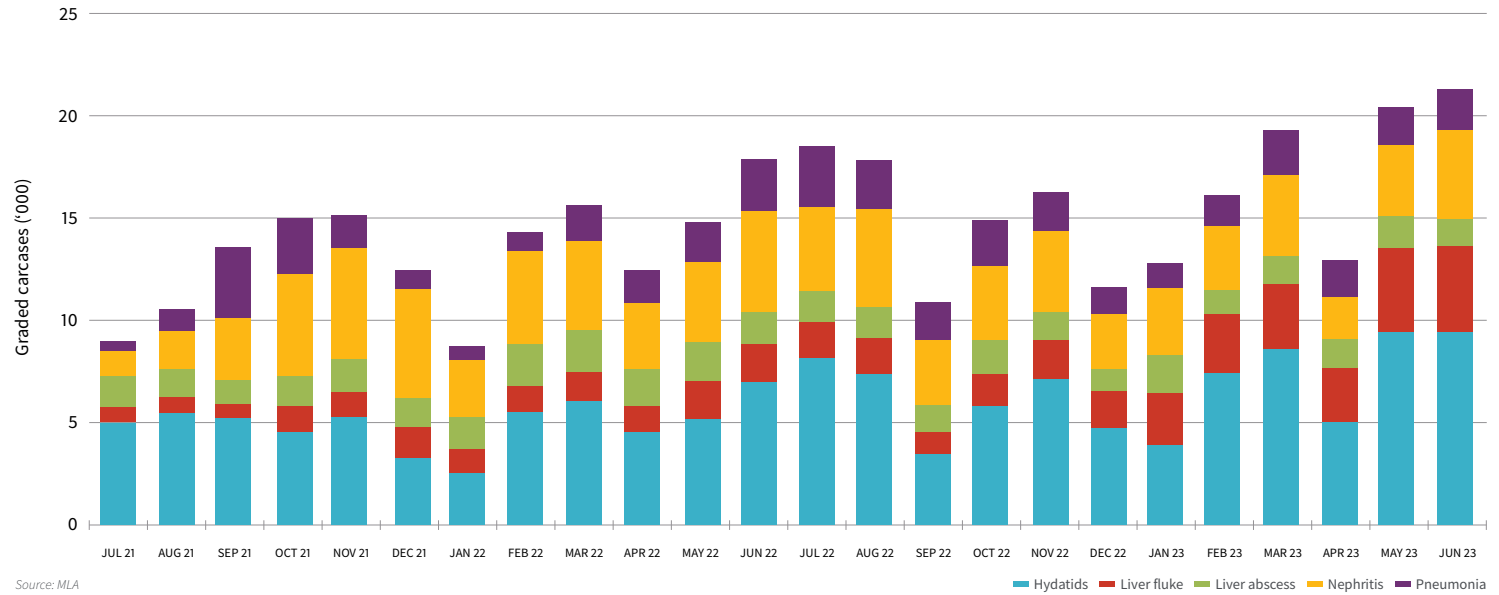
**Disease spotlight: Hydatids**

The prevalence of hydatids varies around the country. Tasmania and South Australia had little or no hydatid disease while other states tend to have regions often associated with poor control in farm dogs, the presence of wild dogs, and to a lesser extent, foxes and other at risk intermediate hosts such as kangaroos or pigs.

Based on the disease and defect information, which represents approximately 20% of the national slaughter, the incidence of hydatids in Queensland has increased from 11% to 13% and NSW has increased from 5% to 8% within this most recent two-year period (2021–2023), compared to the period covered by the 2021 ABEQI, (2019–2021).

■ **More information about treating and managing hydatids and other diseases can be found in Solutions to Feedback, accessed through myFeedback or directly via the MLA website.**

**Figure 14:** Monthly disease and defect incidence 2021–2023



Source: MLA

**Table 5:** Average costs of potential lost opportunities by disease or defect condition per carcass

Nephritis	Liver fluke	Pneumonia	Liver abscess	Hydatids
\$0.62	\$4.14	\$3.75	\$4.33	\$5.97

Figures in **Table 5** are derived from the MLA Co-products monthly report based on offal value from the processors. The values are calculated by offal weight (averaged for carcass weight) multiplied by lost opportunity cost for disease incidence and averaged across the total number of cattle.

**Benchmarking carcass performance**

For more information about the disease or defect conditions and how to manage these conditions on-farm, visit the Solutions to Feedback library:

🔗 [solutionstofeedback.mla.com.au](https://solutionstofeedback.mla.com.au)

Register for myFeedback to access your data from a select number of participating processors. Registration will require a linked LPA PIC account to your myMLA account.

For further information or assistance with myFeedback, contact [myfeedback@mla.com.au](mailto:myfeedback@mla.com.au)

🔗 [mla.com.au/myfeedback](https://mla.com.au/myfeedback)



# MSA performance by feed type

## Effect of feed type on MSA performance

In 2021–23, 60% of MSA graded cattle were identified as grainfed (Figure 15). For the purposes of MSA data, grainfed cattle are defined as those that were lot fed at a registered National Feedlot Accreditation Scheme (NFAS) feedlot and met the Australian grainfed beef standards. Non-grainfed cattle are defined as cattle derived from any production system that did not meet the grainfed standards.



In 2021–23, cattle on feed for a minimum of 100 days (100–149 days), presented the largest number of cattle for MSA grading of the grainfed proportion, at a over 2.3million carcasses. Queensland had the largest proportion of grainfed cattle supplied through the MSA program at 73%, while Tasmania had no accredited grainfed cattle as the state is a pasture-based production system (Figure 16). Approximately 5.5 million cattle were finished in Australian NFAS feedlots during 2021–23. Of these, 73% were MSA graded.

## MSA compliance by feed type

Compliance to MSA minimum requirements differs between feed type. In 2021–23, 97.9% of MSA graded grainfed carcasses were MSA compliant, compared to 91.4% of non-grainfed carcasses. The result for non-grainfed carcasses is an improvement in compliance of 0.9% from 2019–21. Figure 17 illustrates the non-compliance by month for each feed type. Grainfed cattle had consistently higher compliance rates, averaging around 2% non-compliance across the 2021–23 period, whereas non-grainfed cattle had higher and variable non-compliance rates throughout the period due to seasonal impacts on pasture availability and quality.

Figure 15: Proportion of non-grainfed vs grainfed 2021–23

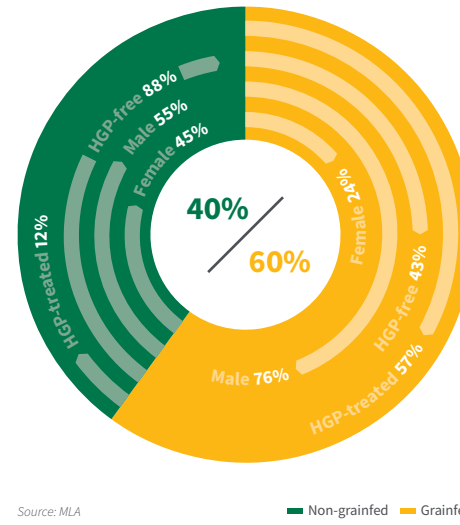


Figure 16: Proportion of non-grainfed and grainfed carcasses by state 2021–23

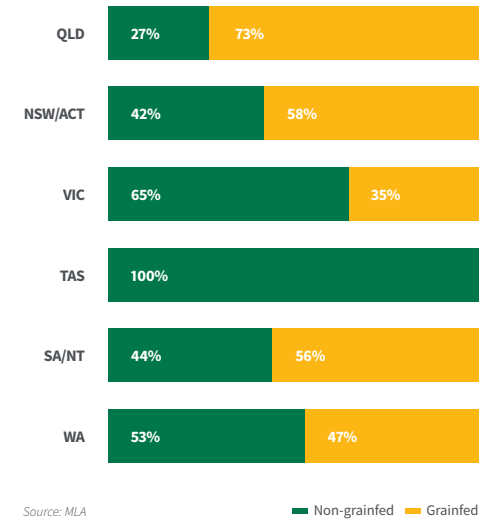
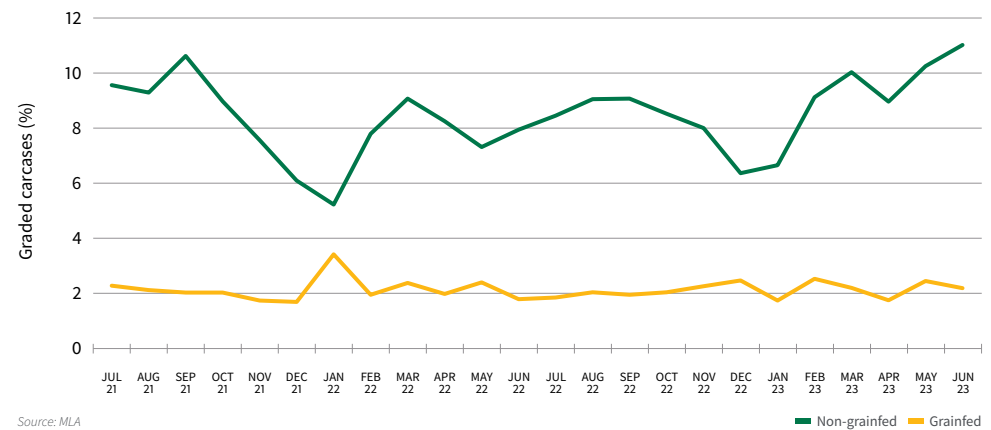
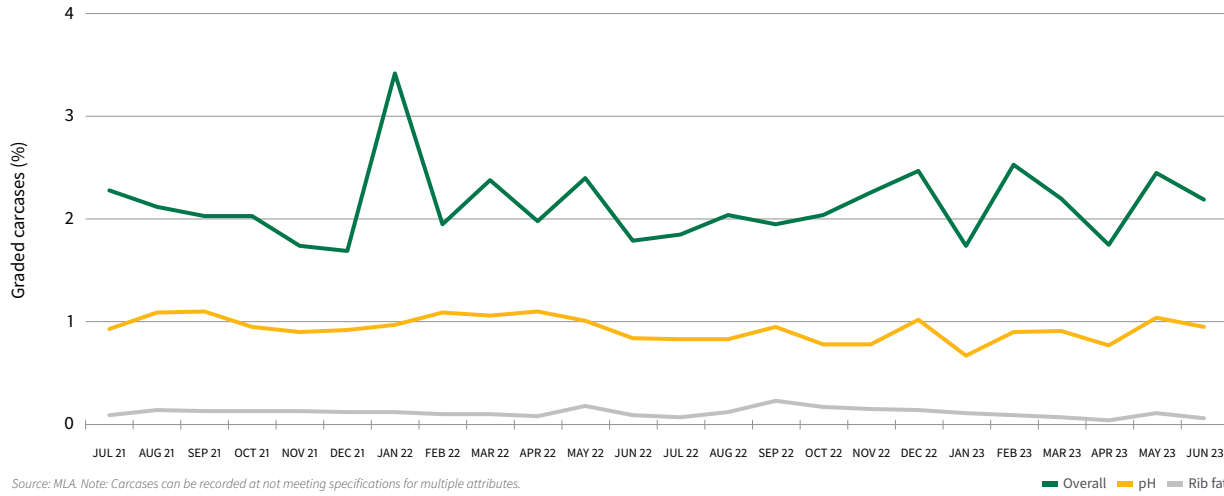


Figure 17: National MSA non-compliance by feed type 2021–23

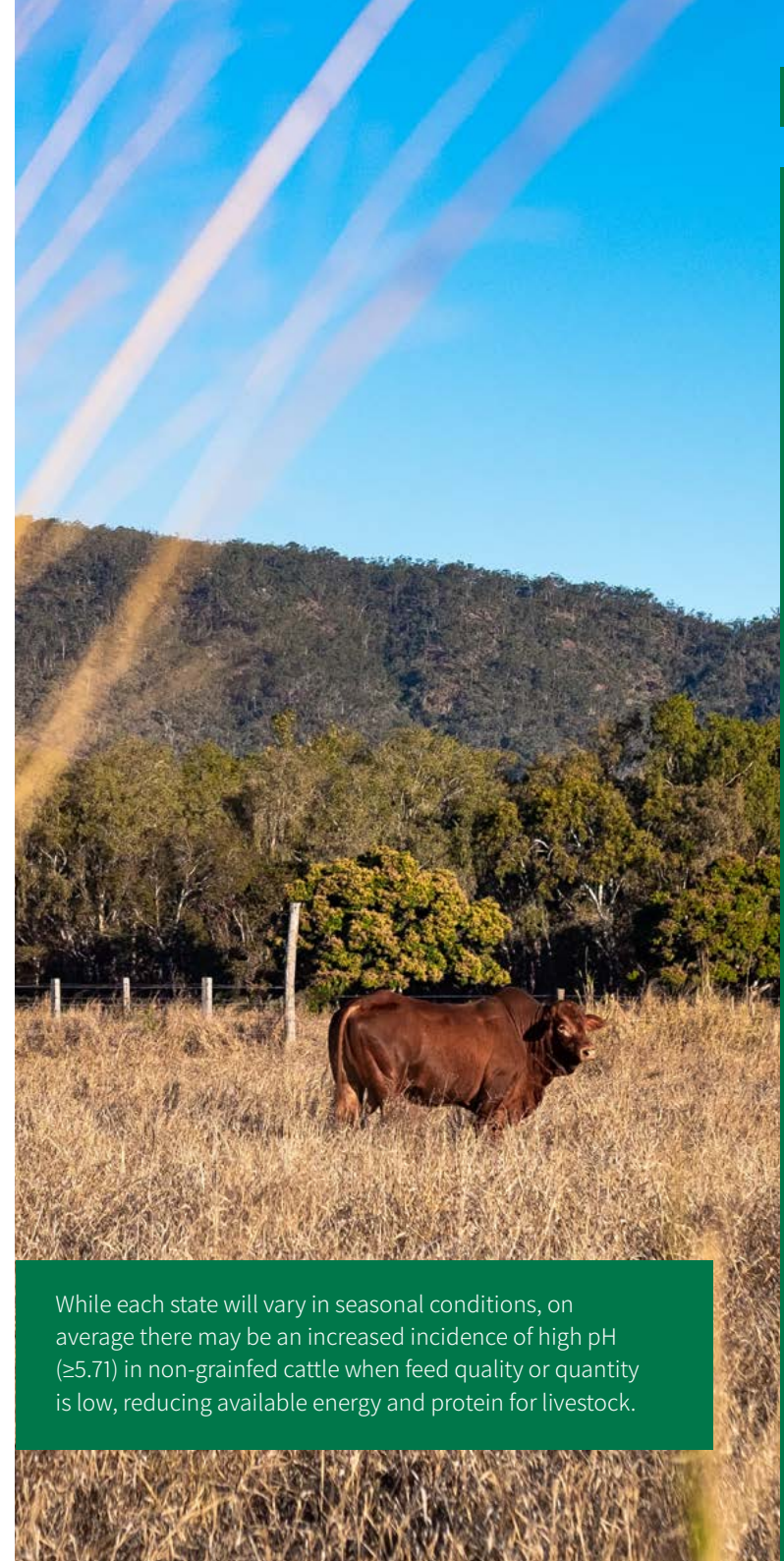
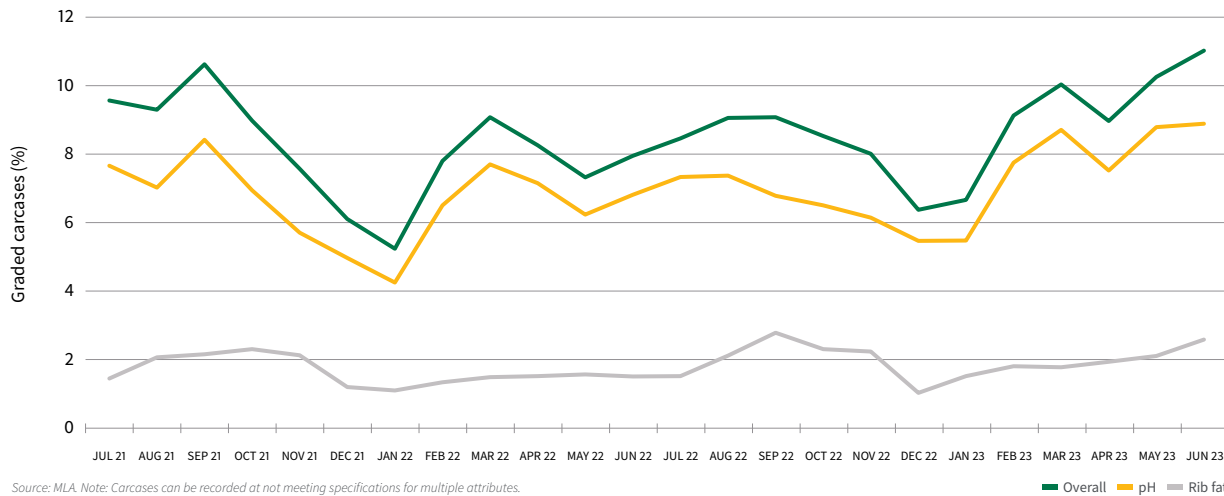




**Figure 18:** Reasons for non-compliance for grainfed cattle 2021–23



**Figure 19:** Reasons for non-compliance for non-grainfed cattle 2021–23



While each state will vary in seasonal conditions, on average there may be an increased incidence of high pH ( $\geq 5.71$ ) in non-grainfed cattle when feed quality or quantity is low, reducing available energy and protein for livestock.

### Effect of feed type on MSA Index

On average in 2021–23, grainfed carcasses were 40kg heavier than non-grainfed carcasses, with lower ossification scores. Grainfed carcasses had both higher average MSA marbling scores and a greater range, compared to non-grainfed carcasses.

The average MSA Index for non-grainfed cattle was 57.90, which is 0.61 points higher than the average MSA Index of 57.29 for grainfed cattle.

The average MSA Index for non-grainfed cattle decreased by 0.30 from 2019–21, while the average MSA Index for grainfed cattle increased 0.40 points from 2019–21.

As seen in **Figure 20**, both feed types have slightly different population distributions. Non-grainfed cattle consist of a higher proportion of cattle spread across a smaller range in MSA Index compared to grainfed cattle, where there are three key peaks similar to the national distribution. These peaks are likely to be attributed to HGP usage, and differences in key drivers in eating quality such as ossification and marbling.

