

BEEFAUSTRALIA2009

AUSTRALIA'S NATIONAL BEEF EXPOSITION

NATIONAL BEEF CARCASS COMPETITION



JUDGING CRITERIA

OVERVIEW OF POINTS ALLOCATION

A summary of the judging criteria and points allocation for the 2009 National Beef Carcass Competition are shown in Table 1.

Table 1. Judging criteria and points allocation

1. Market Specifications		(25 points)
P8 subcutaneous fat depth		15
Meat colour		5
Subcutaneous fat distribution		5
Penalties		
- Out of carcass weight range		Disqualification
- Out of dentition specification		Disqualification
- Bruising (> Bruise score 4)		Disqualification
- Fat colour score > 3 (Grainfed)		Disqualification
- Fat colour score >3 (Pasture finished)		Disqualification
2. Saleable Meat Yield		(40 points)
Subcutaneous fat depth at the rib site		10
Eye muscle area		30
3. MSA Eating Quality ¹		(Combined score 35 points)
Ultimate meat pH	units	
Ossification score	100 - 590	
Hump height	mm	
AUS-MEAT Marbling	0 - 6	
MSA Marbling	100 - 1190	
Sex	Male or female	
Total		100

¹To receive MSA Eating Quality points, carcasses must meet the minimum MSA carcass specifications of:

1. Minimum of 3mm of subcutaneous fat at the rib measurement site
2. Adequate subcutaneous fat distribution
3. pH of 5.70 or less
4. Meat colour 1b and no greater than 3.

Championship trophies will be decided on individual carcass scores only (i.e. the highest individual score out of 100).

1. COMPLIANCE TO MARKET SPECIFICATIONS (25 POINTS)

Market specifications and classes for the 2009 National Beef Carcass Competition are shown in Table 2.

Table 2. Market specifications by each class

Class	Description	Carcass weight (kg)	Dentition	Optimum fat subcutaneous fat depth P8 site (mm)
1	Medium Trade Pasture Fed	180-260	0-2	7-10
4	Medium Trade Grain Fed	180-260	0-2	
2	Heavy Trade Pasture Fed	260.1-340	0-2	9-12
5	Heavy Trade Grain Fed	260.1-340	0-2	
3	Export Pasture Fed	300-420	0-6	10-15
6	Export Grain Fed	300-420	0-4	

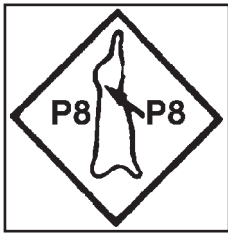
Note: All classes are for a pen of three steers or three heifers, not mixed sex pens

1.1 Carcass weight. Carcasses outside the specified weights will be disqualified. Bonus points will awarded where individual animal carcass weights within a pen are even as shown in Table 3.

Table 3. Carcass weight bonus points

Weight variation (kg)	Points
0-5	5
6-10	4
11-15	3
16-20	2
21-25	1
>25	0

1.2 Dentition. Carcasses outside the specified dentition range will be disqualified. No bonus points are awarded for dentition because ossification (a measure of physiological maturity of a carcass - younger, high growth animals have higher scores) is rewarded under the MSA Eating Quality scheme.



1.3 P8 subcutaneous fat depth (15 points) is measured on the hot carcass at the P8 site over the rump, and is the method of describing fatness in the AUS-MEAT national carcass description language. It is commonly used to set market

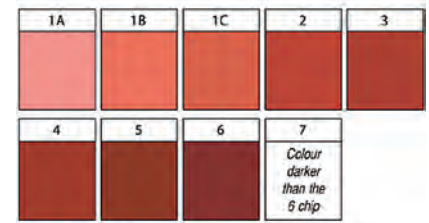
targets and for payment of premiums and discounts. The optimum P8 subcutaneous fat depth is in the range set for each class in the carcass specifications (Table 3). Maximum points are available for the range of optimal P8 subcutaneous fat depths as shown in Table 4.