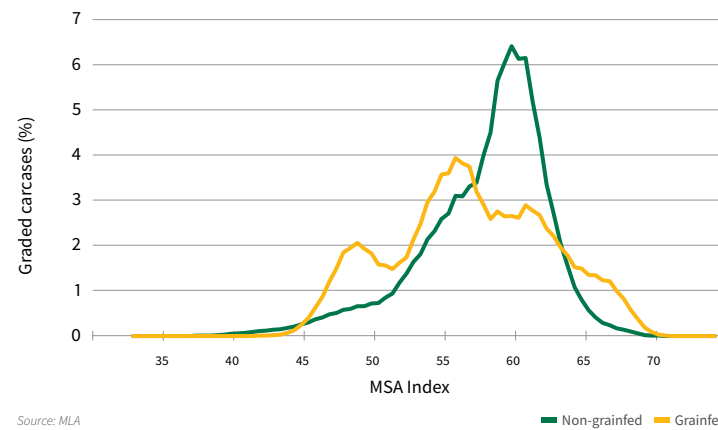
**Table 6:** Carcase attributes, lean meat yield (%) and MSA Index of all MSA graded carcasses by feed type 2021–23 (all traits are independent of each other)

	Grainfed			Non-grainfed		
	Top 5%	Average	Bottom 5%	Top 5%	Average	Bottom 5%
<b>Carcase weight (kg)</b>	455.0	346.7	246.0	403.2	307.1	231.0
<b>Hump height (mm)</b>	45	85	160	40	70	125
<b>Ossification</b>	120	170	230	120	190	500
<b>MSA marbling</b>	750	400	220	530	350	200
<b>Rib fat (mm)</b>	19	10	4	15	8	3
<b>EMA (cm<sup>2</sup>)</b>	98	79	62	89	73	56
<b>Lean meat yield (%)</b>	62.5	57.9	50.6	63.0	59.3	53.6
<b>MSA Index</b>	66.48	57.06	47.71	63.88	58.08	48.93

**Table 7:** MSA Index percentile bands by feed type 2021–23

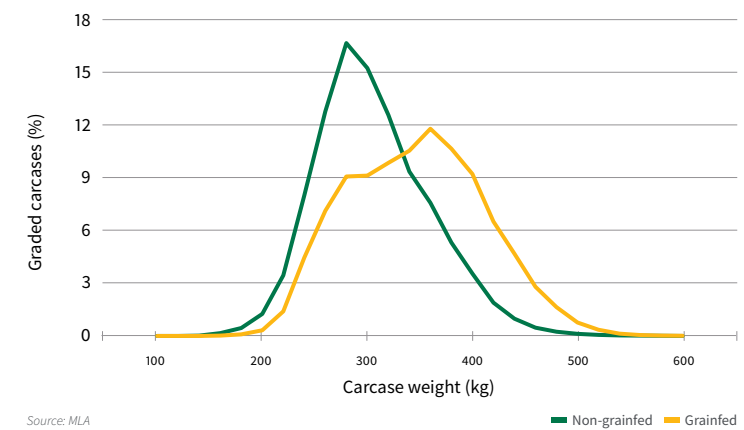
	Grainfed	Non-grainfed
Top 1%	68.48	66.33
Top 5%	66.48	63.88
Top 10%	64.68	62.78
Top 25%	61.29	61.10
Top 50%	56.92	59.07
Bottom 25%	53.26	55.73
Bottom 10%	49.00	52.05
Bottom 5%	47.71	48.93
Bottom 1%	45.82	44.11

**Figure 20:** MSA Index distribution by feed type 2021–23



Source: MLA

**Figure 21:** Carcase weight (kg) by feed type 2021–23



Source: MLA

**Figure 20** also shows that there is a higher percentage of non-grainfed cattle with MSA Index values greater than 60.00, and a lower percentage of non-grainfed cattle with MSA Index values below 50.00.

# Carcase traits impacting on MSA Index and LMY% by feed type

Ossification and marbling are key carcass traits that impact the MSA Index, which are influenced by nutrition, management and genetic selection.

The non-grainfed population had slightly less carcasses with ossification scores of 180 or less (72%), compared to grainfed cattle (73%).

A greater proportion of non-grainfed cattle had marbling scores less than or equal to 400 (80%), when compared to grainfed cattle (68%).

Non-grainfed MSA graded carcasses averaged 59.5 LMY% and grainfed MSA graded carcasses averaged 57.9 LMY%.

## Ossification

Ossification refers to the physiological maturity of the carcass, and is measured on a scale of 100-590, with 100 being, physiologically, the 'least mature'.

Cattle that reach market weight at a younger age are likely to have lower ossification scores.

Higher ossification is linked to an increased amount of connective tissue in the muscles, which has a negative effect on tenderness and eating quality. While ossification increases as the cattle ages, it can also increase with nutritional or health stress and provides an indicator of the growth path of cattle in conjunction with HSCW.

## MSA marbling score

MSA marbling is measured on a score range from 100-1190, with the score taking into account the amount, distribution and fineness of intramuscular fat.

Marbling has a positive effect on eating quality in many high-value cuts. However, marbling only contributes to a proportion of eating quality across the carcass, as other traits such as ossification and hump height also have a considerable impact on eating quality.

## Lean meat yield (%)

LMY% is calculated using HSCW and rib fat depth.

In 2021-23, non-grainfed MSA graded carcasses averaged 59.5 LMY% and grainfed MSA graded carcasses averaged 57.9 LMY%.

On-farm management and genetic factors which influence LMY% should be balanced with those that influence eating quality.

Figure 22: Ossification score by feed type 2021-23

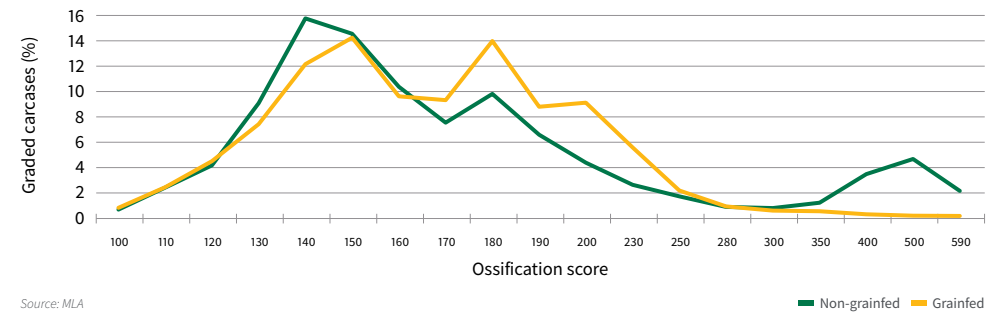


Figure 23: MSA marbling score by feed type 2021-23

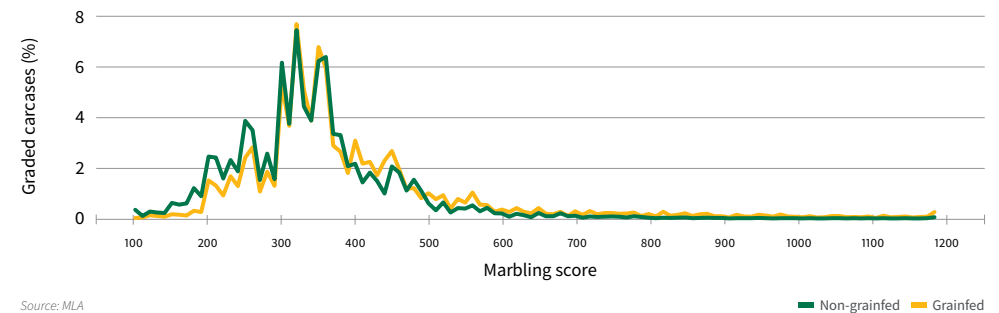
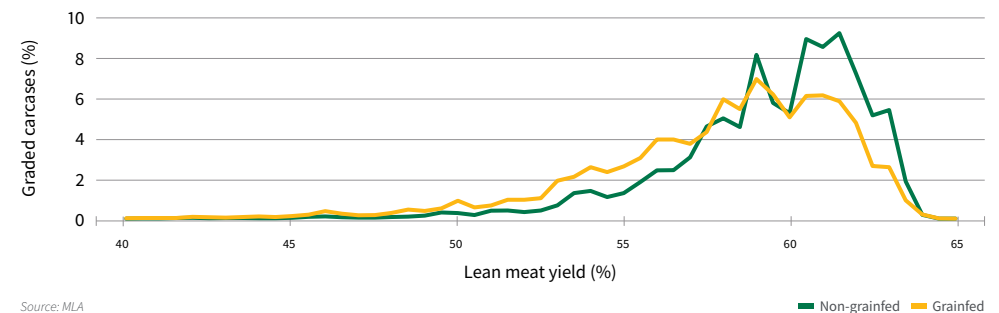


Figure 24: Lean meat yield (%) by feed type 2021-23



# MSA performance by HGP status

**In 2021–23, 39% of MSA graded cattle were treated with hormonal growth promotant (HGP).**

This was an increase from 35% in the 2019–21 period, with 87% of treated cattle being grainfed. Queensland had the highest percentage of HGP usage at 54%.

**Figure 27** illustrates the distribution of the MSA Index by HGP status. In 2021–23, HGP-free MSA graded cattle achieved a higher average MSA Index of 60.09, compared to HGP-treated cattle which averaged an MSA Index of 53.44.

## Why HGP status matters

The use of HGPs has been proven to increase productivity through weight gain and feed conversion efficiencies. However, MSA consumer sensory testing has validated that HGP treatment has a negative impact on eating quality, partly due to an increase in an enzyme which inhibits ageing of meat to improve tenderness.

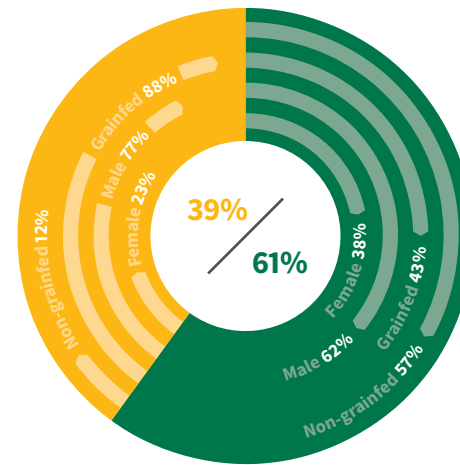
When all carcass attributes are the same, the average MSA Index of HGP-free cattle will be five to six points higher than HGP-treated cattle.

**Table 8:** MSA Index percentile bands by HGP status 2021–23

	HGP-free	HGP-treated
<b>Top 1%</b>	68.58	60.35
<b>Top 5%</b>	66.73	58.77
<b>Top 10%</b>	65.21	57.85
<b>Top 25%</b>	62.66	56.36
<b>Top 50%</b>	60.51	54.20
<b>Bottom 25%</b>	58.17	50.32
<b>Bottom 10%</b>	54.64	47.93
<b>Bottom 5%</b>	52.08	46.92
<b>Bottom 1%</b>	46.04	45.17

Additionally, carcass attributes measured as part of MSA grading are also impacted by HGP treatment. For example, HGP use increases ossification and hump height, and negatively impacts marbling distribution. This is primarily through a dilution effect as cattle divert energy to growth of muscle, rather than a reduction in the amount of marbling per se. The effect of HGPs on carcass traits can depend on the production system, timing and type of HGP implant.

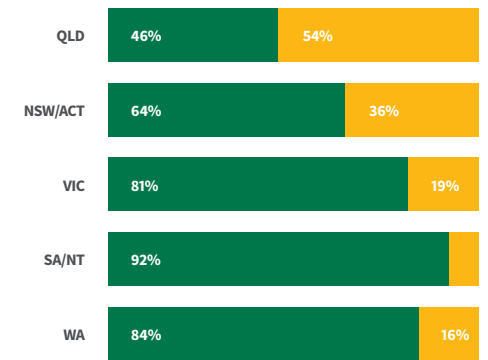
**Figure 25:** Proportion of HGP-free and HGP-treated MSA graded cattle by sex and feed type 2021–23



Source: MLA

■ HGP-free ■ HGP-treated

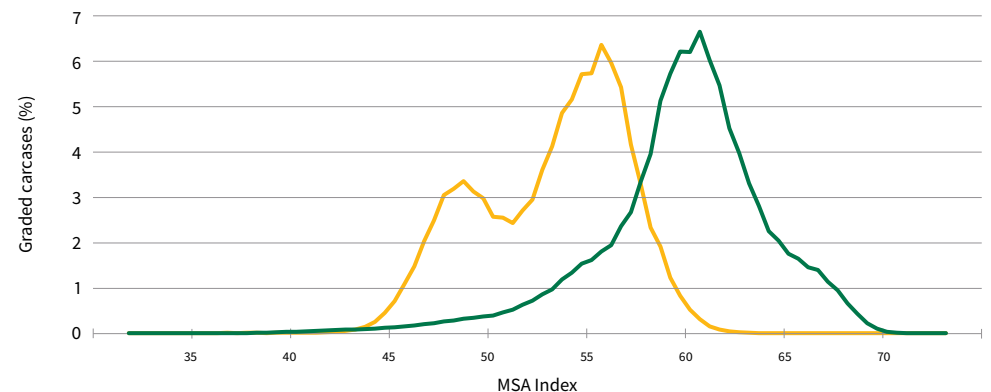
**Figure 26:** Proportion of HGP-free and HGP-treated MSA graded cattle by state 2021–23



Source: MLA

■ HGP-free ■ HGP-treated

**Figure 27:** MSA Index distribution by HGP status 2021–23



Source: MLA

■ HGP-free ■ HGP-treated

# Carcase traits impacting on MSA Index and LMY% by HGP status

HGP-treated cattle had a higher average carcass weight of 344.7kg, compared to HGP-free cattle, which averaged 321.1kg.

On average, HGP-treated cattle have greater hump heights, lower marbling scores and higher ossification scores.

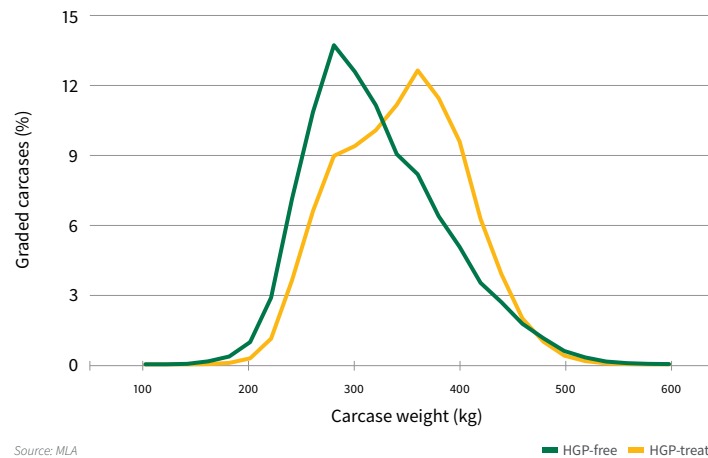
LMY% was similar between the two groups, with HGP-free cattle achieving an average of 58.8 and HGP-treated cattle achieving 58.1.

There are two principal post-slaughter management procedures that can be utilised to improve the eating quality of cattle treated with HGPs. The negative impact of HGPs on eating quality is the greatest on cuts that have the highest ageing rates, which are often the highest value cuts. Some of the HGP impact; however, can be mitigated through ageing. Additionally, the use of the tenderstretch carcass hang method improves the eating quality of loin and hindquarter muscles, also reducing the negative eating quality impact due to HGP use.

**Table 9:** Carcass attributes, lean meat yield (%) and MSA Index of all MSA graded carcasses by HGP status 2021–23 (all traits are independent of each other)

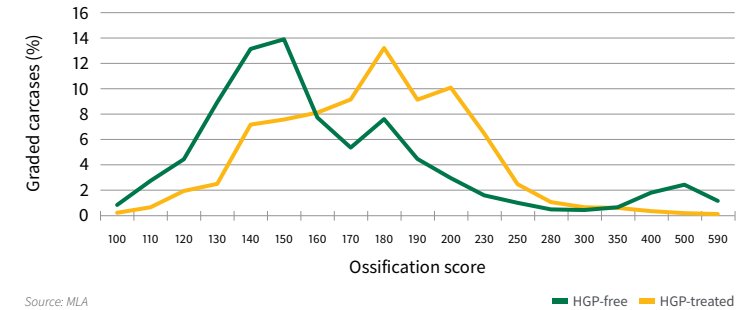
	HGP-free			HGP-treated		
	Top 5%	Average	Bottom 5%	Top 5%	Average	Bottom 5%
<b>Carcass weight (kg)</b>	442.0	321.1	232.2	441.2	344.7	249.6
<b>Hump height (mm)</b>	45	70	120	45	95	175
<b>Ossification</b>	120	180	400	130	180	250
<b>MSA marbling</b>	760	390	200	520	350	210
<b>Rib fat (mm)</b>	18	8	3	18	10	4
<b>EMA (cm<sup>2</sup>)</b>	95	75	59	98	79	59
<b>Lean meat yield (%)</b>	63.0	58.8	52.0	62.7	58.1	51.3
<b>MSA Index</b>	66.73	60.09	52.08	58.77	53.44	46.92

**Figure 28:** Carcass weight (kg) by HGP status 2021–23



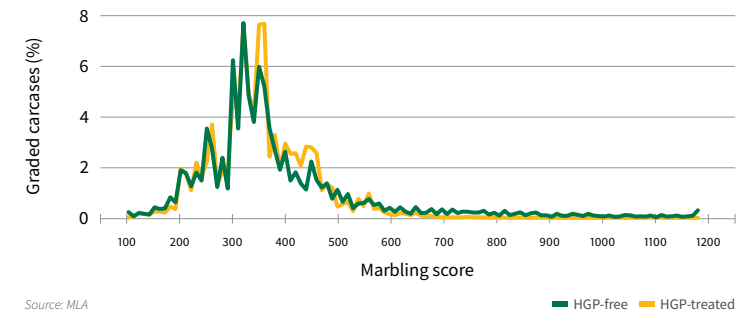
Source: MLA

**Figure 29:** Ossification score by HGP status 2021–23



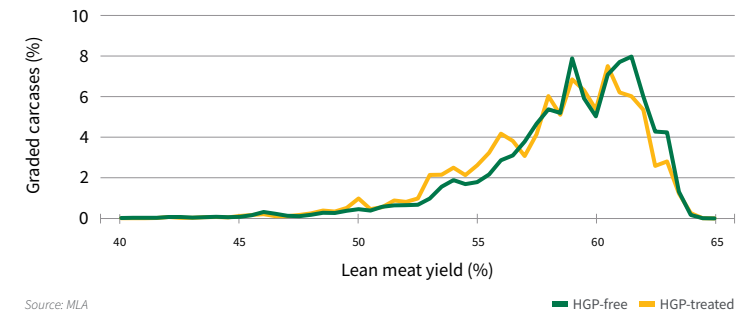
Source: MLA

**Figure 30:** MSA marbling score by HGP status 2021–23



Source: MLA

**Figure 31:** Lean meat yield (%) by HGP status 2021–23



Source: MLA

# MSA performance by sex

In 2021–23, 68% of MSA graded cattle were male. Of this, 69% were grainfed and 55% were HGP-free. Of the 32% of females presented, 56% were non-grainfed and 72% were HGP-free.

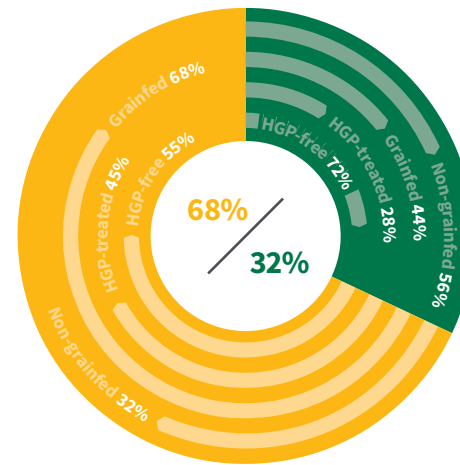
South Australia and the Northern Territory had the largest proportion of male cattle supplied through the MSA program at 72%, while Tasmania had the lowest with 52%.

Figure 34 illustrates the distribution of the MSA Index for sex. In 2021–23, male and female MSA graded cattle achieved comparable average MSA Indexes of 57.70 and 57.68.

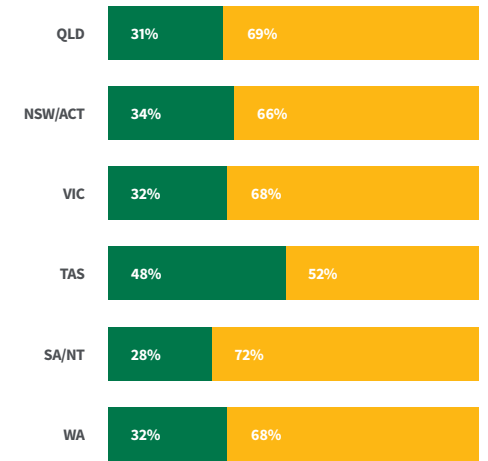
**Table 10:** MSA Index percentile band by sex 2021–23

	Female	Male
Top 1%	67.59	68.31
Top 5%	64.25	66.03
Top 10%	62.25	64.29
Top 25%	60.04	61.69
Top 50%	57.44	58.29
Bottom 25%	54.51	53.93
Bottom 10%	50.69	49.36
Bottom 5%	47.90	47.93
Bottom 1%	43.49	46.00

**Figure 32:** Proportion of MSA graded carcasses by sex, HGP status and feed type 2021–23



**Figure 33:** Proportion of MSA graded carcasses by sex and state 2021–23



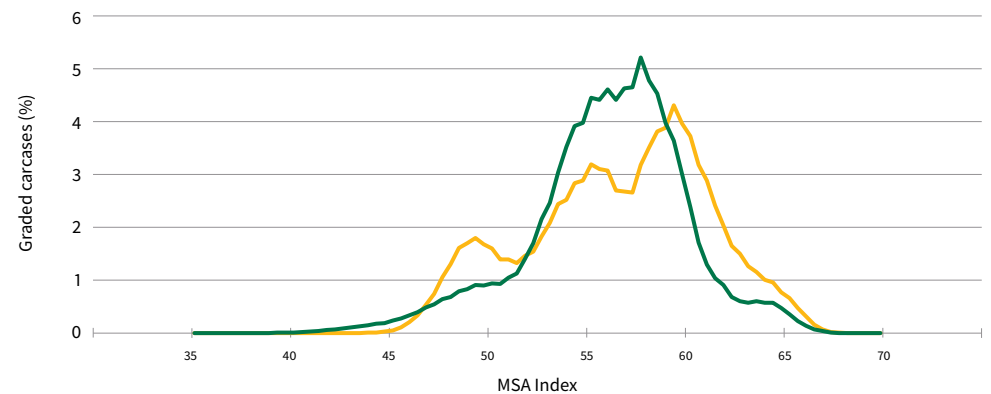
Source: MLA

Female Male

Source: MLA

Female Male

**Figure 34:** MSA Index distribution by sex 2021–23



Source: MLA

Female Male



### Does sex status matter?

Sex status has a small impact on eating quality, although at low ossification scores, females may have a slightly higher MSA Index (+0.30) compared to males.

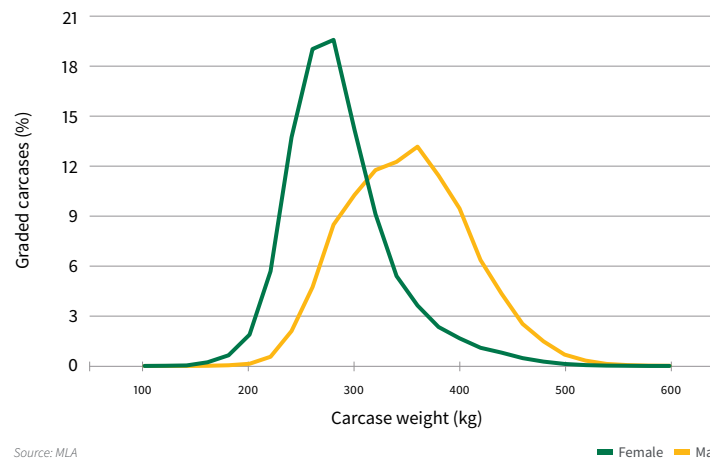
**Table 11** refers to the average, top and bottom 5th percentiles for each trait. This shows that while male cattle were heavier with lower ossification scores, females tended to have lower hump heights and comparable marbling, as well as similar lean meat yields as their male counterparts.



**Table 11:** Carcase attributes, lean meat yield (%) and MSA Index of all MSA graded carcasses by sex 2021–23 (all traits are independent of each other)

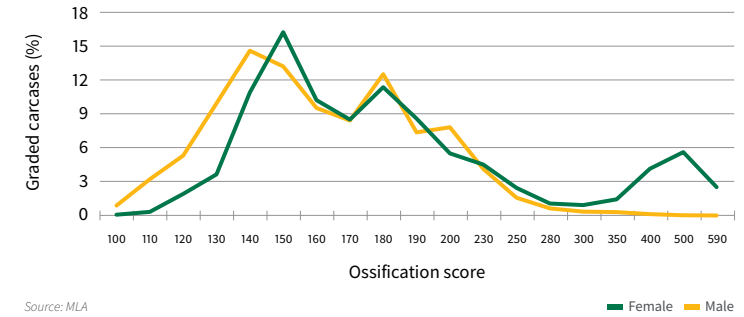
	Female			Male		
	Top 5%	Average	Bottom 5%	Top 5%	Average	Bottom 5%
<b>Carcase weight (kg)</b>	385.0	286.4	220.5	451.5	351.1	261.0
<b>Hump height (mm)</b>	40	70	120	50	85	160
<b>Ossification</b>	130	210	500	120	160	230
<b>MSA marbling</b>	610	360	200	660	380	210
<b>Rib fat (mm)</b>	17	8	3	18	9	3
<b>EMA (cm<sup>2</sup>)</b>	91	73	56	98	79	62
<b>Lean meat yield (%)</b>	62.8	58.7	52.0	62.9	58.4	51.6
<b>MSA Index</b>	64.25	57.01	47.90	66.03	57.65	47.93

**Figure 35:** Carcase weight (kg) by sex 2021–23



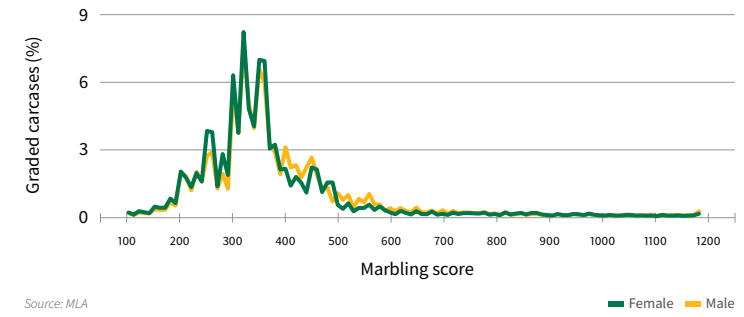
Source: MLA

**Figure 36:** Ossification score by sex 2021–23



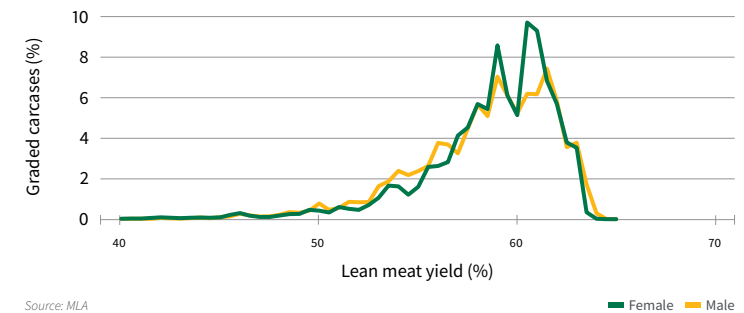
Source: MLA

**Figure 37:** MSA marbling score by sex 2021–23



Source: MLA

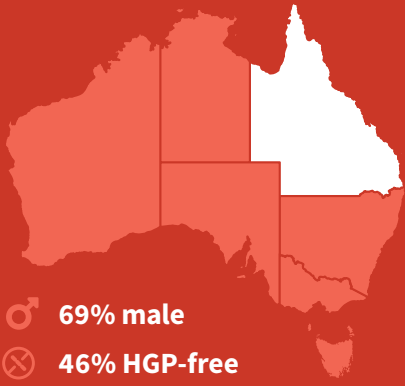
**Figure 38:** Lean meat yield (%) by sex 2021–23



Source: MLA

STATE SNAPSHOT

# Queensland



- 69% male**
- 46% HGP-free**
- 73% grainfed**
- 54% total MSA slaughter**
- 55.09 MSA Index average**

More than 3.1 million MSA cattle were consigned from Queensland producers, representing 54% of all MSA graded cattle in Queensland in 2021-23.

16% of MSA-registered cattle producers reside in Queensland. This equates to 7,556 MSA-registered beef producers, with more than 2,900 of these producers consigning cattle to the program in 2021-23.

MSA-registered beef producers in Queensland achieved 93.6% MSA compliance in 2021-23, which was slightly lower than the national average at 95.1%.

Figure 39: QLD MSA graded carcasses 2010-23

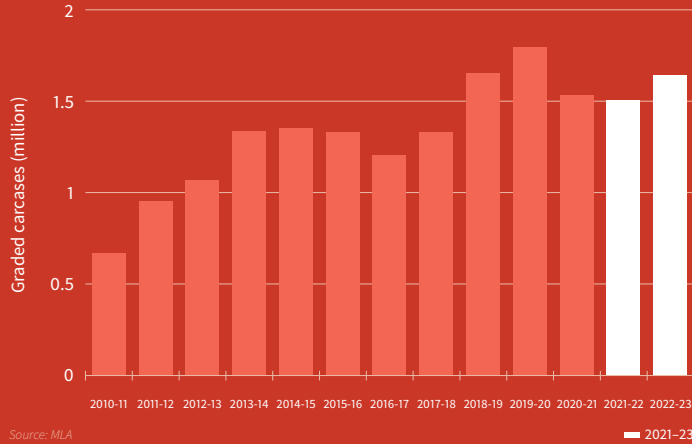


Figure 40: Proportion of carcasses presented for MSA grading to total QLD adult cattle slaughter 2010-23

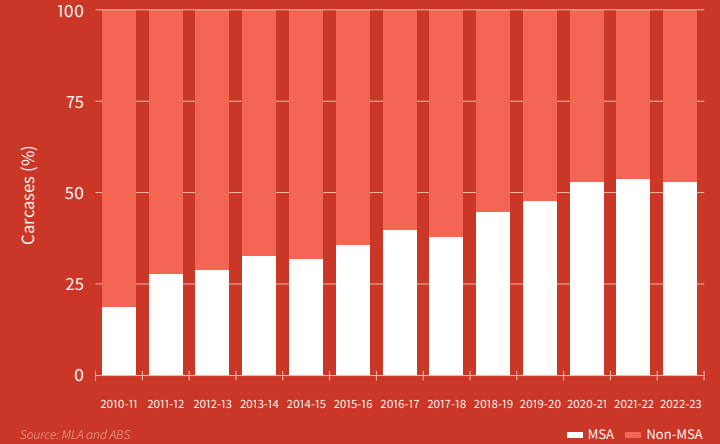
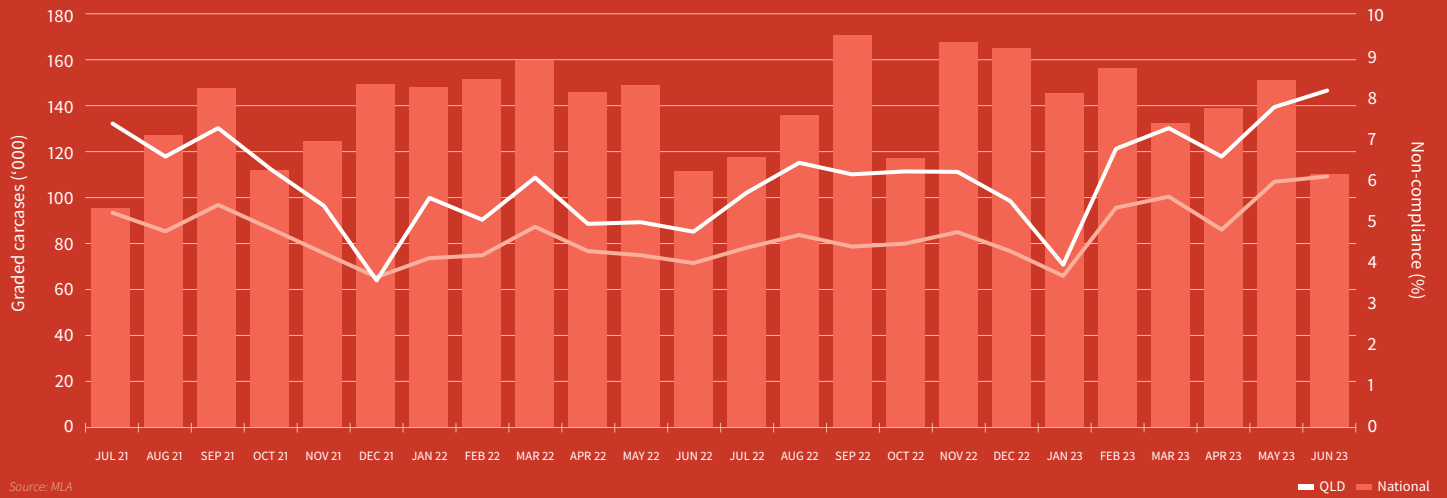


Figure 41: QLD total non-compliance to MSA minimum requirements 2021-23





**Figure 42:** QLD non-compliance to MSA minimum requirements (rib fat and pH) 2021–23

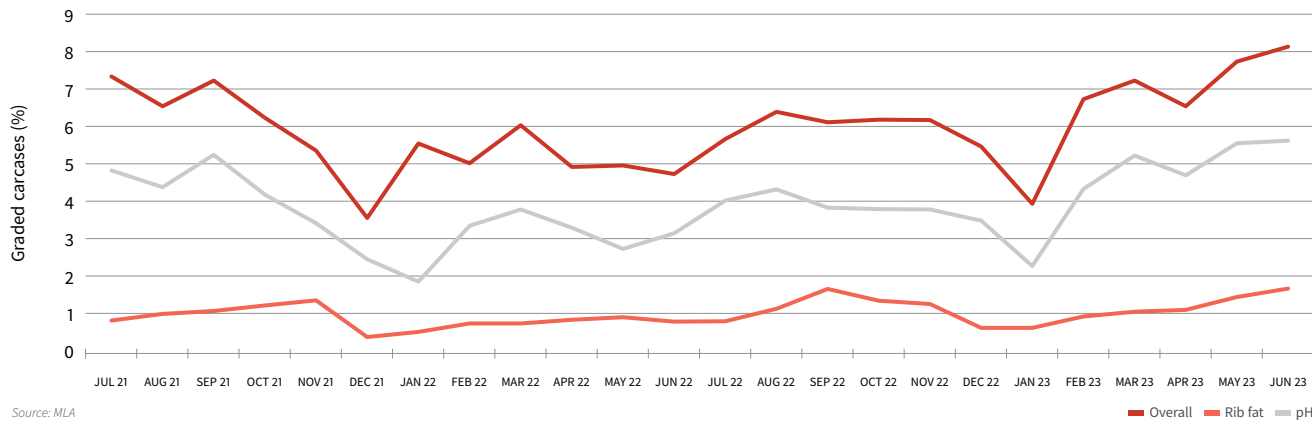
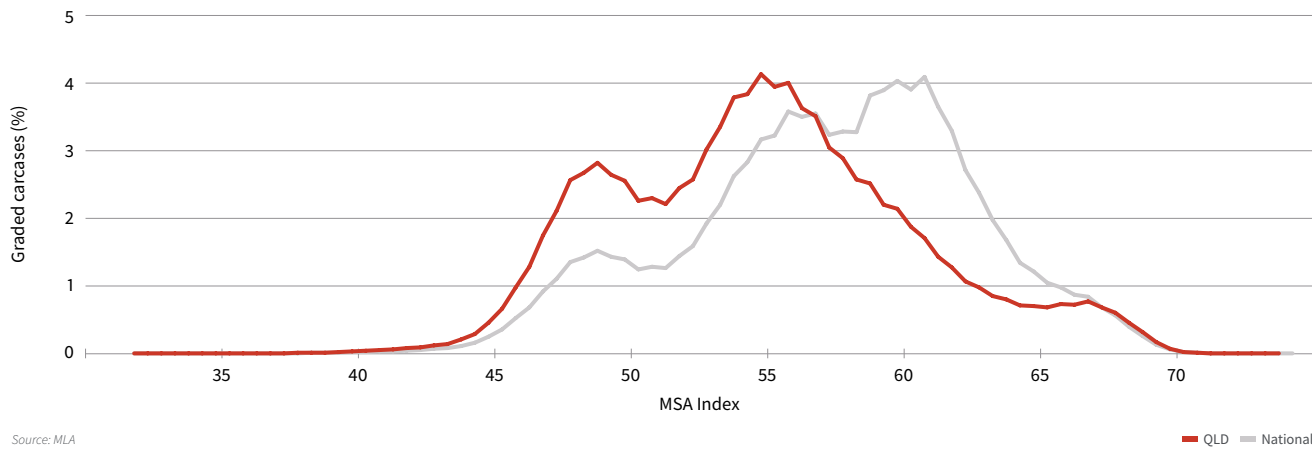


Figure 42 shows in 2021–23, non-compliance fluctuated between 3.6% and 8.1% with the highest non-compliance in June 2023 and lowest in December 2021. The main reason for non-compliance was ultimate pH, which was highest during May and June 2023. Non-compliance due to rib fat peaked at around 2% in September 2022 and June 2023.

**Figure 43:** QLD MSA Index performance 2021–23



**Table 12:** Carcase attributes, lean meat yield (%) and MSA Index of MSA graded carcasses in QLD 2021–23 (all traits are independent of each other)

	Top 5%	Average	Bottom 5%
Carcase weight (kg)	385.0	286.4	220.5
Hump height (mm)	40	70	120
Ossification	130	210	500
MSA marbling	610	360	200
Rib fat (mm)	17	8	3
EMA (cm <sup>2</sup> )	91	73	56
Lean meat yield (%)	62.8	58.7	52.0
MSA Index	64.25	57.01	47.90

**Table 13:** QLD MSA Index percentile bands 2021–23

	QLD	National
Top 1%	68.31	68.13
Top 5%	65.47	65.67
Top 10%	62.47	63.81
Top 25%	58.51	61.18
Top 50%	54.98	57.91
Average	55.09	57.45
Bottom 25%	50.91	54.16
Bottom 10%	48.04	49.63
Bottom 5%	46.87	47.92
Bottom 1%	44.46	45.40

## QUEENSLAND

## Eating quality benchmarks for MSA graded cattle

### Identifying opportunities for improvement

The percentile band tables are ranked by the MSA Index. The carcass traits displayed are the average of cattle within the percentile band. These are presented by feed type, HGP status and sex. These assist producers to match their production system and benchmark their herd's performance. For example, if a producer's production system was based on HGP-free, non-grainfed, male cattle they would focus on **Table 14**. If the producer's average MSA Index was 57.01 or above, they would be in the top 50th percentile of the state for MSA Index. If the producer wanted to improve their eating quality to the top 25%, they would need to implement practices to improve their MSA Index to 59.50. Carcasses in the top 25% percentile had lower hump heights, higher carcass weights and higher MSA marbling when compared to cattle in the top 50%.