Table 4. P8 subcutaneous fat depth points allocation

P8 Fat depth (mm)	Class					
	1	2	3	4	5	6
1	0	0	0	0	0	0
2	2	2	0	2	2	0
3	3	3	0	3	3	0
4	5	5	0	5	5	0
5	11	6	3	11	6	3
6	13	11	6	13	11	6
7	15	12	6	15	12	6
8	15	13	12	15	13	12
9	15	15	13	15	15	13
10	15	15	15	15	15	15
11	13	15	15	13	15	15
12	12	15	15	12	15	15
13	11	13	15	11	13	15
14	9	13	15	9	13	15
15	7	12	15	7	12	15
16	6	12	13	6	12	13
17	5	9	13	5	9	13
18	3	9	12	3	9	12
19	2	6	12	2	6	12
20	0	6	9	0	6	9
21	0	0	9	0	0	9
22	0	0	6	0	0	6
23	0	0	6	0	0	6
>24	0	0	0	0	0	0

1.4 Meat colour (5 points)

Meat colour is recorded using AUS-MEAT standard meat colour chips on the bloomed eye muscle in a range of 1A (very pale) to 7 (very dark purple). Colour strongly influences consumer appeal, with bright, pinkish colours in the range 1B to 3 being most acceptable to consumers. Carcasses must meet the MSA specification of meat colour 1B to 3 to receive eating quality points.



Colours displayed show the darkest colour of each grading and it is a guide only, not a true representation.

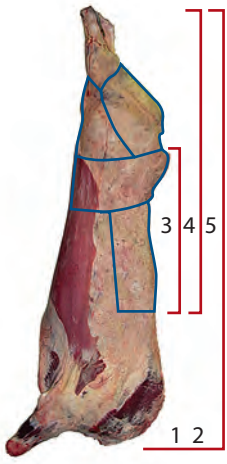
As shown in Table 5, maximum points are available for meat colour scores of 1B and 1C in each class.

Table 5. Meat colour points allocation

Meat colour score	Class					
	1	2	3	4	5	6
1A	2	2	2	2	2	2
1B	5	5	5	5	5	5
1C	5	5	5	5	5	5
2	4	4	4	4	4	4
3	3	3	3	3	3	3
4	2	2	2	0	0	2
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0

1.5 Fat Distribution (5 points). An ideal carcass will have a thin, even fat cover over all the important cuts of meat, especially over the rump and forward along the backline. This contributes to enhancing eating quality by slowing the carcass chilling rate, and reduces tissue weight loss due to dehydration as the carcass chills.

Carcasses will lose points for inadequate cover, or for excessive heavy, deposits. Key areas for assessment of excessive fat deposits are the subcutaneous fat (especially over the ribs), intermuscular (seam) fat and internal fat in the cod, udder, ribs and brisket.



Carcases must have adequate fat cover over the highlighted areas to receive maximum points.

Points	Description
5	Meets minimum fat requirements with good even fat cover over entire body without excess deposits of subcutaneous or seam fat.
4	Meets minimum fat requirements with good even fat cover over the butt
3	Meets minimum fat requirements with fat cover over major primal cuts - Cube roll, Striploin and Rump.
2	Lean carcasses or carcasses with uneven fat distribution. Also carcasses with some excess fat deposits or seam fat.
1	Fails to meet minimum fat requirements or overfat carcasses with excessive fat deposits.
0	Extremely lean or extremely fat carcasses

1.6 Fat colour is assessed on internal seam (intermuscular) fat at the quartering site and is recorded for the entrant's information but has no direct impact on eating quality. Excessive yellowing or softness of fat may affect the saleability of the carcase. Fat colour using the AUS-MEAT chips and ranges from 0 (bright white) to 9 (very yellow).



0	1	2	3	4
5	6	7	8	9

Colours displayed show the darkest colour of each grading and it is a guide only, not a true representation.

No points are allocated for fat colour. Carcasses with unacceptable fat colour as indicated in Table 6 will be disqualified.