**Table 14:** QLD percentile bands for MSA Index and their average carcass traits for HGP-free, non-grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
<b>MSA Index</b>	63.08	63.96	61.01	62.19	59.87	61.24	57.62	59.50	54.20	57.01	49.83	54.51	46.02	52.76	43.79	51.88	40.76	50.36
<b>Carcass weight (kg)</b>	292.1	342.0	284.1	339.4	279.4	339.6	275.6	337.8	282.8	335.8	287.9	331.9	283.2	328.2	276.1	324.8	246.3	317.9
<b>Hump height (mm)</b>	60	65	60	65	60	70	65	75	85	95	95	125	105	130	120	135	125	140
<b>Ossification</b>	160	130	160	130	170	140	180	150	270	150	450	160	500	170	510	180	510	210
<b>MSA marbling</b>	540	510	430	410	380	380	340	350	320	310	300	270	280	240	270	220	210	190
<b>Rib fat (mm)</b>	9	8	8	7	8	7	8	6	8	6	7	6	7	6	7	5	5	4

**Table 15:** QLD percentile bands for MSA Index and their average carcass traits for HGP-free, grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
<b>MSA Index</b>	68.86	69.48	67.42	68.41	66.37	67.61	61.58	65.50	59.03	62.58	56.87	59.87	55.07	56.97	54.08	55.19	51.64	53.25
<b>Carcass weight (kg)</b>	449.1	475.9	436.5	455.9	417.4	437.7	350.6	421.4	268.5	360.4	255.9	303.1	259.3	303.5	260.9	304.2	264.4	301.4
<b>Hump height (mm)</b>	70	75	70	75	70	80	70	80	70	75	95	85	110	115	115	135	115	140
<b>Ossification</b>	160	150	190	160	200	160	180	160	160	150	160	140	170	140	190	150	300	180
<b>MSA marbling</b>	1050	1060	960	1020	880	950	620	790	320	450	300	310	300	310	290	300	280	250
<b>Rib fat (mm)</b>	22	20	22	17	20	15	14	14	8	10	8	7	9	8	8	8	8	6

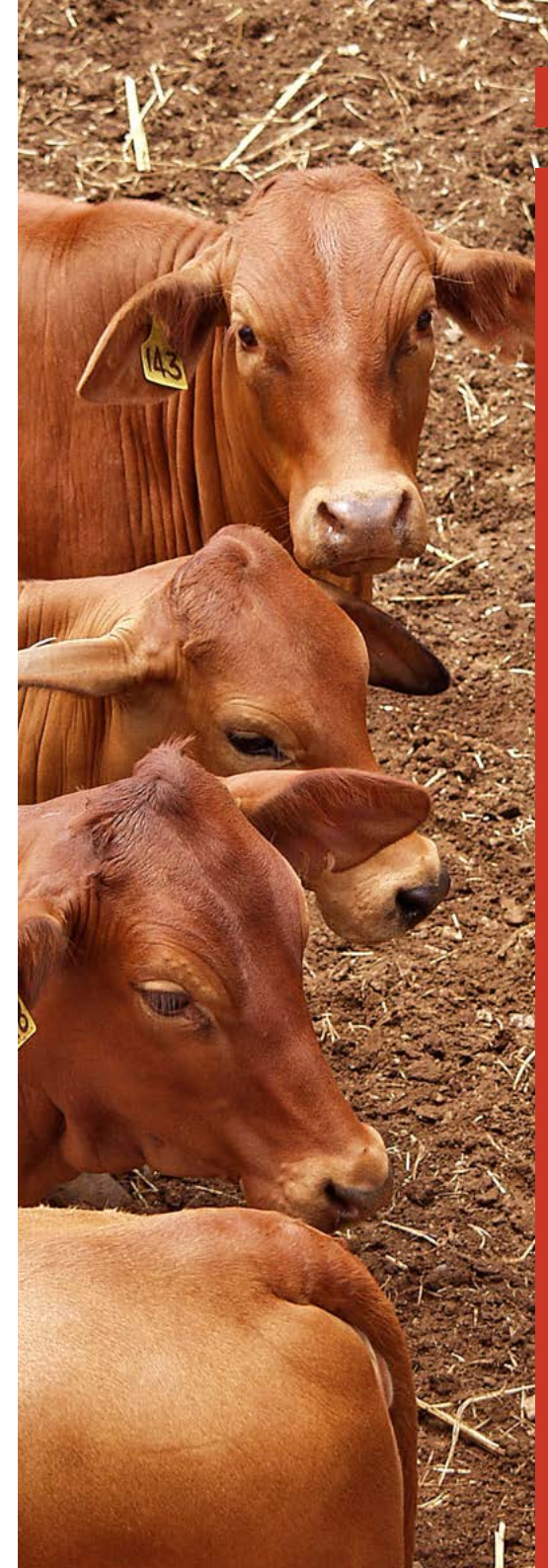


**Table 16:** QLD percentile bands for MSA Index and their average carcass traits for HGP-treated, non-grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
MSA Index	59.49	59.03	58.38	57.76	57.57	56.91	56.33	55.49	54.67	52.15	51.88	48.23	47.00	46.39	44.74	45.50	38.42	43.91
Carcass weight (kg)	268.0	279.5	269.6	282.9	270.0	282.6	269.1	284.4	264.1	317.1	253.5	323.7	257.0	311.6	260.7	302.4	248.3	296.6
Hump height (mm)	50	55	50	55	55	60	55	60	60	95	95	135	120	140	115	140	120	145
Ossification	130	120	130	130	140	130	150	140	170	170	200	190	230	200	370	220	520	290
MSA marbling	470	440	420	390	420	370	370	340	350	320	320	270	280	230	270	210	260	170
Rib fat (mm)	8	7	7	6	7	6	7	6	6	7	7	7	7	6	7	5	7	4

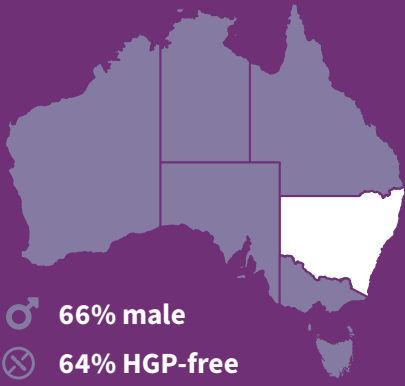
**Table 17:** QLD percentile bands for MSA Index and their average carcass traits for HGP-treated, grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
MSA Index	59.74	59.93	58.29	58.01	57.43	56.95	56.01	55.00	54.40	51.90	52.15	48.97	48.23	47.41	46.76	46.59	44.58	45.18
Carcass weight (kg)	312.4	438.7	291.0	411.9	289.6	395.9	290.3	379.7	291.7	363.4	305.8	351.5	297.1	342.2	289.0	335.4	277.7	323.0
Hump height (mm)	55	75	55	75	55	75	60	75	65	110	105	150	130	155	135	160	135	160
Ossification	130	180	130	180	140	180	150	180	170	180	190	200	200	210	220	220	310	250
MSA marbling	480	610	410	490	390	420	370	370	330	330	320	310	300	270	260	230	240	190
Rib fat (mm)	11	15	8	12	8	11	8	10	7	10	9	10	9	9	8	8	7	7



STATE SNAPSHOT

# New South Wales/Australian Capital Territory



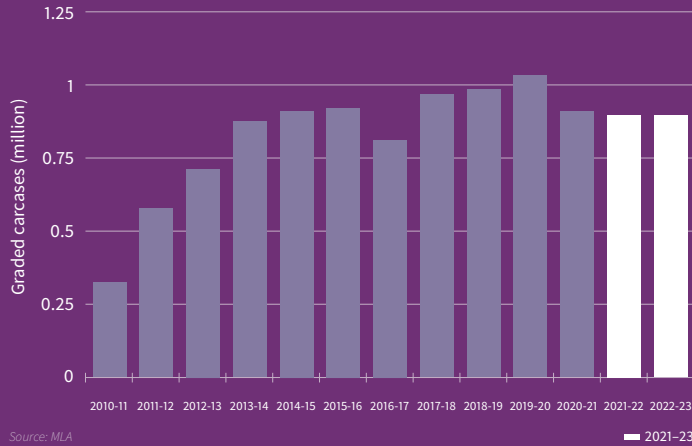
- 66% male**
- 64% HGP-free**
- 58% grainfed**
- 65% total MSA slaughter**
- 58.60 MSA Index average**

More than 1.8 million MSA cattle were consigned from New South Wales and the Australian Capital Territory, representing 27% of all MSA graded cattle in Australia in 2021–23.

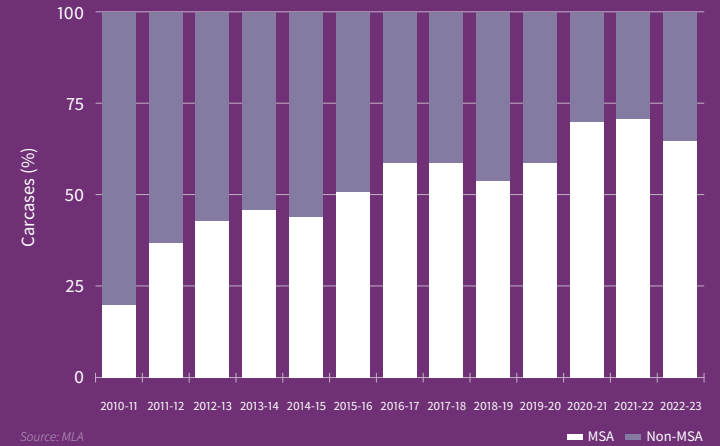
36% of MSA-registered cattle producers reside in NSW/ACT. This equates to 17,765 MSA-registered beef producers, with more than 4,270 of these producers consigning cattle to the program in 2021–23.

MSA-registered beef producers in NSW/ACT achieved 97.2% MSA compliance in 2021–23.

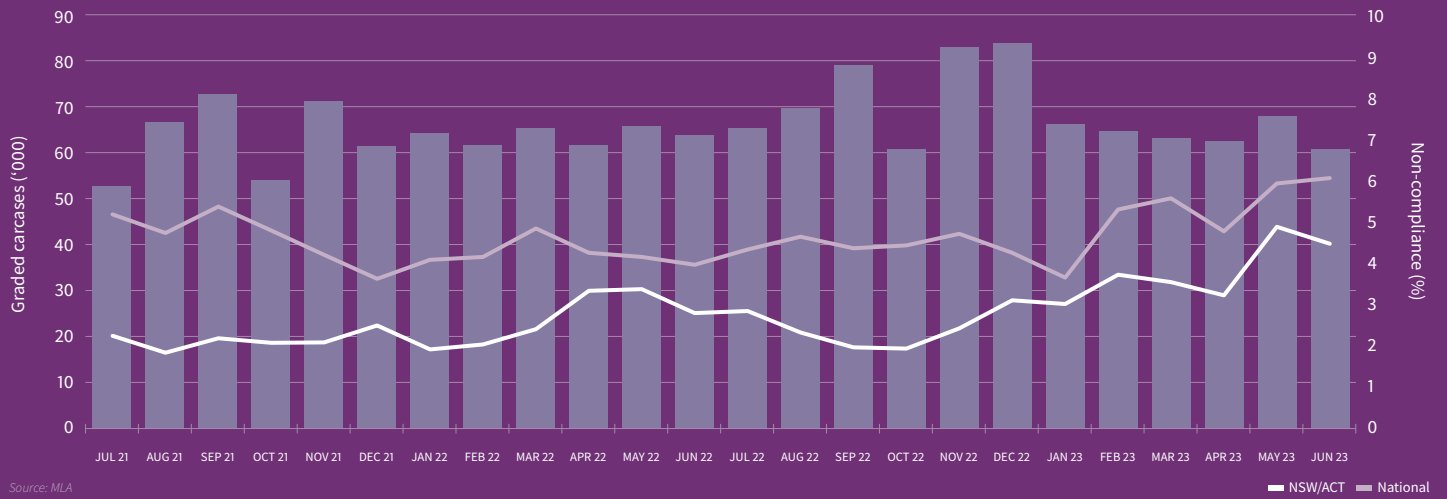
**Figure 44:** NSW/ACT MSA graded carcasses 2010–23



**Figure 45:** Proportion of carcasses presented for MSA grading to total NSW/ACT adult cattle slaughter 2010–23



**Figure 46:** NSW/ACT total non-compliance to MSA minimum requirements 2021–23



**Figure 47:** NSW/ACT non-compliance to MSA minimum requirements (rib fat and pH) 2021–23

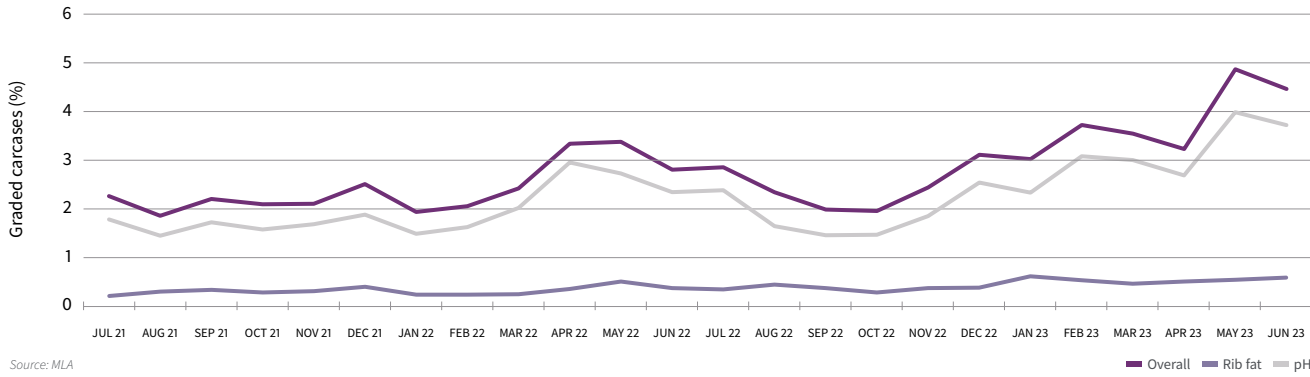


Figure 47 shows in 2021–23, non-compliance fluctuated between 1.8% and 4.9% with the highest non-compliance in May 2023 and lowest in August 2021. The main reason for non-compliance was ultimate pH peaking at 4% in May 2023.

**Figure 48:** NSW/ACT MSA Index performance 2021–23

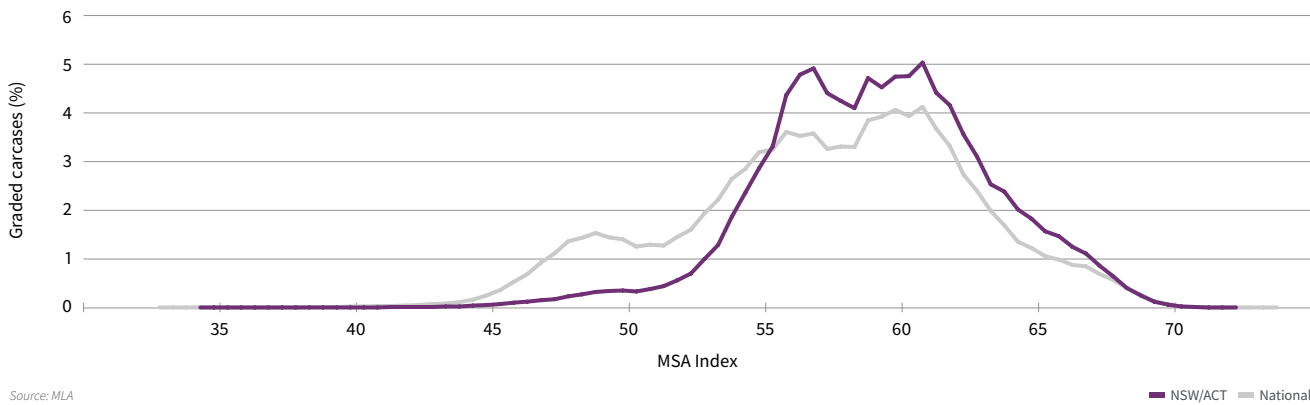


Figure 48 illustrates the MSA Index distribution of MSA graded carcasses across NSW/ACT and nationally. On average, the NSW/ACT MSA Index was higher than the national MSA Index, in part due to the higher average MSA marble scores and lower average hump height in proportion to carcass weight, when compared to national figures.

**Table 18:** Carcass attributes, lean meat yield (%) and MSA Index of MSA graded carcasses in NSW/ACT 2021–23 (all traits are independent of each other)

	Top 5%	Average	Bottom 5%
Carcass weight (kg)	451.0	335.1	244.6
Hump height (mm)	40	70	100
Ossification	120	170	230
MSA marbling	670	400	210
Rib fat (mm)	18	9	4
EMA (cm <sup>2</sup> )	97	78	58
Lean meat yield (%)	62.6	58.4	52.0
MSA Index	66.15	59.31	52.90

**Table 19:** NSW/ACT MSA Index percentile bands 2021–23

	NSW/ACT	National
Top 1%	68.13	68.13
Top 5%	66.15	65.67
Top 10%	64.64	63.81
Top 25%	62.03	61.18
Top 50%	59.35	57.91
Average	59.31	57.91
Bottom 25%	56.58	54.16
Bottom 10%	54.50	49.63
Bottom 5%	52.90	47.92
Bottom 1%	48.21	45.40

## Eating quality benchmarks for MSA graded cattle

### Identifying opportunities for improvement

The percentile band tables are ranked by the MSA Index. The carcass traits displayed are the average of cattle within the percentile band. These are presented by feed type, HGP status and sex. These assist producers to match their production system and benchmark their herd's performance. For example, if a producer's production system was based on HGP-free, non-grainfed, male cattle they would focus on **Table 20**. If the producer's average MSA Index was 60.82 or above, they would be in the top 50th percentile of the state for that trait. If the producer wanted to improve their eating quality to the top 25%, they would need to implement practices to improve their MSA Index to 62.35. Carcasses in the top 25% percentile had similar hump heights but lower ossification scores and higher MSA marbling when compared to cattle in the top 50%.

**Table 20:** NSW/ACT percentile bands for MSA Index and their average carcass traits for HGP-free, non-grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
<b>MSA Index</b>	65.29	67.91	63.53	65.29	62.51	64.03	61.01	62.35	59.34	60.82	57.23	59.44	53.47	58.26	50.04	57.25	46.45	54.11
<b>Carcass weight (kg)</b>	319.7	457.2	292.2	394.9	288.8	341.6	285.2	321.3	280.1	316.6	281.6	314.5	304.7	313.6	287.6	313.1	260.4	306.7
<b>Hump height (mm)</b>	55	75	55	75	55	65	55	60	55	60	65	65	70	75	60	90	80	130
<b>Ossification</b>	160	160	150	140	150	130	160	130	170	140	250	150	440	160	520	170	530	180
<b>MSA marbling</b>	700	910	510	650	450	490	390	410	310	310	290	260	330	260	300	250	220	260
<b>Rib fat (mm)</b>	12	18	10	12	9	10	9	9	8	7	7	6	8	6	5	5	5	5

**Table 21:** NSW/ACT percentile bands for MSA Index and their average carcass traits for HGP-free, grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
<b>MSA Index</b>	68.75	68.97	67.39	67.65	66.37	66.86	63.69	65.20	61.17	63.04	59.48	61.26	57.88	59.74	56.77	58.44	53.83	54.66
<b>Carcass weight (kg)</b>	440.5	457.9	430.5	445.3	413.5	434.9	370.5	416.0	299.6	366.3	283.9	336.5	279.0	324.6	274.8	323.5	275.1	315.6
<b>Hump height (mm)</b>	60	70	60	70	60	75	60	75	60	70	60	70	65	75	80	110	125	150
<b>Ossification</b>	160	130	170	140	180	140	170	140	160	140	170	150	190	150	210	150	220	160
<b>MSA marbling</b>	1010	910	920	800	790	720	620	610	370	430	310	340	310	310	310	320	320	310
<b>Rib fat (mm)</b>	19	16	18	13	16	12	13	11	9	10	7	8	7	7	7	7	7	6

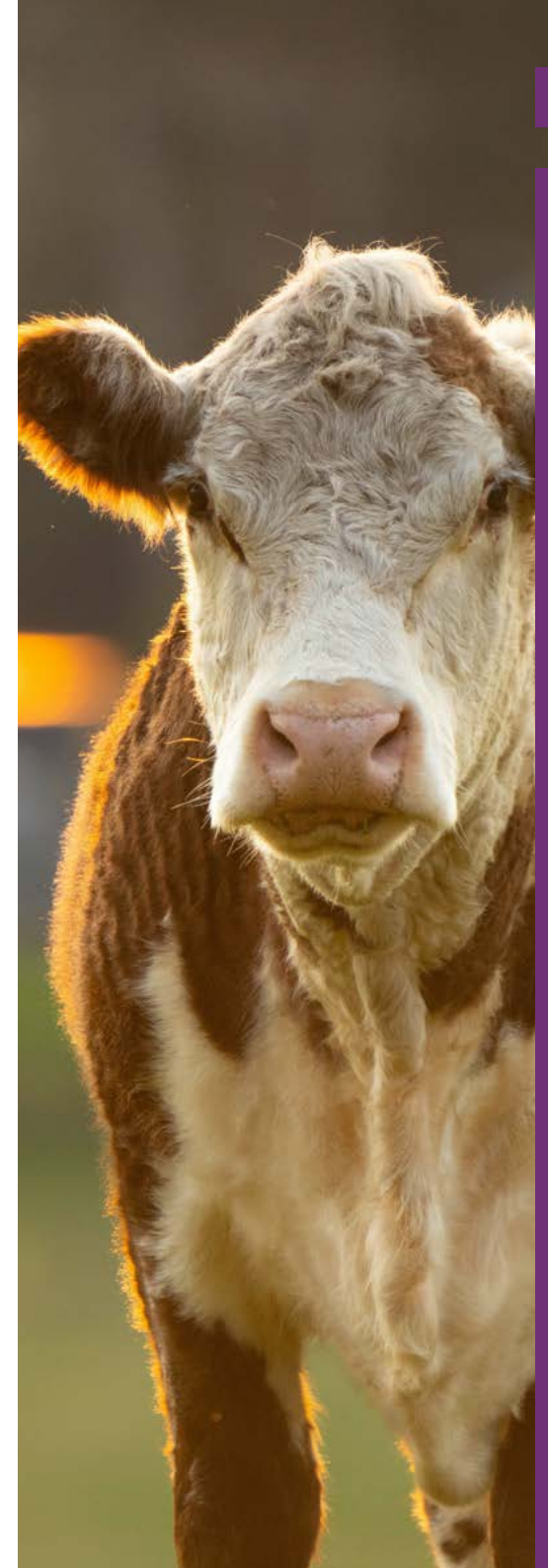


**Table 22:** NSW/ACT percentile bands for MSA Index and their average carcass traits for HGP-treated, non-grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
MSA Index	60.42	60.48	59.10	59.18	58.50	58.48	57.24	57.41	56.00	56.26	54.54	55.12	52.72	53.67	50.38	52.28	45.62	47.13
Carcass weight (kg)	315.1	385.0	311.1	363.4	297.6	342.7	300.1	326.0	296.5	312.5	292.0	298.0	281.8	298.4	274.7	302.5	263.2	301.5
Hump height (mm)	50	60	50	60	50	60	50	60	55	60	60	60	70	75	125	100	145	145
Ossification	140	150	150	150	150	150	160	150	170	150	190	160	200	170	210	180	280	230
MSA marbling	560	600	500	510	460	480	440	430	390	360	350	320	310	320	270	310	240	280
Rib fat (mm)	11	14	11	12	9	10	9	9	8	8	8	6	7	5	8	5	8	5

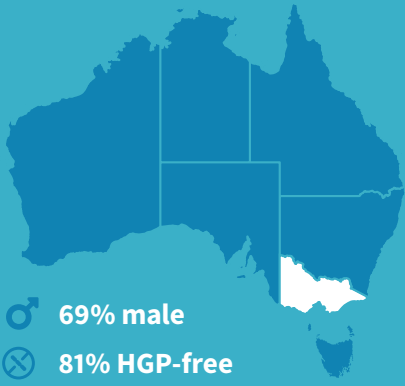
**Table 23:** NSW/ACT percentile bands for MSA Index and their average carcass traits for HGP-treated, grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
MSA Index	60.35	61.14	58.99	59.83	58.35	59.15	57.12	57.83	55.89	56.65	54.36	55.21	52.36	53.49	50.04	51.60	46.16	48.07
Carcass weight (kg)	329.7	437.9	311.2	428.1	295.3	417.8	295.6	403.9	288.2	378.8	285.6	349.0	280.5	340.5	291.2	341.5	279.5	322.2
Hump height (mm)	55	75	55	75	55	75	55	75	60	75	65	80	90	90	135	130	135	150
Ossification	150	170	150	180	150	180	150	180	160	170	190	180	200	180	200	170	300	200
MSA marbling	580	700	490	600	460	560	420	500	370	410	350	340	340	320	330	320	310	290
Rib fat (mm)	12	18	10	16	9	14	9	13	8	11	7	8	7	8	8	8	7	6



STATE SNAPSHOT

# Victoria



- 69% male
- 81% HGP-free
- 35% grainfed
- 30% total MSA slaughter
- 60.57 MSA Index average

More than 706,778 MSA cattle were consigned from Victoria, representing 11% of all MSA graded cattle in Australia in 2021-23.

20% of MSA-registered cattle producers reside in Victoria. This equates to 9,760 MSA-registered beef producers, with more than 2,450 of these producers consigning cattle to the program in 2021-23.

MSA-registered beef producers in Victoria achieved 97.0% MSA compliance in 2021-23.

Figure 49: VIC MSA graded carcasses 2010-23

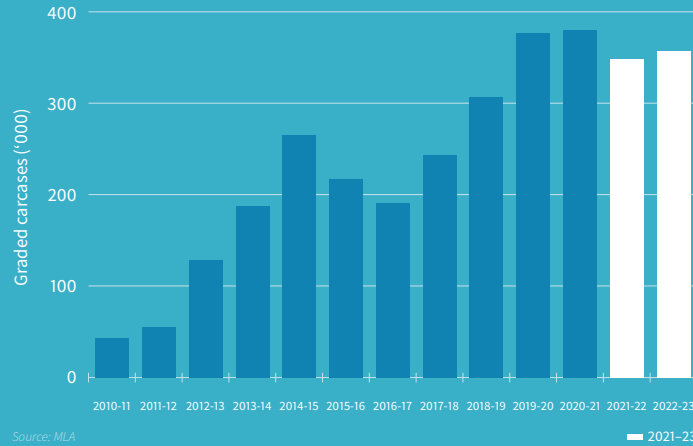


Figure 50: Proportion of carcasses presented for MSA grading to total VIC adult cattle slaughter 2010-23

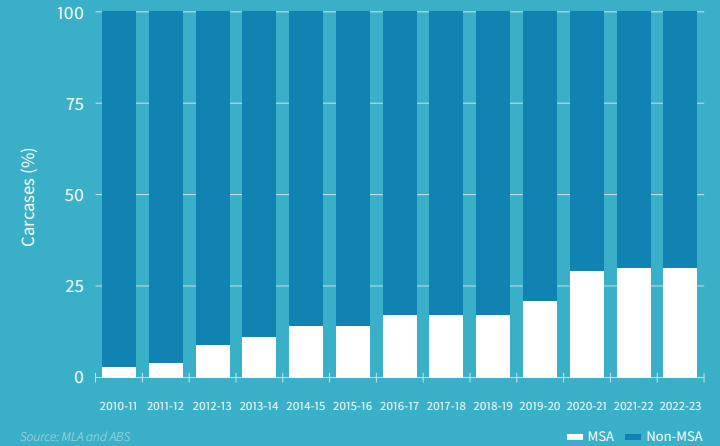
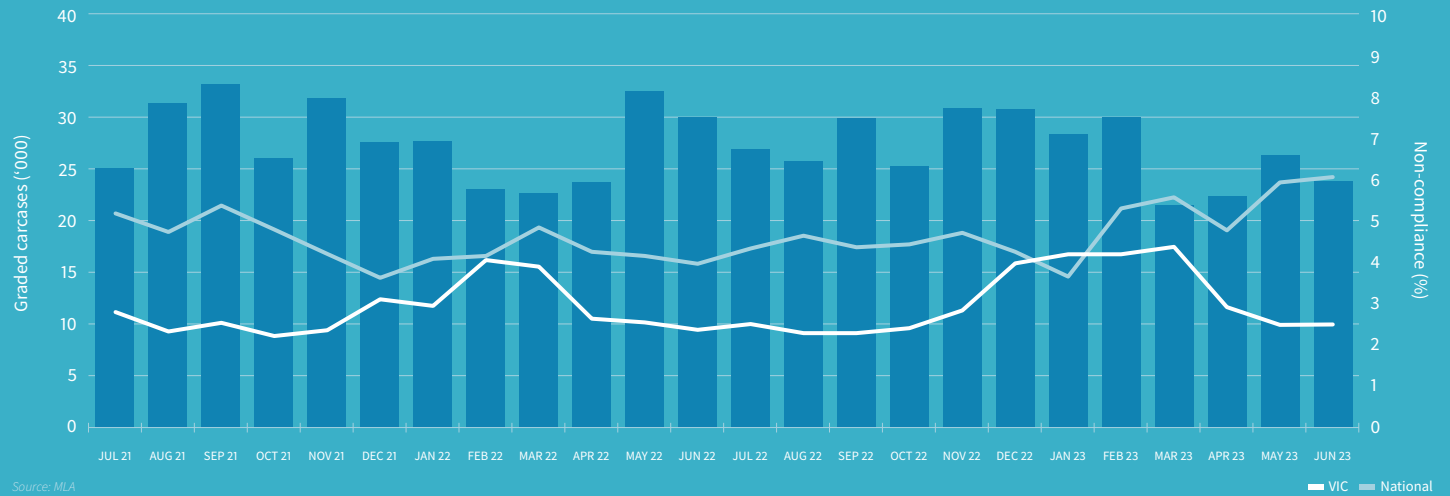


Figure 51: VIC total non-compliance to MSA minimum requirements 2021-23





**Figure 52:** VIC non-compliance to MSA minimum requirements (rib fat and pH) 2021–23

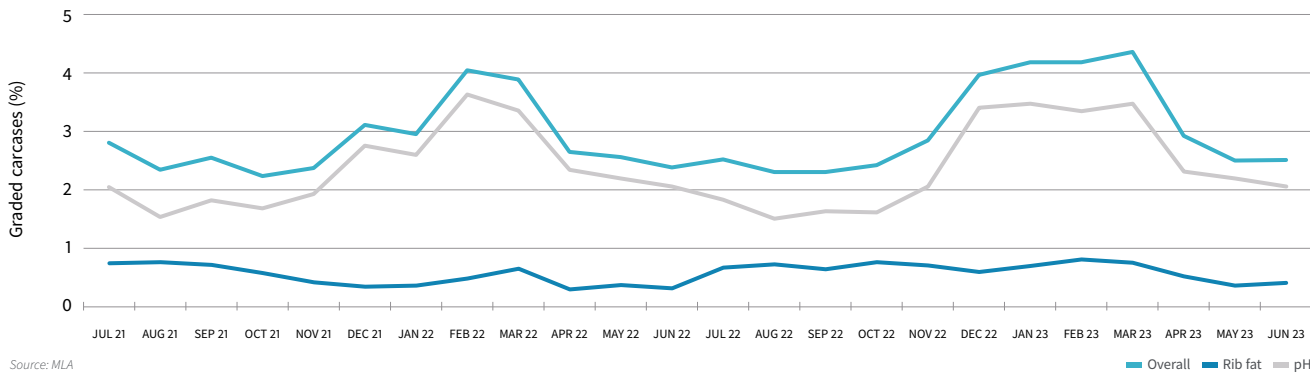


Figure 52 shows in 2021–23, non-compliance fluctuated between approximately 2.2% and 4.4% with the highest non-compliance in March 2023 and the lowest from October 2021. The main reason for non-compliance was pH, peaking at nearly 4% in February 2022.

**Figure 53:** VIC MSA Index performance 2021–23

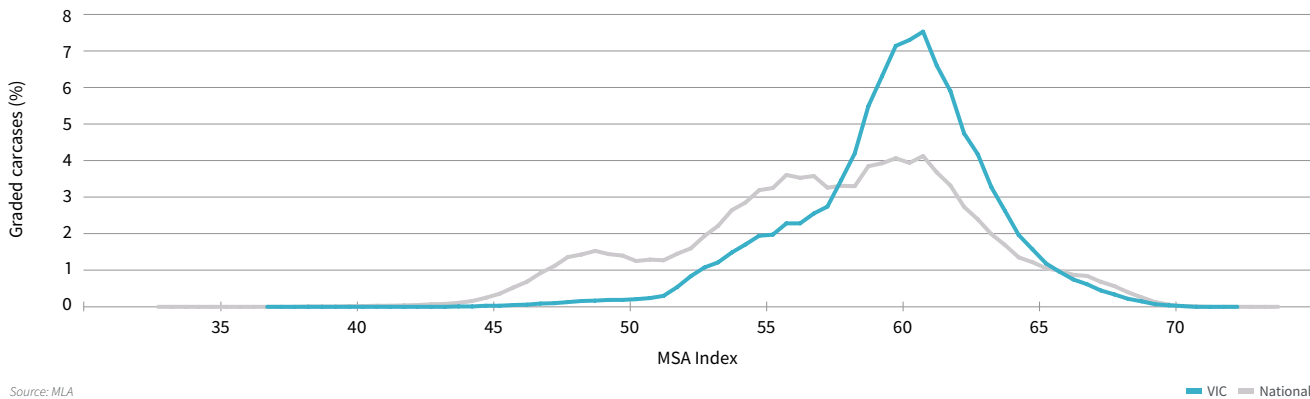


Figure 53 illustrates the MSA Index distribution of MSA graded carcasses across Victoria and nationally. On average, the Victorian MSA Index was higher than the national MSA Index, due to a lower proportion of HGP-treated cattle, carcasses with lower average ossification and hump height in proportion to carcass weight, similar average MSA marble scores, compared to national figures.

**Table 24:** Carcass attributes, lean meat yield (%) and MSA Index of MSA graded carcasses in VIC 2021–23 (all traits are independent of each other)

	Top 5%	Average	Bottom 5%
Carcass weight (kg)	437.0	328.9	243.0
Hump height (mm)	40	60	90
Ossification	120	170	200
MSA marbling	620	370	210
Rib fat (mm)	16	8	3
EMA (cm <sup>2</sup> )	95	74	58
Lean meat yield (%)	62.9	59.1	53.1
MSA Index	65.19	59.91	53.49

**Table 25:** VIC MSA Index percentile bands 2021–23

	VIC	National
Top 1%	67.55	68.13
Top 5%	65.19	65.67
Top 10%	63.93	63.81
Top 25%	62.09	61.18
Top 50%	60.30	57.91
Average	59.91	57.45
Bottom 25%	58.10	54.16
Bottom 10%	55.05	49.63
Bottom 5%	53.49	47.92
Bottom 1%	49.64	45.40

## VICTORIA

## Eating quality benchmarks for MSA graded cattle

## Identifying opportunities for improvement

The percentile band tables are ranked by the MSA Index. The carcass traits displayed are the average of cattle within the percentile band. These are presented by feed type, HGP status and sex. These assist producers to match their production system and benchmark their herd's performance. For example, if a producer's production system was based on HGP-free, non-grainfed, male cattle they would focus on **Table 26**. If the producer's average MSA Index was 60.92 or above, they would be in the top 50th percentile of the state for that trait. If the producer wanted to improve their eating quality to the top 25%, they would need to implement practices to improve their MSA Index to 62.36. Carcasses in the top 25% percentile had similar hump heights and similar ossification scores, but higher MSA marbling when compared to cattle in the top 50%.

**Table 26:** VIC percentile bands for MSA Index and their average carcass traits for HGP-free, non-grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
<b>MSA Index</b>	65.38	66.81	63.59	64.98	62.58	63.95	60.94	62.36	59.34	60.92	57.67	59.71	54.43	58.69	50.36	58.01	47.47	55.98
<b>Carcass weight (kg)</b>	336.2	412.3	312.4	386.7	301.4	370.8	295.7	356.1	289.0	348.2	286.3	344.8	337.9	343.1	298.3	342.2	269.1	346.5
<b>Hump height (mm)</b>	60	70	55	70	55	65	55	65	50	65	50	65	60	70	60	75	55	85
<b>Ossification</b>	160	150	160	150	160	150	160	150	180	150	230	160	510	160	540	170	540	170
<b>MSA marbling</b>	720	810	560	640	480	530	400	430	330	330	290	280	380	260	310	230	190	140
<b>Rib fat (mm)</b>	12	13	10	11	9	10	9	9	7	8	6	6	11	5	7	5	6	4

**Table 27:** VIC percentile bands for MSA Index and their average carcass traits for HGP-free, grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
<b>MSA Index</b>	68.49	68.82	66.77	67.06	64.78	65.89	62.16	63.94	60.65	62.33	59.22	60.97	58.11	59.85	57.43	59.23	56.11	58.00
<b>Carcass weight (kg)</b>	452.0	473.9	427.0	447.7	371.0	411.4	275.5	358.0	262.4	326.1	262.8	309.9	263.6	306.3	263.0	302.0	261.4	313.4
<b>Hump height (mm)</b>	50	60	50	70	50	75	50	70	45	65	45	65	45	65	45	65	45	85
<b>Ossification</b>	170	150	180	150	180	140	150	130	150	140	160	140	170	150	180	160	200	170
<b>MSA marbling</b>	1030	990	900	790	690	650	440	490	320	370	280	310	270	290	260	280	230	290
<b>Rib fat (mm)</b>	21	18	19	14	15	11	9	11	7	9	6	7	6	7	5	6	4	7



**Table 28:** VIC percentile bands for MSA Index and their average carcass traits for HGP-treated, non-grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
MSA Index	59.24	59.47	57.75	58.06	56.89	57.35	55.57	56.21	54.25	55.15	52.99	53.98	52.14	52.94	51.20	52.26	46.74	49.80
Carcass weight (kg)	288.8	294.1	280.7	298.0	282.2	296.4	281.0	297.1	279.2	296.3	275.0	296.8	266.9	296.3	288.2	299.7	273.7	277.0
Hump height (mm)	50	55	50	60	55	60	55	60	55	60	55	65	55	70	140	80	165	135
Ossification	140	120	150	130	160	140	160	140	180	160	190	180	190	190	180	190	190	200
MSA marbling	520	480	460	440	430	420	400	380	360	340	320	320	300	310	250	310	210	290
Rib fat (mm)	9	8	8	7	8	7	7	7	7	6	6	5	5	4	12	4	9	5

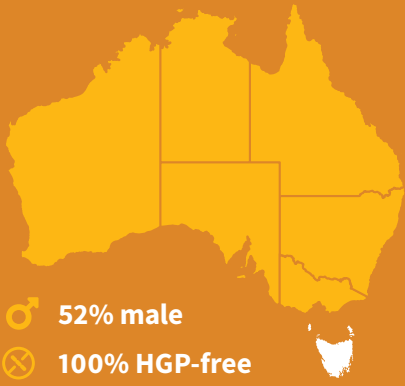
**Table 29:** VIC percentile bands for MSA Index and their average carcass traits for HGP-treated, grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
MSA Index	59.86	61.24	58.61	59.74	57.83	58.93	56.52	57.69	55.08	56.48	53.63	55.16	52.22	53.89	50.72	53.03	45.61	50.53
Carcass weight (kg)	308.3	430.0	294.5	412.9	299.2	406.5	293.0	397.3	286.3	371.5	278.3	337.8	271.1	322.1	283.8	325.3	301.0	341.4
Hump height (mm)	55	75	55	75	55	75	55	70	55	70	60	70	70	75	105	85	125	125
Ossification	150	190	150	180	160	180	160	180	180	180	190	180	200	180	230	190	340	200
MSA marbling	560	740	470	620	470	540	410	480	380	400	340	340	330	330	330	320	260	320
Rib fat (mm)	11	17	9	15	10	15	9	14	8	11	7	8	6	7	9	7	9	9



STATE SNAPSHOT

# Tasmania



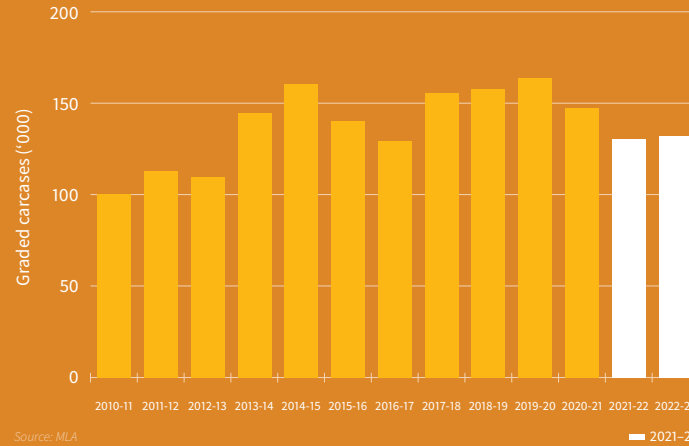
- 52% male**
- 100% HGP-free**
- 64% total MSA slaughter**
- 60.04 MSA Index average**

More than 262,715 MSA cattle were consigned from Tasmania, representing 4% of all MSA graded cattle in Australia in 2021-23.