Table 6. Subcutaneous fat colour eligibility

Fat colour score	Class					
	1	2	3	4	5	6
1	eligible	eligible	eligible	eligible	eligible	eligible
2	eligible	eligible	eligible	eligible	eligible	eligible
3	eligible	eligible	eligible	eligible	eligible	eligible
≥4	disqualified	disqualified	disqualified	disqualified	disqualified	disqualified

2. SALEABLE MEAT YIELD (40 POINTS)

Saleable meat yield is the proportion of the carcase that is saleable as primal meat cuts and meat trimmings. It excludes bone and waste fat. High-yielding carcasses are preferred which are heavily muscled with a thin, even fat cover, however the subcutaneous fat depth and fat distribution must be adequate to meet quality requirements.

2.1 Subcutaneous fat depth (10 points) at a rib site where quartered is a good indicator of carcase yield with over fat animals having lower yields. It is measured on subcutaneous fat in millimetres at the quartering site (usually 10/11th or 12/13th rib). A range of optimum subcutaneous fat depths has been set for each class in the specifications. To receive eating quality points, carcasses must meet the MSA minimum standard of 3 mm at the quartering site. The range of optimal rib subcutaneous fat depths for each class is shown in Table 7.



Table 7. Optimal subcutaneous fat depths at two rib sites

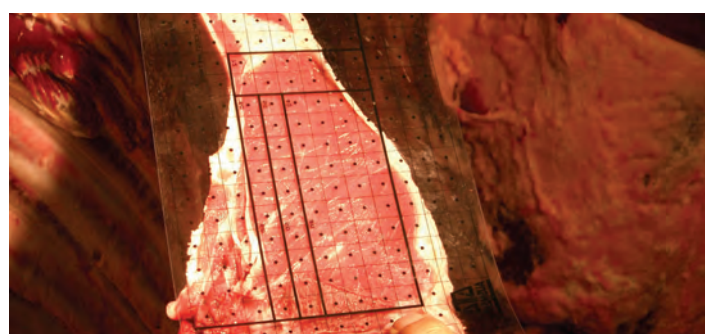
Class	Description	Optimal subcutaneous fat depth at a rib site(mm)	
		10/11 th Rib site	12/13 th Rib site
1	Medium Trade Pasture Fed	6-8	5-7
4	Medium Trade Grain Fed	6-8	5-7
2	Heavy Trade Pasture Fed	8-10	7-9
5	Heavy Trade Grain Fed	8-10	7-9
3	Export Pasture Fed	10-12	10-12
6	Export Grain Fed	10-12	10-12

Points allocated for subcutaneous fat depth at a rib site are shown in Table 8. Maximum points are available for the optimal range of subcutaneous fat depths for each class.

Table 8. Subcutaneous fat depth points allocation for two rib sites

Classes 1 & 4				Classes 2 & 5				Classes 3 & 6			
10/11 th Rib fat (mm)	Points	12/13 th Rib fat (mm)	Points	10/11 th Rib fat (mm)	Points	12/13 th Rib fat (mm)	Points	10/11 th Rib fat (mm)	Points	12/13 th Rib fat (mm)	Points
1	0	1	2	1	0	1	0	1	0	1	0
2	2	2	4	2	0	2	2	2	0	2	0
3	4	3	6	3	2	3	4	3	0	3	0
4	8	4	8	4	4	4	6	4	0	4	4
5	9	5	10	5	6	5	8	5	0	5	5
6	10	6	10	6	8	6	9	6	4	6	6
7	10	7	10	7	9	7	10	7	6	7	7
8	10	8	9	8	10	8	10	8	8	8	8
9	9	9	8	9	10	9	10	9	9	9	9
10	8	10	6	10	10	10	9	10	10	10	10
11	6	11	4	11	9	11	8	11	10	11	10
12	4	12	2	12	8	12	6	12	10	12	10
13	2	13	0	13	6	13	4	13	9	13	9
14	0	14	0	14	4	14	4	14	8	14	8
15	0	15	0	15	4	15	2	15	7	15	6
16	0	16	0	16	4	16	0	16	6	16	4
17	0	17	0	17	0	17	0	17	4	17	0
>18	0	>18	0	>18	0	>18	0	>18	0	>18	0

2.2 Eye muscle area (30 points) is a good indicator of the saleable red meat content of the carcass. The calculation is based on the area of the eye muscle measured in square centimetres at the quartering site (10/11th or 12/13th rib) in relation to the carcass's hot standard weight.



The points for eye muscle area are calculated using one of the following equations:

Eye muscle area measured at the 10/11th quartering point

$$\text{Points} = ((\text{EMA}^{10/11\text{th}} * 1.13) / 2) - (\text{HSCW} / 11) - 2$$

Eye muscle area measured at the 12/13th quartering point

$$\text{Points} = (\text{EMA}^{12/13\text{th}} / 2) - (\text{HSCW} / 11) - 2$$

Some examples of calculated points are shown in Table 9.

Table 9. Example of points calculation for eye muscle area

HSCW (kg)	EMA ^{10/11th} (cm ²)	EMA ^{12/13th} (cm ²)	Points ^{10/11th} /30	Points ^{12/13th} /30
300	80	90	15.9	15.7
300	100	105	27.2	23.2
300	100	110	27.2	25.7
310	100	110	26.3	24.8

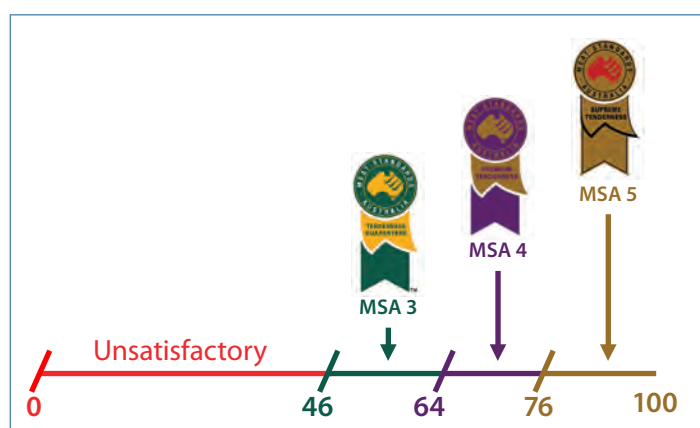
3. MSA EATING QUALITY (COMBINED SCORE OF 35 POINTS)

The grading of a carcass by Meat Standards Australia (MSA) is based on the principle that:

1. The potential meat quality of an animal must be realised as far as possible by minimising animal stress between farm and slaughter, and by optimising chilling/electrical stimulation (accelerated conditioning) conditions during processing
2. There are known variable factors that affect the eating quality of individual muscles and adjustments are made for their effect.

Based on consumer research the MSA Grading Model predicts eating quality of 40 bovine muscles by six different cooking methods and applies a score out of 100 for the individual muscle.

This score is called a consumer meat quality score. The score out of 100 is then applied to an eating quality grade **MSA 3**, **MSA 4** or **MSA 5** as shown in the following figure.



In the National Beef Carcass Competition, the MSA eating quality score is the average MSA consumer eating quality score of 16 major primal cuts, when cooked by their optimum method (a total of 22 scores) as shown in Table 10. Scores have been scaled to deliver a maximum of 35 points for eating quality. This score is a combined score based on measurement/assessment of key meat quality parameters. It is a multi factorial score with no one single factor alone responsible for maximum points.

Table 10. MSA cut by cooking method matrix

*Eating Quality points are calculated for each cut and their optimal cook method						
Cut by Cook Method						
Tenderloin	✓	✓				
Cube roll	✓	✓				
Striploin	✓	✓				
Oyster blade	✓	✓				
Rump	✓	✓				
Knuckle		✓	✓			
Blade						✓
Chuck tender						✓
Outside				✓		
Eye Round						✓
Topside						✓
Chuck						✓
Thin Flank			✓			
Brisket						✓
Forequarter Shin						✓
Intercostals			✓			

If carcasses fail to meet MSA minimum requirements, they are below the benchmark standard for quality table beef and will not receive an eating quality score in the competition.

3.1 Eating quality parameters and their effect on eating quality

The variables of greatest impact on the MSA Eating Quality score in the 2009 National Beef Carcass Competition are described in the following sections.

3.1.1 Ultimate pH

pH is a measure of acidity/alkalinity levels of meat. It is very important for keeping quality (shelf life) and is related to its cooking properties, colour and consumer acceptance.