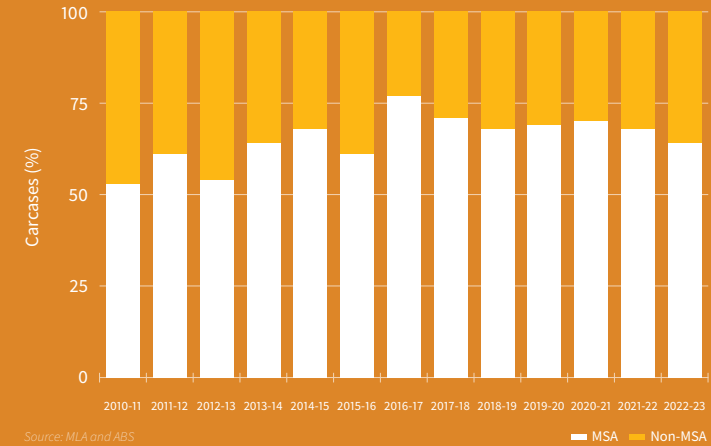
8% of MSA-registered cattle producers reside in Tasmania. This equates to 3,750 MSA-registered beef producers, with more than 2,350 of these producers consigning cattle to the program in 2021-23.

MSA-registered beef producers in Tasmania achieved 94.5% MSA compliance in 2021-23.

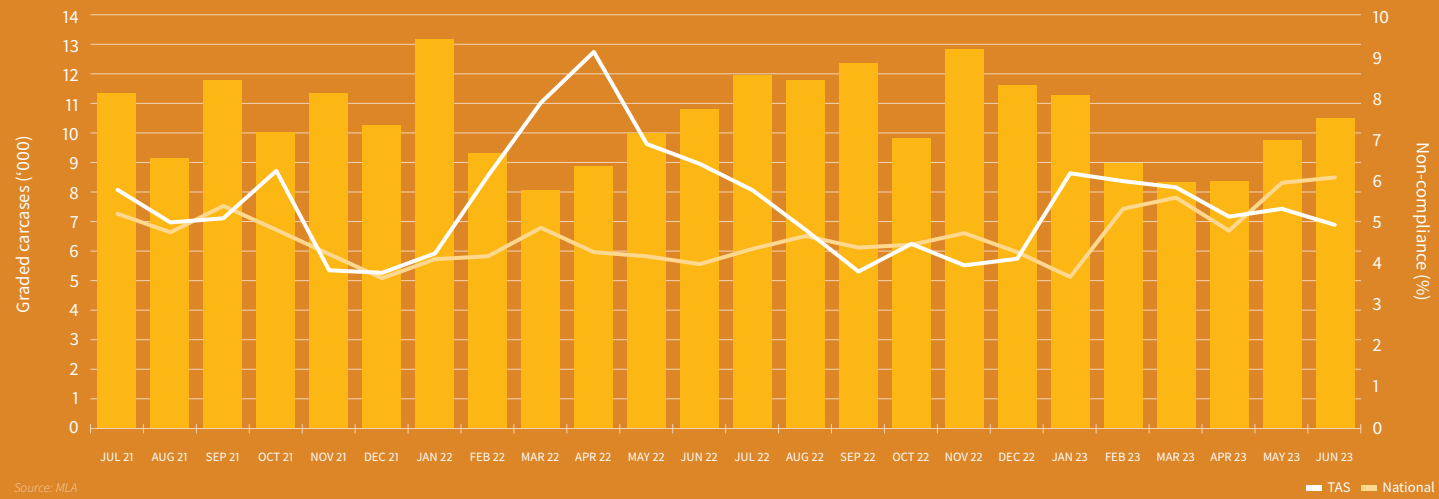
**Figure 54:** TAS MSA graded carcasses 2010-23



**Figure 55:** Proportion of carcasses presented for MSA grading to total TAS adult cattle slaughter 2010-23



**Figure 56:** TAS total non-compliance to MSA minimum requirements 2021-23



**Figure 57:** TAS non-compliance to MSA minimum requirements (rib fat and pH) 2021–23

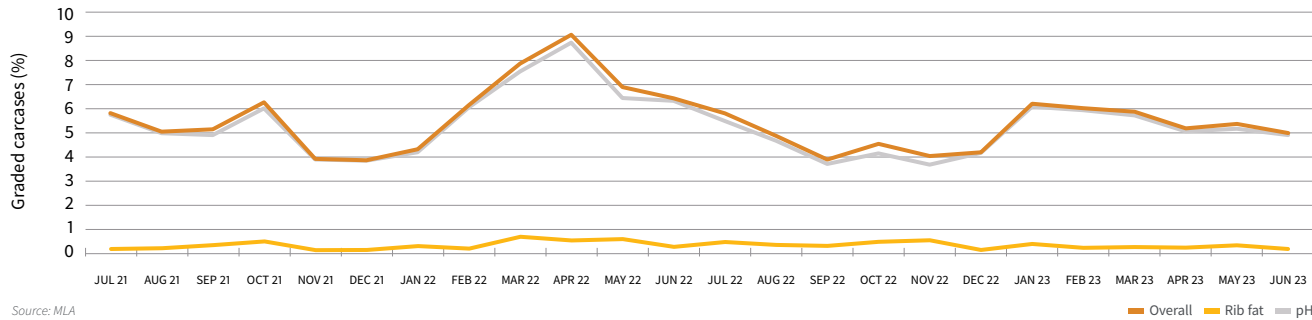


Figure 57 shows in 2021–23, non-compliance fluctuated between approximately 3.8% and 9.1% with the highest non-compliance in April 2022, and lowest in December 2021. The main reason for non-compliance was ultimate pH, with very few carcasses presented that were non-compliant due to inadequate rib fat.

**Figure 58:** TAS MSA Index performance 2021–23

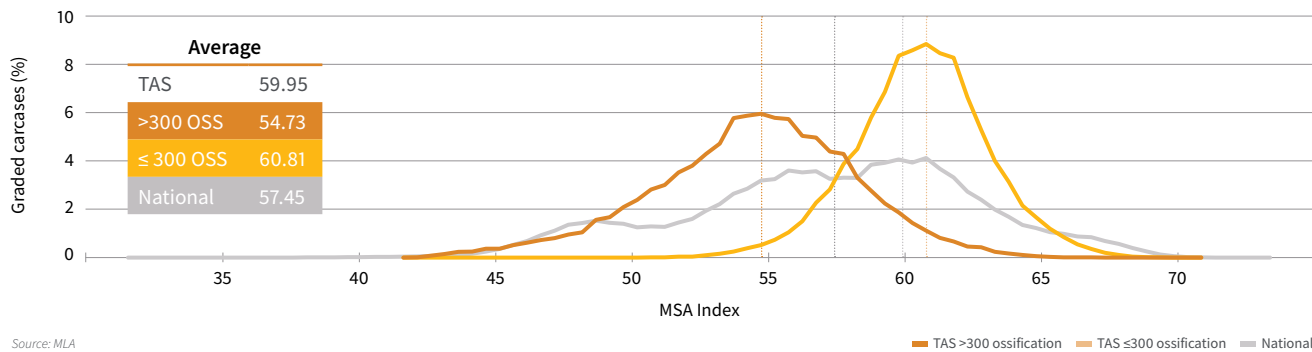


Figure 58 illustrates the MSA Index distribution of MSA graded carcasses across Tasmania (for above 300 ossification or less than or equal to 300 ossification) and nationally. On average, the Tasmanian MSA Index for cattle with <300 ossification was higher than the national MSA Index, due to no usage of HGPs, lower average ossification and hump height in proportion to carcass weight, as well as higher average MSA marble scores when compared to national figures.

Tasmania has traditionally graded higher proportions of cows compared to other states. Cattle have been grouped by ossification score to show the eating quality differences between younger and older cattle that have been consigned for MSA grading.

**Table 30:** Carcass attributes, lean meat yield (%) and MSA Index of MSA graded carcasses in TAS 2021–23 (all traits are independent of each other)

	Top 5%	Average	Bottom 5%
Carcass weight (kg)	399.6	311.7	229.6
Hump height (mm)	40	55	70
Ossification	130	210	400
MSA marbling	600	380	210
Rib fat (mm)	20	10	5
EMA (cm <sup>2</sup> )	80	69	60
Lean meat yield (%)	61.5	57.3	49.7
MSA Index	64.55	59.95	53.48

**Table 31:** TAS MSA Index percentile bands 2021–23

	TAS	National
Top 1%	66.35	68.13
Top 5%	64.55	65.67
Top 10%	63.58	63.81
Top 25%	62.09	61.18
Top 50%	60.43	57.91
Average	59.95	57.45
Bottom 25%	58.40	54.16
Bottom 10%	55.61	49.63
Bottom 5%	53.48	47.92
Bottom 1%	49.03	45.40

## TASMANIA

## Eating quality benchmarks for MSA graded cattle

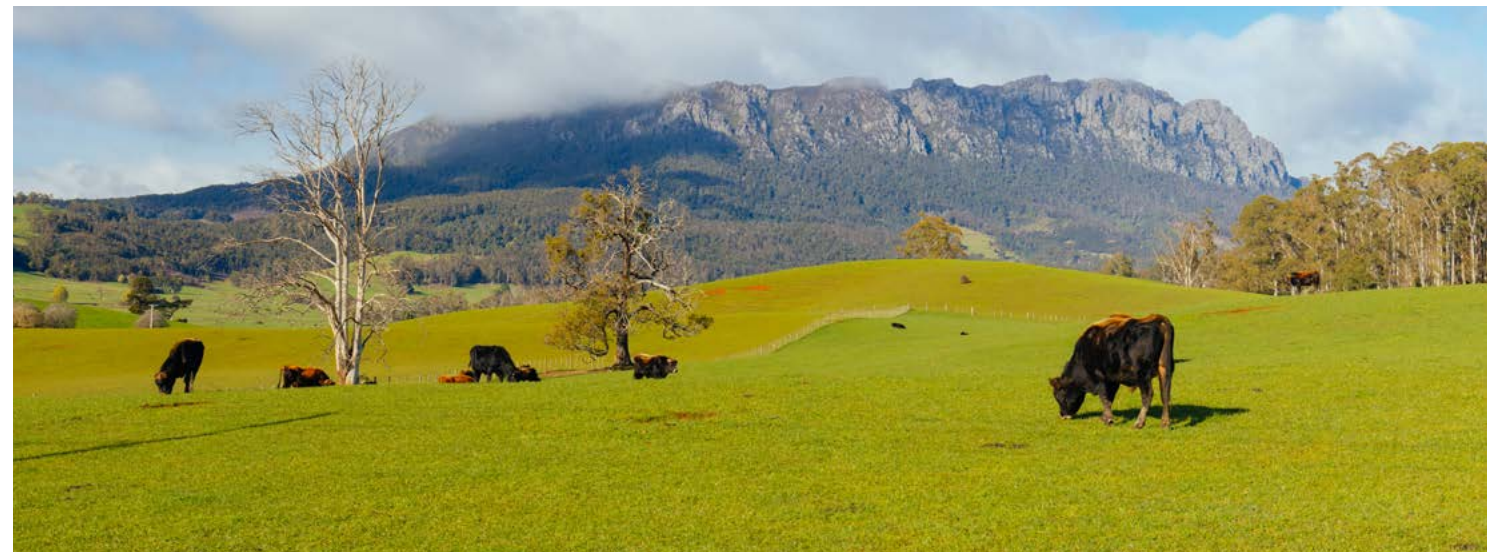
### Identifying opportunities for improvement

Percentile band tables are ranked by the MSA Index. The carcass traits displayed are the average of cattle within the percentile band. These are presented by feed type, HGP status and sex. These assist producers to match their production system and benchmark their herd's performance.

For example, if a producer's production system was based on HGP-free, non-grainfed, male cattle they would focus on **Table 32**. If the producer's average MSA Index was 61.51 or above, they would be in the top 50th percentile of the state for that trait. If the producer wanted to improve their eating quality to the top 25%, they would need to implement practices to improve their MSA Index to 62.76. Carcasses in the top 25% percentile had similar hump heights and similar ossification scores, but higher MSA marbling and higher rib fat when compared to cattle in the top 50%.

**Table 32:** TAS percentile bands for MSA Index and their average carcass traits for HGP-free, non-grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
<b>MSA Index</b>	64.81	66.66	62.94	65.05	61.93	64.13	60.31	62.76	58.50	61.51	56.18	60.30	53.29	59.26	51.21	58.56	47.23	57.17
<b>Carcass weight (kg)</b>	324.5	381.1	311.9	368.2	301.5	357.6	296.6	349.8	287.5	331.5	282.0	314.5	274.1	305.5	268.3	296.4	231.5	285.1
<b>Hump height (mm)</b>	55	65	55	65	50	60	50	60	50	60	50	60	45	60	45	55	40	55
<b>Ossification</b>	180	150	200	160	190	150	200	150	240	150	350	160	420	160	480	170	520	180
<b>MSA marbling</b>	700	770	580	640	490	540	430	460	360	370	310	310	270	280	260	240	200	170
<b>Rib fat (mm)</b>	17	15	15	13	14	13	13	12	10	10	9	8	8	7	8	7	5	6





Fiona and James Paterson – JHW Paterson & Son – Balranald, winners of MSA 2023 Excellence in Eating Quality **NSW/ACT Most Outstanding MSA Beef Producer – Feedlot** award.



Ian Dickson and Renee Bergamen – Alloa Pastoral Co – Milawa, winners of MSA 2023 Excellence in Eating Quality **VIC Most Outstanding MSA Beef Producer – Feedlot** award.



Thomas Foods International, Southern Cross Feedlot – Tintinara, winners of MSA 2023 Excellence in Eating Quality **SA/NT Most Outstanding MSA Beef Producer – Feedlot** award.



Stockyard Beef – Jondaryn, winners of MSA 2023 Excellence in Eating Quality **QLD Most Outstanding MSA Beef Producer – Feedlot** award.



Brad and Eric Ipsen – Manjimup, winners of MSA 2023 Excellence in Eating Quality **WA Most Outstanding Small Non-grained Producer** award.



Lucy and Gerard Gallagher with children Nicholas and Molly – Tarrabah Pastoral Co, Attunga, winners of MSA 2023 Excellence in Eating Quality **NSW/ACT Most Outstanding Small Non-grained Producer** award.



Sarah and James Pearson – Bull Creek Beef, Taroom, winners of MSA 2023 Excellence in Eating Quality **QLD Most Outstanding Large Non-grained Producer** award.



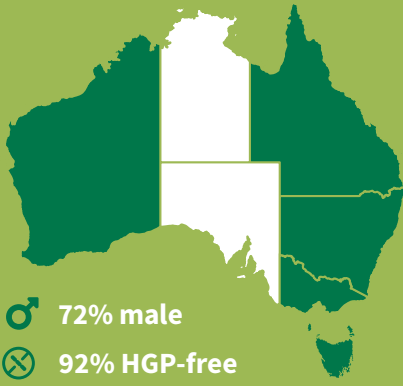
Karen and Neville Beecher with children Shavonne and Bailey – Churchill, winners of MSA 2023 Excellence in Eating Quality **VIC Most Outstanding Large Non-grained Producer** award.



Gill and Kevin Johnson – Preston, winners of MSA 2023 Excellence in Eating Quality **TAS Most Outstanding Large Non-grained Producer** award.

STATE SNAPSHOT

# South Australia/Northern Territory



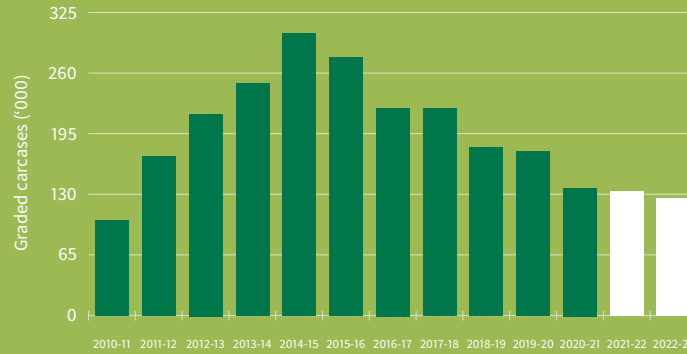
- 72% male**
- 92% HGP-free**
- 56% grainfed**
- 87% total MSA slaughter**
- 60.54 MSA Index average**

More than 259,640 MSA cattle were consigned from South Australia and the Northern Territory, representing 5% of all MSA graded cattle in Australia in 2021–23.

With most MSA cattle from the Northern Territory flowing south for processing, rather than to Queensland, data from the Northern Territory is grouped with South Australia. 11% of MSA-registered cattle producers reside in South Australia and the Northern Territory. This equates to just over 5,400 MSA-registered beef producers, with more than 570 of these producers consigning cattle to the program in 2021–23.

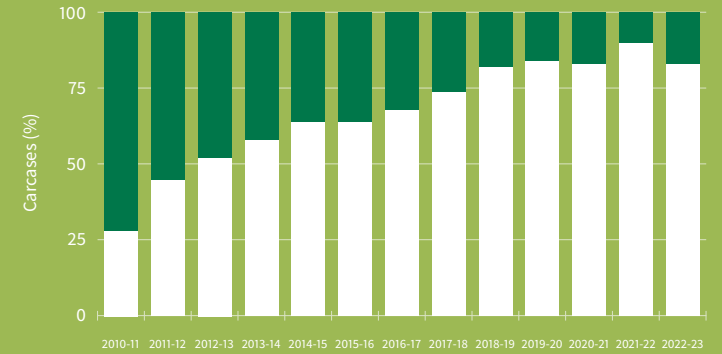
MSA-registered beef producers in South Australia and the Northern Territory achieved 97.2% MSA compliance in 2021–23, an increase in compliance by 1.1% on the 2019–21 financial years.

**Figure 59:** SA/NT MSA graded carcasses 2010–23



Source: MLA

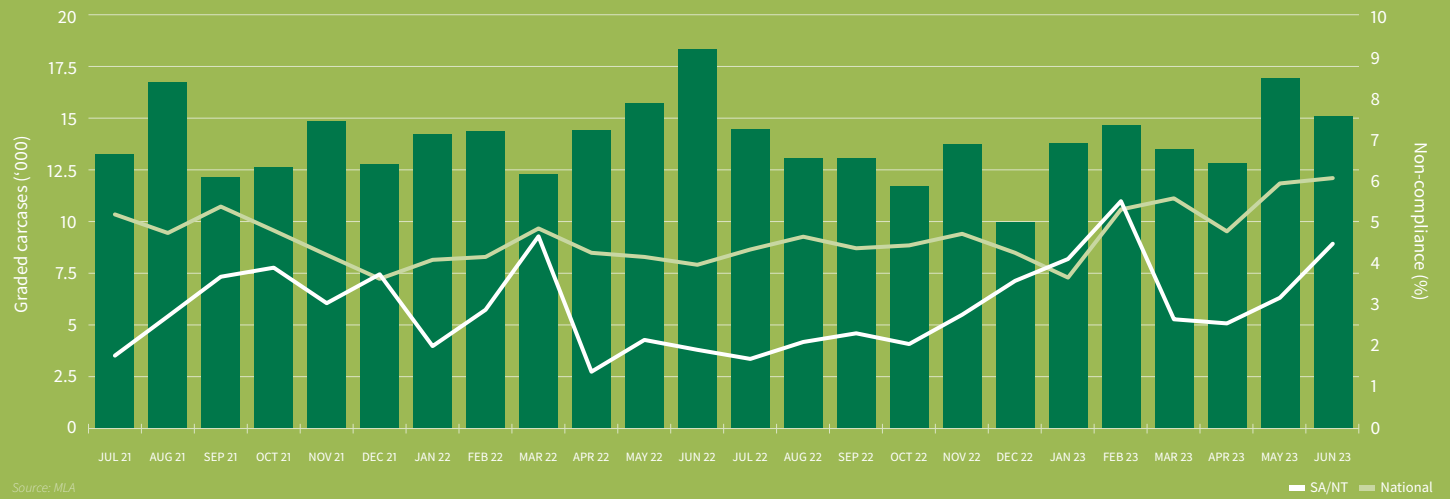
**Figure 60:** Proportion of carcasses presented for MSA grading to total SA/NT adult cattle slaughter 2010–23



Source: MLA

Between the 2019–2021 financial years and 2021–2023 financial years, SA saw an increase in the proportion of MSA graded carcasses to total slaughter, from 81% to 87%.