After slaughter, the reserves of glycogen (energy) in the animal's muscles are converted to lactic acid, causing the pH to fall. As long as there is adequate glycogen present at slaughter, the pH will fall to within the normal range of 5.30 to 5.70. If there is not enough glycogen (due to stress

or poor nutrition) then pH will remain above the acceptable limit of pH 5.70 and the meat is likely to be dark in colour, with poor keeping quality.

High pH meat is more difficult to cook to the right degree of doneness. At the same temperature as a cooked normal steak, high pH meat appears much rarer and if further cooked will lose its juice and become tough and dry.

- MSA rejects carcasses with pH over 5.70
- A slight downward adjustment is made to eating quality of all cuts from carcasses as they approach pH 5.70
- To maintain high glycogen levels it is important to maintain a high level of nutrition and water prior to slaughter and minimise transport and handling stress.

3.1.2 Ossification (maturity) and carcass weight

Ossification score is a measure of physiological maturity of the beef carcass. Hot Standard Carcass Weight (HSCW) is used in conjunction with the ossification score to identify carcasses with greater weight for maturity - faster grown cattle have better eating quality.

As beef cattle mature the cartilage present around the bones of the spinal column gradually change into bone (ossify). The rate at which this occurs is reasonably predictable but is affected by factors such as sex and nutrition. The scale of ossification is 100 to 590. Cuts from carcasses with lower ossification at the same weight are graded higher. Increasing ossification has a cut-by-cut effect with a high effect on some cuts (e.g. rump) and a low effect on others (e.g. oyster blade).

Ossification score is influenced by a number of other factors:

- Heifers tend to have higher ossification scores at the same age compared to steers.
- Hormonal Growth Promotants (HGP) - treatment tends to increase ossification scores.
- Nutritional setbacks or injury can increase ossification score, and this is irreversible.

Ossification score is assessed at three different locations on the sawn chine: the 5 sacral vertebrae (Tail), 6 Lumbar (back) and first 13 thoracic vertebrae (ribs).

An example of ossification score shown in Table 11 compares two primal cuts, from animals different only in their ossification score with 38% tropical breed content, non HGP treated, HSCW 240 kg, Achilles tendon (AT) hung, hump height 75 mm, 400 MSA marbling score, meat colour 1C, subcutaneous rib fat 7 mm, pHu 5.55, aged for 5 days and cooking method 'Grill'.

MATURITY ASSESSMENT REGIONS

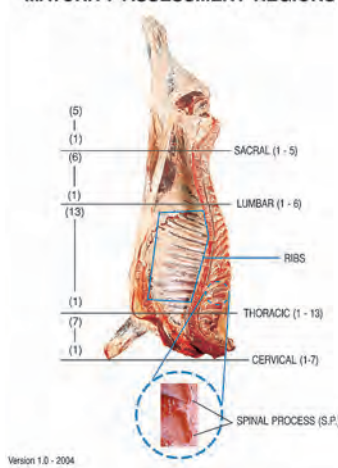


Table 11. The effect of ossification score on eating quality.

MSA Ossification Score	MSA Eating Quality Scores			
	Striploin		Rump	
	MSA actual score	Competition score	MSA actual score	Competition score
120	59	20.65	61	21.35
140	58	20.30	62	21.70
180	56	19.60	59	20.65
250	55	19.25	57	19.95
400	54	18.90	55	19.25

Note: Faster grown cattle will score higher

3.1.3 Hump height

Hump height is measured in increments of 5 mm on the hump muscle (*M. Rhomboideus*) on the animal's neck. Lower hump heights are associated with a higher MSA Grade.

3.1.4 MSA and AUS-MEAT Marbling Score

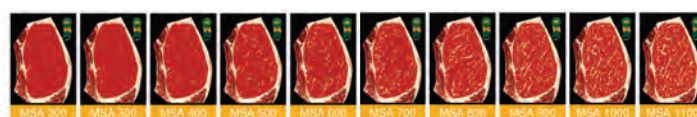
Marbling is the intramuscular fat (IMF), which appears as fine flecks within the muscle. It is deposited unevenly throughout the muscles in the body, increasing through the carcass towards the neck and decreasing towards the tail. As cattle fatten, fat deposits accumulate in all the main fat depots (under the skin, around the internal organs, between the muscles and inside the muscles) but some cattle have the genetic ability to favour the development of marbling within the muscles.

MSA research associates increased marbling to higher eating quality scores for many grilling and roasting cuts. The effect is greatest in the loin cuts (cube roll and striploin); however it is possible to achieve good eating quality without visible marbling.

The MSA grader assesses MSA and AUS-MEAT marbling scores on the exposed rib eye (eye-muscle) at the quartering site.

AUS-MEAT marbling is assessed on a scale of 0 to 6, reported in tenths within each score, and is based on the total amount of marbling within the eye muscle.

A MSA-specific marbling score is also given on a scale of 100 to 1190, in increments of 10, with emphasis on fineness of the marbling fat and how it is distributed.



MSA Marbling Standards 100 -1190



AUS-MEAT Beef Marbling standards 0 - 6

Note: higher marbling scores are associated with higher MSA Grades.

The use of HGP's reduces the amount of marbling at a constant carcass weight. With reduced marbling there is a reduction in MSA score for many cuts of meat.

An example of MSA Marbling Score shown in Table 12 compares two primal cuts from good quality domestic trade steer carcasses, different only in their MSA marbling score, with 0% tropical breed content, non HGP treated, HSCW 240 kg, 170 ossification, Achilles tendon (AT) hung, 270 MSA marbling, meat colour 1C, subcutaneous rib fat 7 mm, pH 5.55, aged for 5 days and cooking method 'Grill'.

Table 12. The effect of MSA marbling score on eating quality.

MSA Marbling Score	MSA Eating Quality Score			
	Striploin		Rump	
	MSA actual score	Competition score	MSA actual score	Competition score
200	54	18.90	49	17.15
300	57	19.95	50	17.50
400	61	21.35	51	17.85
600	66	23.10	53	18.55
800	67	23.45	53	18.55
1000	67	23.45	53	18.55
1100	67	23.45	53	18.55

3.1.5 Sex

There are small differences in eating quality between steers and heifers, with all other factors being equal. Although small, the effect of animal sex is rather complex, with heifers having a lower eating quality in some muscles and higher in others compared to steers.

The biological basis for the sex effect is not clear at this stage.

The example shown in Table 13 compares two primal cuts from otherwise identical non HGP treated steer and heifer carcasses with 0% tropical breed content, HSCW 240 kg, AT hang, 150 ossification, 270 MSA marbling, meat colour 1C, subcutaneous rib fat 7 mm, pH 5.55, aged for 5 days and cooking method 'Grill'.

Table 13. The effect of sex on eating quality.

Sex	MSA Eating Quality Score			
	Striploin		Rump	
	MSA actual score	Competition score	MSA actual score	Competition score
Male	55	19.25	51	17.85
Female	53	18.55	53	18.55

3.1.6 Subcutaneous fat depth at a rib site

In the National Beef Carcass Competition, subcutaneous fat depth at a rib site is primarily used as an indicator of saleable meat yield, but it also plays two roles in eating

quality. Firstly, MSA requires a minimum of 3 mm of subcutaneous fat at the quartering site with even fat distribution over the entire body. This fat cover helps avoid eating quality problems caused by a rapid or irregular pattern of chilling (see fat distribution). Secondly, fatter carcasses have slightly improved eating quality, over and above that associated with marbling and in this case a small upward adjustment is made to the grilling cuts.

3.1.7 Carcass hanging method

Traditionally, the carcass is suspended by the Achilles tendon. In the 'Achilles hung' carcass (AT), the spine is curved and the hindquarter muscles have less tension on them. As a result, when these muscles go through rigor mortis they can contract. When this occurs, the muscle fibres overlap resulting in slightly tougher meat.

In the 'Tenderstretch' carcass (TL, TX) the carcass side is suspended by the pelvis so that the leg drops down at a 90° angle. As a result, a number of muscles are held in a stretched position so they cannot contract during rigor mortis. Tenderstretch is most effective in the hindquarter and has a varying effect on each cut.