**Figure 61:** SA/NT total non-compliance to MSA minimum requirements 2021–23



Source: MLA



**Figure 62:** SA/NT non-compliance to MSA minimum requirements (rib fat and pH) 2021–23

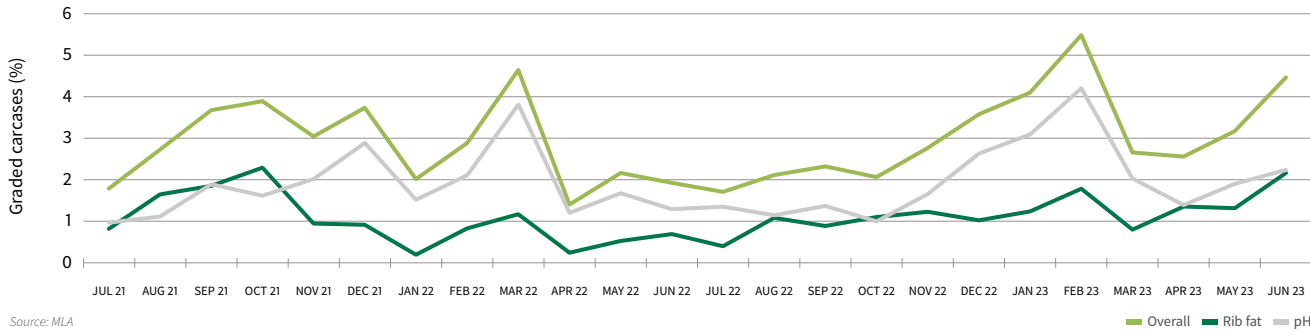


Figure 62 shows in 2021–23, non-compliance fluctuated between approximately 1.4% and 5.5% with the highest non-compliance in February 2023 and lowest in April 2022. The main reason for non-compliance was ultimate pH, peaking at around 4% in February 2023 an improvement in compliance by 1.8% from 2019–21 financial years. The highest incidences of rib fat non-compliance was June 2023 peaking at 2%.

**Figure 63:** SA/NT MSA Index performance 2021–23

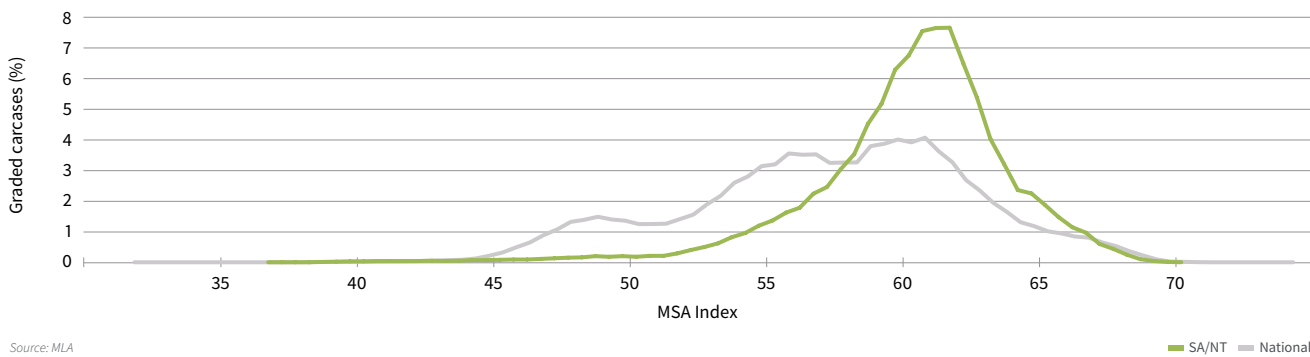


Figure 63 illustrates the MSA Index distribution of MSA graded carcasses across South Australia and the Northern Territory, and nationally. On average, the SA/NT MSA Index was higher than the national MSA Index and has the highest average MSA Index when compared to the other states. This is due to the low HGP usage (8%), slightly higher marbling, lower average ossification and hump height in proportion to carcass weight, when compared to national figures.

**Table 33:** Carcass attributes, lean meat yield (%) and MSA Index of MSA graded carcasses in SA/NT 2021–23 (all traits are independent of each other)

	Top 5%	Average	Bottom 5%
Carcass weight (kg)	438.0	330.6	248.6
Hump height (mm)	45	65	95
Ossification	110	170	230
MSA marbling	600	380	250
Rib fat (mm)	15	8	4
EMA (cm <sup>2</sup> )	93	77	60
Lean meat yield (%)	62.5	58.8	53.5
MSA Index	65.76	60.54	54.17

**Table 34:** SA/NT MSA Index percentile bands 2021–23

	SA/NT	National
Top 1%	67.59	68.13
Top 5%	65.76	65.67
Top 10%	64.57	63.81
Top 25%	62.68	61.18
Top 50%	61.00	57.91
Average	60.54	57.45
Bottom 25%	58.93	54.16
Bottom 10%	56.16	49.63
Bottom 5%	54.17	47.92
Bottom 1%	47.56	45.40

## SOUTH AUSTRALIA/NORTHERN TERRITORY

## Eating quality benchmarks for MSA graded cattle

## Identifying opportunities for improvement

Percentile band tables are ranked by the MSA Index. The carcass traits displayed are the average of cattle within the percentile band. These are presented by feed type, HGP status and sex. These assist producers to match their production system and benchmark their herd's performance. For example, if a producer's production system was based on HGP-free, non-grainfed, male cattle they would focus on **Table 35**. If the producer's average MSA Index was 60.96 or above, they would be in the top 50th percentile of the state for that trait. If the producer wanted to improve their eating quality to the top 25%, they would need to implement practices to improve their MSA Index to 62.25. Carcasses in the top 25% percentile had similar hump heights but lower ossification scores, higher MSA marbling and higher rib fat when compared to cattle in the top 50%.

**Table 35:** SA/NT percentile bands for MSA Index and their average carcass traits for HGP-free, non-grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
<b>MSA Index</b>	65.10	66.26	63.11	64.53	62.10	63.59	60.56	62.25	58.95	60.96	56.94	59.78	49.94	58.51	47.20	57.37	41.38	53.63
<b>Carcass weight (kg)</b>	289.6	339.6	298.1	338.3	295.1	330.2	288.2	328.8	282.1	322.8	304.8	318.7	278.9	311.7	232.3	309.1	221.7	312.5
<b>Hump height (mm)</b>	55	65	55	65	55	65	55	65	55	65	60	65	60	75	80	95	130	225
<b>Ossification</b>	150	130	160	140	160	140	170	140	190	150	390	160	550	170	550	180	560	190
<b>MSA marbling</b>	580	640	520	540	470	460	400	410	350	350	350	310	310	290	250	260	240	260
<b>Rib fat (mm)</b>	11	10	10	9	9	9	8	8	7	7	8	6	7	5	6	5	5	5

**Table 36:** SA/NT percentile bands for MSA Index and their average carcass traits for HGP-free, grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
<b>MSA Index</b>	66.08	68.18	64.13	66.77	63.12	65.79	61.71	63.92	60.37	62.28	59.10	60.89	58.03	58.96	57.35	57.15	55.76	54.07
<b>Carcass weight (kg)</b>	376.9	442.4	340.4	424.0	318.6	407.9	310.3	376.2	301.9	354.9	293.2	323.0	286.1	317.7	279.5	319.2	290.2	310.4
<b>Hump height (mm)</b>	50	50	55	55	55	55	55	60	55	65	55	75	55	90	60	115	90	130
<b>Ossification</b>	150	140	160	140	160	140	160	130	170	140	180	150	190	150	190	150	230	170
<b>MSA marbling</b>	670	820	570	680	490	580	430	470	370	360	330	330	310	320	290	320	320	300
<b>Rib fat (mm)</b>	13	15	11	13	11	12	10	11	9	10	7	7	7	7	6	7	8	6



**Table 37:** SA/NT percentile bands for MSA Index and their average carcass traits for HGP-treated, non-grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
<b>MSA Index</b>	59.62	60.77	57.90	59.12	57.10	58.37	55.84	57.11	54.46	55.92	53.27	54.66	52.33	53.05	51.85	50.96	49.03	45.47
<b>Carcass weight (kg)</b>	270.3	273.3	271.1	285.3	273.8	297.1	271.9	291.0	274.7	286.9	271.8	284.6	266.1	276.5	272.2	290.1	302.6	262.8
<b>Hump height (mm)</b>	60	60	55	60	55	60	55	60	55	60	55	65	55	70	70	145	145	180
<b>Ossification</b>	130	110	150	120	160	130	160	140	180	150	190	170	190	180	200	200	180	250
<b>MSA marbling</b>	510	480	480	450	450	440	400	420	360	360	320	330	310	310	290	330	240	290
<b>Rib fat (mm)</b>	10	10	10	8	10	8	9	7	8	6	6	6	5	5	7	6	10	4

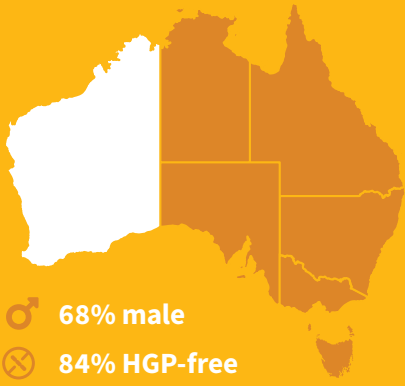
**Table 38:** SA/NT percentile bands for MSA Index and their average carcass traits for HGP-treated, grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
<b>MSA Index</b>	59.74	60.71	58.25	59.49	57.47	58.80	56.38	57.71	55.23	56.68	54.06	55.63	52.77	54.61	51.31	53.93	45.56	52.17
<b>Carcass weight (kg)</b>	340.2	427.9	346.1	419.4	342.8	417.5	339.6	407.1	317.9	384.9	293.3	351.7	280.5	332.5	275.5	315.1	256.6	302.5
<b>Hump height (mm)</b>	60	70	60	70	60	70	60	70	55	65	55	65	60	65	105	70	135	115
<b>Ossification</b>	170	170	180	180	180	180	190	180	190	180	200	180	210	180	260	190	270	220
<b>MSA marbling</b>	640	660	570	570	500	520	450	470	400	410	350	350	320	330	360	310	320	310
<b>Rib fat (mm)</b>	12	17	12	14	12	13	11	12	9	10	7	8	6	7	8	6	6	6



STATE SNAPSHOT

# Western Australia



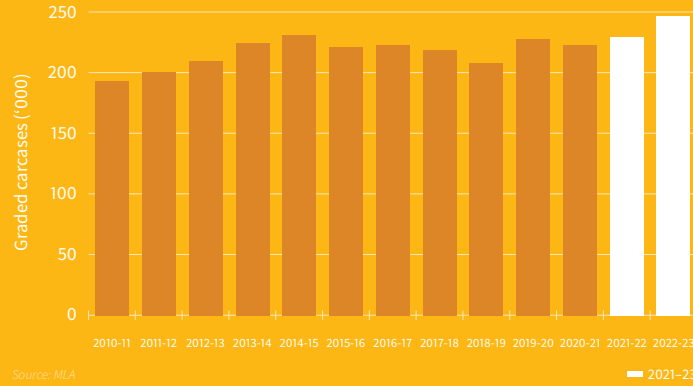
- 68% male**
- 84% HGP-free**
- 47% grainfed**
- 68% total MSA slaughter**
- 60.33 MSA Index average**

More than 476,000 MSA cattle were consigned from Western Australia, representing 7% of all MSA graded cattle in Australia in 2021–23.

9% of MSA-registered cattle producers reside in Western Australia. This equates to just over 4,300 MSA-registered beef producers, with more than 1,500 of these producers consigning cattle to the program in 2021–23.

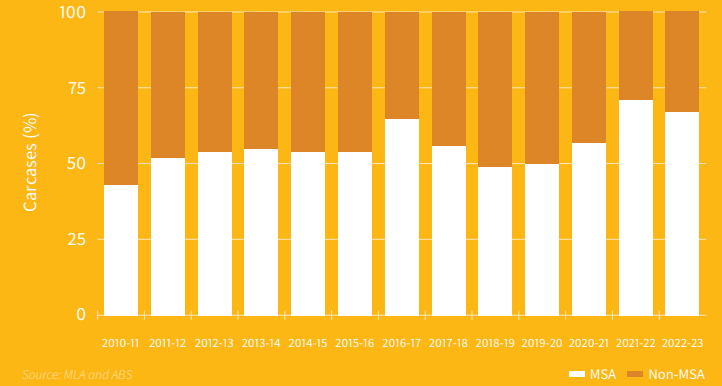
MSA-registered beef producers in Western Australia achieved 95.8% MSA compliance in 2021–23.

**Figure 64:** WA MSA graded carcasses 2010–23



Source: MLA

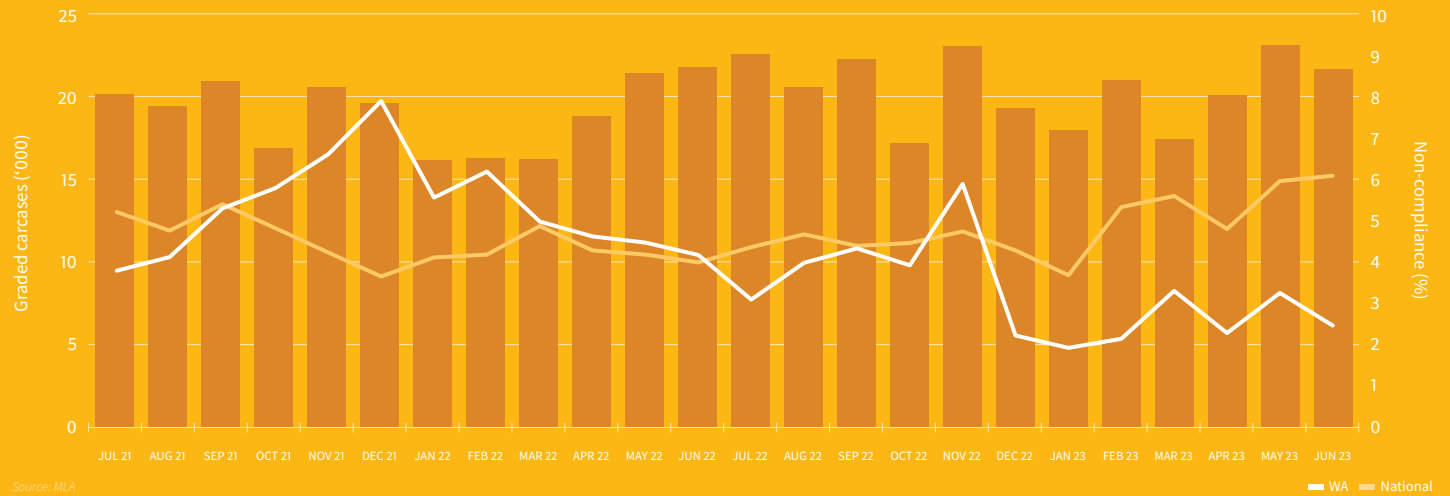
**Figure 65:** Proportion of carcasses presented for MSA grading to total WA adult cattle slaughter 2010–23



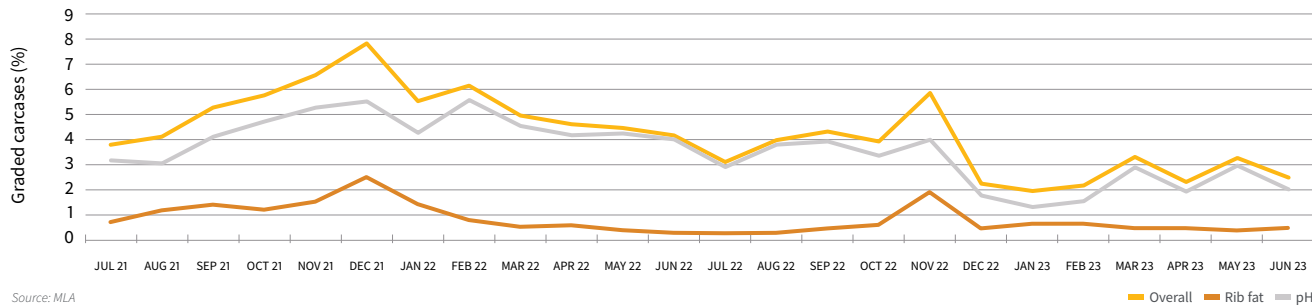
Source: MLA and ABS

Between the 2019–2021 financial years and 2021–2023 financial years, the proportion of MSA graded carcasses of total WA slaughter increased from 52% to 68%.

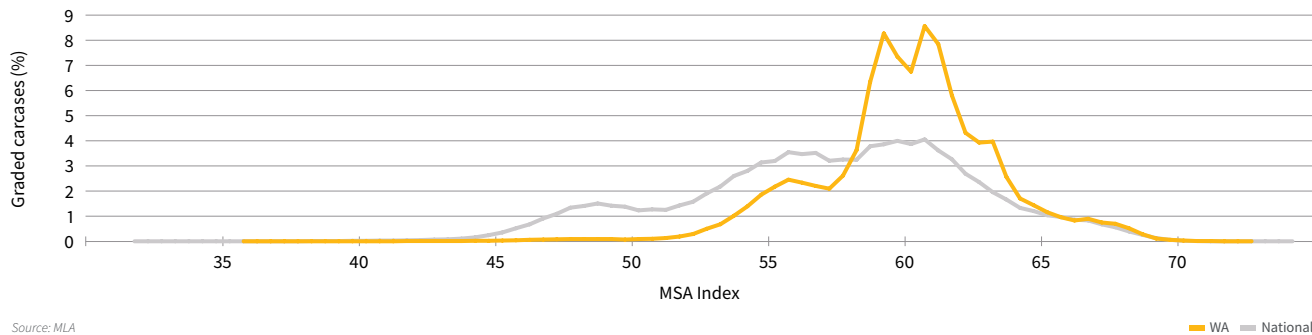
**Figure 66:** WA total non-compliance to MSA minimum requirements 2021–23



Source: MLA

**Figure 67:** WA non-compliance to MSA minimum requirements (rib fat and pH) 2021–23

Source: MLA

**Figure 68:** WA MSA Index performance 2021–23

Source: MLA

**Figure 68** illustrates the MSA Index distribution of MSA graded carcasses across WA and nationally. On average, the WA MSA Index was higher than the national MSA Index, in part due to lower usage of HGPs, higher presence of milk fed vealers, and lower average ossification and hump height in proportion to carcass weight, when compared to national figures.

In the 2021–23 timeframe, non-compliance fluctuated between approximately 1.9% and 7.9% with the highest non-compliance observed in December 2021, and lowest in January 2023. The main reason for non-compliance was ultimate pH. However, there were higher incidences of rib fat non-compliance throughout the entire timeframe, when compared to the national data. Western Australia experiences large seasonal fluctuations which influence compliance, largely driven by the lower quality pasture at the end of spring into summer.

**Table 39:** Carcass attributes, lean meat yield (%) and MSA Index of MSA graded carcasses in WA 2021–23 (all traits are independent of each other)

	Top 5%	Average	Bottom 5%
Carcass weight (kg)	388.0	291.2	225.8
Hump height (mm)	45	65	85
Ossification	110	160	190
MSA marbling	550	380	280
Rib fat (mm)	13	8	4
EMA (cm <sup>2</sup> )	90	71	56
Lean meat yield (%)	62.4	59.0	54.7
MSA Index	65.82	60.33	54.69

**Table 40:** WA MSA Index percentile bands 2021–23

	SA/NT	National
Top 1%	68.27	68.13
Top 5%	65.82	65.67
Top 10%	64.14	63.81
Top 25%	62.18	61.18
Top 50%	60.50	57.91
Average	60.33	57.45
Bottom 25%	58.78	54.16
Bottom 10%	55.90	49.63
Bottom 5%	54.69	47.92
Bottom 1%	51.31	45.40

## WESTERN AUSTRALIA

## Eating quality benchmarks for MSA graded cattle

## Identifying opportunities for improvement

The percentile band tables are ranked by the MSA Index. The carcass traits displayed are the average of cattle within the percentile band. These are presented by feed type, HGP status and sex. These assist producers to match their production system and benchmark their herd's performance. For example, if a producer's production system was based on HGP-free, non-grainfed, male cattle they would focus on **Table 41**. If the producer's average MSA Index was 60.95 or above, they would be in the top 50th percentile of the state for that trait. If the producer wanted to improve their eating quality to the top 25%, they would need to implement practices to improve their MSA Index to 62.32. Carcasses in the top 25% percentile had similar hump heights but lower ossification scores, higher MSA marbling and higher rib fat when compared to cattle in the top 50%.

**Table 41:** WA percentile bands for MSA Index and their average carcass traits for HGP-free, non-grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
<b>MSA Index</b>	66.59	68.53	64.57	66.04	63.39	64.03	61.61	62.32	59.97	60.95	58.67	59.70	56.54	58.85	52.31	58.13	46.67	55.22
<b>Carcass weight (kg)</b>	244.0	255.4	247.2	261.9	259.4	299.0	271.7	303.5	265.1	303.6	252.5	284.1	253.1	273.8	268.4	277.6	227.9	283.8
<b>Hump height (mm)</b>	45	50	50	55	55	60	60	60	60	65	60	65	85	70	80	85	95	145
<b>Ossification</b>	130	100	140	110	140	130	150	130	170	150	190	170	250	170	460	170	510	160
<b>MSA marbling</b>	460	400	400	380	400	440	390	400	360	350	330	350	320	330	320	300	300	290
<b>Rib fat (mm)</b>	9	8	9	7	8	8	9	8	8	7	7	7	8	6	9	7	7	7

**Table 42:** WA percentile bands for MSA Index and their average carcass traits for HGP-free, grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
<b>MSA Index</b>	68.43	68.60	66.47	66.96	64.69	65.43	62.46	63.43	61.01	61.53	59.45	60.06	58.59	59.14	57.90	58.42	51.42	55.32
<b>Carcass weight (kg)</b>	389.4	404.0	374.7	388.5	337.9	351.3	290.4	314.3	275.7	310.5	263.5	292.0	258.2	280.2	271.3	303.4	295.9	318.1
<b>Hump height (mm)</b>	65	70	65	70	65	65	60	60	60	65	65	65	60	70	75	95	95	140
<b>Ossification</b>	140	140	160	150	170	140	150	130	160	140	180	170	190	170	230	160	530	150
<b>MSA marbling</b>	960	1000	880	880	730	640	440	430	370	370	360	360	340	350	320	320	320	310
<b>Rib fat (mm)</b>	13	13	12	11	10	10	9	9	8	8	8	8	7	7	9	8	13	8

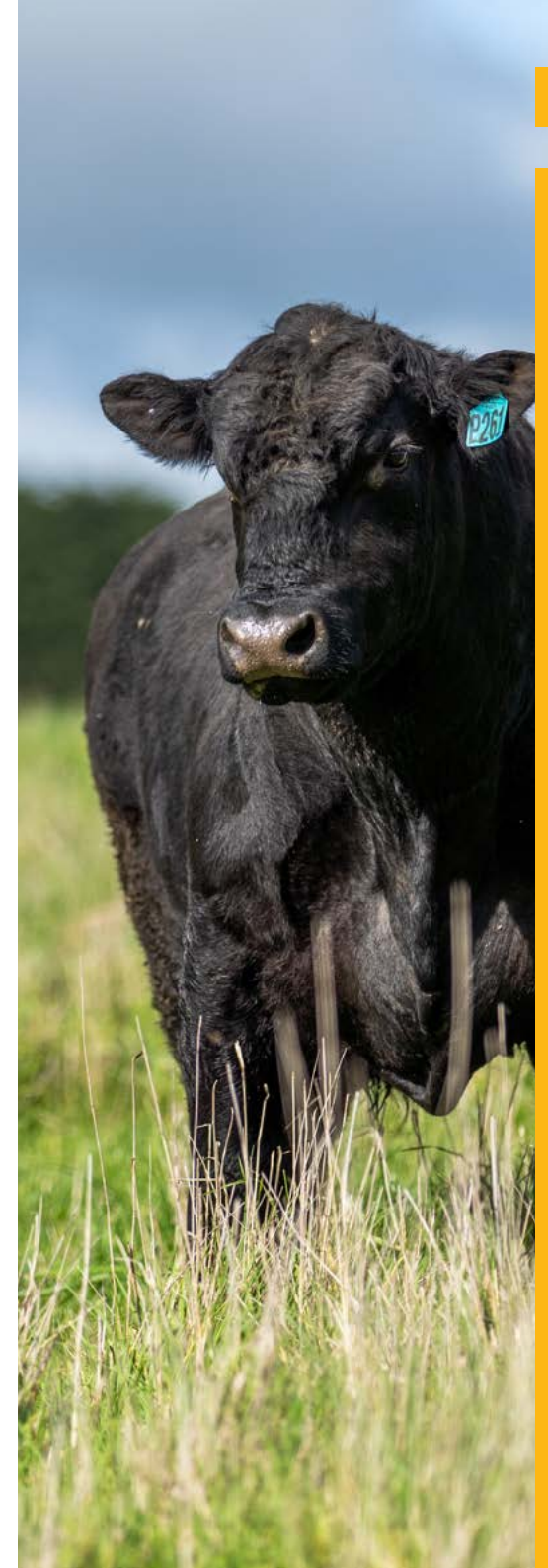


**Table 43:** WA percentile bands for MSA Index and their average carcass traits for HGP-treated, non-grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
MSA Index	61.51	62.73	59.92	60.66	58.90	59.66	57.20	57.68	55.80	56.30	54.44	55.23	53.18	54.24	52.31	53.52	45.57	50.85
Carcass weight (kg)	247.8	254.2	244.1	264.9	243.6	271.1	257.3	283.1	261.9	298.2	257.8	289.7	253.0	285.5	250.7	289.2	268.3	322.7
Hump height (mm)	45	50	45	55	45	55	50	55	50	55	50	60	50	60	80	80	110	165
Ossification	140	110	140	120	150	130	140	130	160	140	180	160	190	160	230	170	470	170
MSA marbling	440	370	380	360	360	360	360	360	350	340	330	320	320	310	320	300	350	290
Rib fat (mm)	9	7	8	7	8	7	10	8	9	8	7	6	7	6	8	7	10	10

**Table 44:** WA percentile bands for MSA Index and their average carcass traits for HGP-treated, grainfed cattle

	Top 1%		Top 5%		Top 10%		Top 25%		Top 50%		Bottom 25%		Bottom 10%		Bottom 5%		Bottom 1%	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
MSA Index	59.31	60.70	57.94	59.21	57.27	58.40	56.22	57.21	55.15	56.22	54.11	55.32	53.12	54.43	52.59	53.84	50.14	52.43
Carcass weight (kg)	272.6	288.3	275.8	287.0	273.1	286.3	269.1	289.6	267.2	286.0	266.5	282.9	261.1	283.1	247.2	277.6	240.5	285.7
Hump height (mm)	50	55	50	55	50	55	50	55	50	55	50	60	50	60	60	70	140	105
Ossification	140	110	150	120	150	120	160	130	170	140	180	150	190	160	190	170	190	180
MSA marbling	540	470	470	410	430	400	390	390	360	340	330	320	320	310	310	310	280	300
Rib fat (mm)	11	10	10	9	10	9	9	9	8	8	7	7	7	7	6	6	8	7



# Eating quality of the cuts MSA carcasses produced in 2021–23

New to the 2023 MSA Australian Beef Eating Quality Insights report are insights about the eating quality grading of four example cuts from the carcass – tenderloin, cube roll, striploin, and rump – from MSA carcasses in 2021–23.

The data presented shows the proportion of cuts across each of the MSA eating quality grades or MSA star ratings. To demonstrate the differences production factors and traits have on eating quality, the eating quality of cuts from non-HGP-treated carcasses at five days ageing (Figure 70), have been compared to cuts from HGP-treated carcasses at five days ageing (Figure 71).

MSA consumer sensory testing has validated that HGP treatment has a negative impact on eating quality of some high value cuts across the carcass, partly due to an increase in the enzyme which inhibits ageing. This is why HGP-treated carcasses have a lower MSA Index.

The data presented demonstrates that a smaller proportion of higher value cuts are available to supply to consumers when

HGPs are used compared to not using HGPs. Virtually all steps in the production process have some impact on the eventual consumer experience or outcome. While HGPs have been presented as an example, changes in other traits such as ossification or marbling will also affect the proportion of available cuts across the eating quality grades available to consumers.

## How is eating quality grading determined?

The MSA Index is a weighted average of the predicted MSA eating quality scores of 39 MSA cuts in a carcass.

Meat eating score (MQ4) is the predicted eating quality score of the individual cuts in the carcass, based on consumer ratings of

tenderness, juiciness, flavour, and overall liking.

Each cut is allocated an MQ4 out of 100, and a beef cut must achieve a minimum of 46 points to be allocated an MSA star rating.

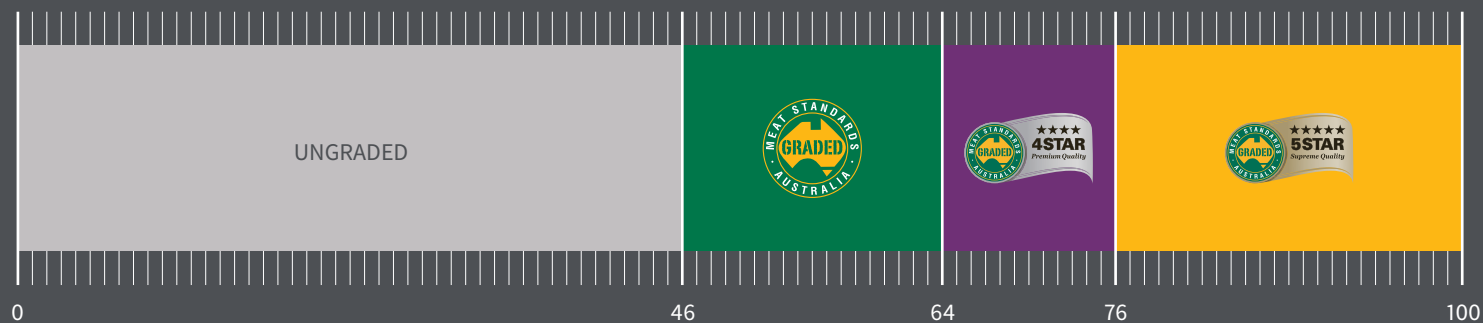
These scores determine the eating quality grade or MSA star rating they achieve at a certain days' ageing and cooking method.

Brand owners use the meat eating quality score to define the minimum MSA specifications for their brand or range of brands they produce. This ensures that consumers can have confidence in the brand because of consistency in the eating quality.

Figure 69 shows MSA scores that form the cut-off point between each MSA star rating, which was determined through extensive consumer sensory data as part of continual MSA model development.

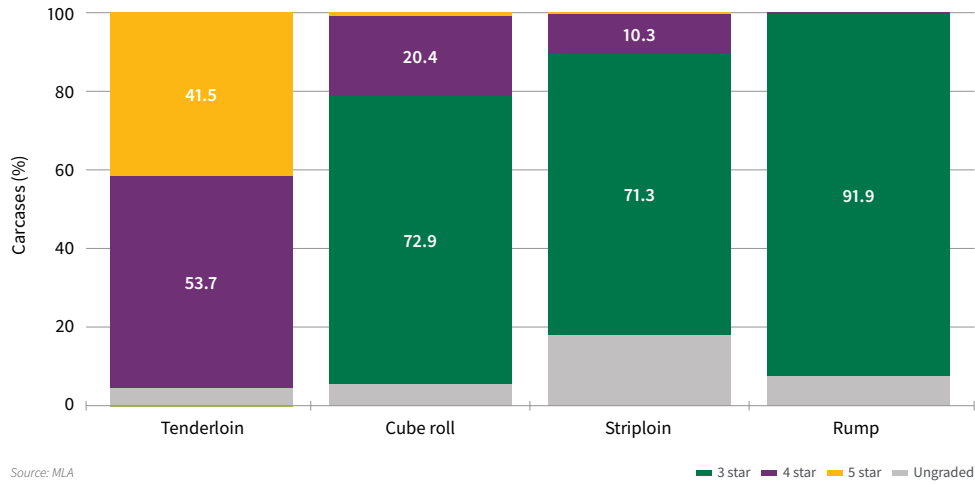


Figure 69: Eating quality score and MSA star rating ranges



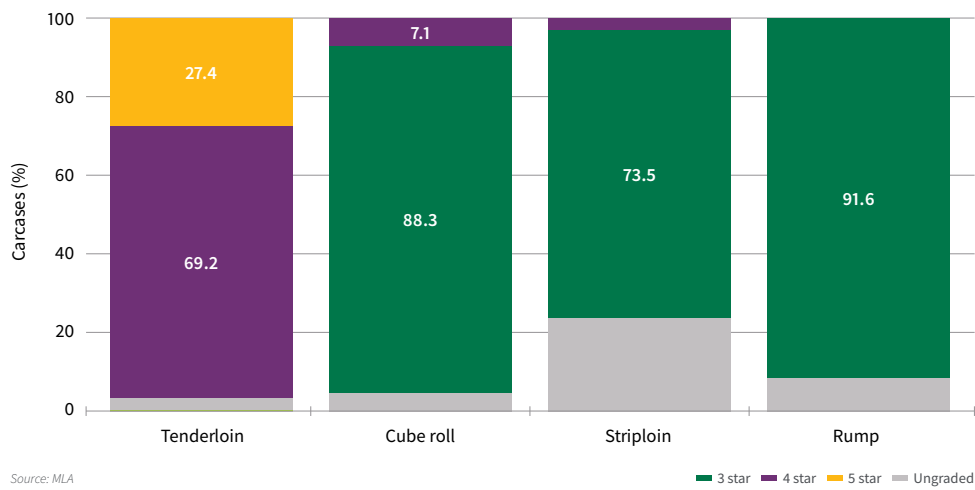


**Figure 70:** Eating quality by cut at 5 days ageing for non-HGP-treated cattle 2021-23



Source: MLA

**Figure 71:** Eating quality by cut at 5 days ageing for HGP-treated cattle 2021-23



Source: MLA





<b>5</b>	Average costs of potential lost opportunities by disease or defect condition	<b>13</b>	<b>19</b>	NSW/ACT MSA Index percentile bands 2021–23	<b>27</b>	<b>33</b>	Carcase attributes, lean meat yield (%) and MSA Index of MSA graded carcasses in SA/NT 2021–23	<b>39</b>
<b>6</b>	Carcase attributes, lean meat yield (%) and MSA Index of all MSA graded carcasses by feed type 2021–23	<b>16</b>	<b>20</b>	NSW/ACT percentile bands for MSA Index and their average carcass traits for HGP-free, non-grainfed cattle	<b>28</b>	<b>34</b>	SA/NT MSA Index percentile bands 2021–23	<b>39</b>
<b>7</b>	MSA Index percentile bands by feed type 2021–23	<b>16</b>	<b>21</b>	NSW/ACT percentile bands for MSA Index and their average carcass traits for HGP-free, grainfed cattle	<b>28</b>	<b>35</b>	SA/NT percentile bands for MSA Index and their average carcass traits for HGP-free, non-grainfed cattle	<b>40</b>
<b>8</b>	MSA Index percentile bands by HGP status 2021–23	<b>18</b>	<b>22</b>	NSW/ACT percentile bands for MSA Index and their average carcass traits for HGP-treated, non-grainfed cattle	<b>29</b>	<b>36</b>	SA/NT percentile bands for MSA Index and their average carcass traits for HGP-free, grainfed cattle	<b>40</b>
<b>9</b>	Carcass attributes, lean meat yield (%) and MSA Index of all MSA graded carcasses by HGP status 2021–23	<b>19</b>	<b>23</b>	NSW/ACT percentile bands for MSA Index and their average carcass traits for HGP-treated, grainfed cattle	<b>29</b>	<b>37</b>	SA/NT percentile bands for MSA Index and their average carcass traits for HGP-treated, non-grainfed cattle	<b>41</b>
<b>10</b>	MSA Index percentile band by sex 2021–23	<b>20</b>	<b>24</b>	Carcass attributes, lean meat yield (%) and MSA Index of MSA graded carcasses in VIC 2021–23	<b>31</b>	<b>38</b>	SA/NT percentile bands for MSA Index and their average carcass traits for HGP-treated, grainfed cattle	<b>41</b>
<b>11</b>	Carcass attributes, lean meat yield (%) and MSA Index of all MSA graded carcasses by sex 2021–23	<b>21</b>	<b>25</b>	VIC MSA Index percentile bands 2021–23	<b>31</b>	<b>39</b>	Carcass attributes, lean meat yield (%) and MSA Index of MSA graded carcasses in WA 2021–23	<b>43</b>
<b>12</b>	Carcass attributes, lean meat yield (%) and MSA Index of MSA graded carcasses in QLD 2021–23	<b>23</b>	<b>26</b>	VIC percentile bands for MSA Index and their average carcass traits for HGP-free, non-grainfed cattle	<b>32</b>	<b>40</b>	WA MSA Index percentile bands 2021–23	<b>43</b>
<b>13</b>	QLD MSA Index percentile bands 2021–23	<b>23</b>	<b>27</b>	VIC percentile bands for MSA Index and their average carcass traits for HGP-free, grainfed cattle	<b>32</b>	<b>41</b>	WA percentile bands for MSA Index and their average carcass traits for HGP-free, non-grainfed cattle	<b>44</b>
<b>14</b>	QLD percentile bands for MSA Index and their average carcass traits for HGP-free, non-grainfed cattle	<b>24</b>	<b>28</b>	VIC percentile bands for MSA Index and their average carcass traits for HGP-treated, non-grainfed cattle	<b>33</b>	<b>42</b>	WA percentile bands for MSA Index and their average carcass traits for HGP-free, grainfed cattle	<b>44</b>
<b>15</b>	QLD percentile bands for MSA Index and their average carcass traits for HGP-free, grainfed cattle	<b>24</b>	<b>29</b>	VIC percentile bands for MSA Index and their average carcass traits for HGP-treated, grainfed cattle	<b>33</b>	<b>43</b>	WA percentile bands for MSA Index and their average carcass traits for HGP-treated, non-grainfed cattle	<b>45</b>
<b>16</b>	QLD percentile bands for MSA Index and their average carcass traits for HGP-treated, non-grainfed cattle	<b>25</b>	<b>30</b>	Carcass attributes, lean meat yield (%) and MSA Index of MSA graded carcasses in TAS 2021–23	<b>35</b>	<b>44</b>	WA percentile bands for MSA Index and their average carcass traits for HGP-treated, grainfed cattle	<b>45</b>
<b>17</b>	QLD percentile bands for MSA Index and their average carcass traits for HGP-treated, grainfed cattle	<b>25</b>	<b>31</b>	TAS MSA Index percentile bands 2021–23	<b>35</b>			
<b>18</b>	Carcass attributes, lean meat yield (%) and MSA Index of MSA graded carcasses in NSW/ACT 2021–23	<b>27</b>	<b>32</b>	TAS percentile bands for MSA Index and their average carcass traits for HGP-free, non-grainfed cattle	<b>36</b>			

# Resources

There are a range of free online resources available to help producers achieve their desired MSA outcomes. They include:

## MSA beef information kit

[mla.com.au/msa-beef-info-kit](https://mla.com.au/msa-beef-info-kit)

## MSA Index calculator

[mymsa.com.au/beef/calculator](https://mymsa.com.au/beef/calculator)

## MLA genetics hub

[genetics.mla.com.au](https://genetics.mla.com.au)

## MLA stocking rate calculator

[mla.com.au/stocking-rate-calculator](https://mla.com.au/stocking-rate-calculator)

## MLA phosphorus hub

[mla.com.au/phosphorus-hub](https://mla.com.au/phosphorus-hub)

## Profitable Grazing Systems

[mla.com.au/pgs](https://mla.com.au/pgs)

## Producer Demonstration Sites

[mla.com.au/pds](https://mla.com.au/pds)

## BredWell FedWell

[mla.com.au/bwfw](https://mla.com.au/bwfw)

## EDGE network

[mla.com.au/edgenetwork](https://mla.com.au/edgenetwork)



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**MLA's 2023 MSA Australian Beef Eating Quality Insights  
is available online at [mla.com.au/abeqi](http://mla.com.au/abeqi)**