In abattoirs that tenderstretch, carcass sides are suspended by the Achilles tendon during the dressing procedure and then hung in the tenderstretch position before they are moved into the chiller.

It is essential that carcasses are tenderstretched before their pH falls below 6.00 (rigor mortis). If this does not occur, the increase in eating quality from tenderstretching will be affected and the MSA prediction model will not be accurate.



Achilles Hung

Tenderstretched

Table 14 shows the effect of hanging method on three primal cuts based on a MSA carcass with the following specifications: 0% tropical breed content, HSCW 260 kg, male, ossification 150, MSA marbling 300, rib fat 5 mm, pH 5.55, loin temp 7.0°C, 5 days aged and cooking method 'Grill'.

Table 14. The effect of carcass hanging method on MSA Eating Quality Score

Cut	MSA Eating Quality Score			
	AT ¹		TX ²	
	MSA actual score	Competition score	MSA actual score	Competition score
Tenderloin	77	26.95	73	25.55
Oyster Blade	53	18.55	51	17.85
Rump	62	21.70	68	23.80

¹AT = Achilles tendon
²TX = Tenderstretched

3.1.8 Hormonal growth promotants

Hormonal growth promotants are routinely used in many beef cattle production systems in Australia to improve animal productivity, in particular to increase weight gain, carcass weight and feed conversion efficiency.

MSA research has identified that HGP has a negative effect on the eating quality of some cuts of meat. The effect differs between muscles and can be managed with cut ageing. The striploin and cube roll are most affected, the rump and topside intermediate, and other cuts are less affected.

Two post slaughter management procedures can be utilised to improve the eating quality of meat from HGP treated animals. The first is to increase the ageing period, especially on cuts that have high ageing rates, and the second is to use the tenderstretch method of hanging carcasses during the chilling process.

Table 15 shows the effect of HGP implantation on three primal cuts from MSA carcasses with the following specifications: 38% tropical breed content, HSCW 300 kg male, ossification 150, MSA marbling 400, subcutaneous rib fat 5 mm, pH 5.55, loin temp 7.0°C, 5 days aged and cooking method 'Grill'.

Table 15. The effect of HGP implantation on MSA Eating Quality Score

Cut	MSA Eating Quality Score			
	HGP 'Yes'		HGP 'No'	
	MSA actual score	Competition score	MSA actual score	Competition score
Tenderloin	77	26.95	82	28.70
Oyster blade	59	20.65	64	22.40
Rump	49	17.15	53	18.55

Example typical MSA Eating Score data

As a guide to the MSA Eating Quality Score that is used in the 2009 National Beef Carcass Competition, Table 16 indicates typical scores from a range of different carcasses.

Table 16. Example MSA Eating Quality Score data

HSCW	HGP	Hang ¹	RFT (mm)	Sex	Hump (mm)	Oss	AUS MB	USA MB	pH	Total (/35)
240	Y	AT	8	M	100	350	1.0	300	5.55	10.57
250	Y	AT	4	M	65	200	1.0	320	5.55	16.45
260	N	AT	26	F	80	500	3.0	380	5.55	14.70
260	N	AT	6	M	105	130	2.0	450	5.68	23.45
390	Y	AT	14	M	70	160	6.0	930	5.55	24.64
400	N	AT	15	M	65	130	6.0	1090	5.55	27.09

¹Where:
 Hang = carcass side hanging method (AT = Achilles tendon)
 RFT = subcutaneous rib fat depth
 Hump = hump height
 Oss = ossification score
 AUSMB = AUS_MEAT marbling score
 MSAMB = MSA marbling score
 pH = Ultimate pH

For further details on the MSA grading system:
 Meat Standards Australia - www.mla.com.au/msa
 including MSA Tips and Tools

Beef CRC - www.beef.crc.org.au

Bonus points

All entrants will be eligible for bonus points based on the evenness of the carcasses in the pen. Ten bonus points are available per pen. In addition to the evenness of carcass weight bonus points (5 points) as outlined in Section 1.1, there are 5 points for evenness of carcass score across the three carcasses from the pen.