

MEAT STANDARDS AUSTRALIA

Extract from Internet: <http://msa.une.edu.au>

Background

The Australian beef industry has undertaken extensive market research of customers' requirements at home and in key export markets. This research has highlighted that domestic consumption of beef is stagnant with per capita consumption trending down as consumers switch to alternative meal solutions. In the major export markets of Japan and Korea, although beef consumption is growing steadily, Australia's market share is declining in the face of intense competition from the USA which is gaining market share at higher prices. This in part is due to the greater consistency in product delivered by the USA grading system.

The message delivered by domestic consumers showed that the performance of the beef industry was not satisfactory:

- 4 in 10 have difficulty buying beef of the quality they seek;
- 6 in 10 have difficulty knowing which piece of uncooked beef is more tender;
- 8 in 10 say price is a poor indicator of beef quality;
- there is no relationship between the beef consumers like the appearance of, and the beef they like to eat;
- 9 in 10 believe that any fat equals poor eating quality.
- 20,000 consumer tests in the Brisbane market prior to the launch of MSA demonstrated that up to 50% of retail beef failed consumer requirements for palatability. Even when the 'better' product was tested some 26% failed.

However, the same consumers say that they would buy more beef and pay more for it if satisfaction could be guaranteed. This research clearly showed that the lack of an adequate means of identifying the eating quality of beef was reducing consumer satisfaction and repeat purchase intent on the domestic market.

Eating quality and consistency of product is of paramount importance to consumers - and they do not always get it. Price is commonly used as an indicator of quality and consistency but this rarely provides an accurate measure.

In recognition of the importance of eating quality to consumers the beef industry has moved to develop a national grading scheme. This scheme, the Meat Standards Australia (MSA) Tenderness Guarantee Scheme, differentiates the product at the point of retail by identifying the eating quality that can be expected from a particular piece of beef cooked in a particular fashion. This removes the 'guesswork' when purchasing a cut of beef, thus providing the consumer with peace of mind and the ability to repeat purchase with confidence.

Key Elements of the Scheme

- Is consumer driven with grade standards being determined by consumer perceptions defined through product testing.
- Describes and differentiates the eating qualities of different types of beef through three grades - three star, four star and five star.
- Is underpinned by 'paddock to plate' quality assurance
- Delivers market signals down the supply chain and provides financial rewards to participants
- Has a high standard of integrity with standards which cannot be compromised
- Is solely based on criteria relating to palatability

- Voluntary participation with non-MSA beef available
- Licensing of participants to comply with specific practises
- Will be continually monitored and improved to ensure accurate application of standards against consumer sensory responses
- Eating quality communicated to consumers by graphic symbols on cuts, identifying grade and recommending cooking technique

The preliminary research on which the Meat Standards Australia (MSA) Tenderness Guarantee Scheme is based was conducted under a Meat Research Corporation Key program in the two to three years leading up to June 1996. In June 1996 MSA became a separate Key program in the current MRC R & D Corporate plan. Following a recommendation from the Meat Industry Council that the development of a voluntary beef grading scheme be given highest priority, an industry Steering Committee was formed in October 1996 to deliver a system that met consumer needs and to oversight the implementation of a commercial trial in Brisbane.

The development of the grading scheme has been based on the simple principal that there is only one reason to grade beef and that is on how well it will eat. Thus the grade divisions and standards have been set by consumer perceptions only. Considerations of breed, growth patterns, processing etc have a lot to do with producing to meet the various grade alternatives but they have nothing to do with setting the grade standard. This is a consumer driven process and current grade standards are based on the results of a testing program involving over 10,000 consumers and 70,000 taste tests covering a wide variety of product samples.

The consumer testing process is based on a rigorous consumer testing protocol developed by leading scientists and researchers from Australia and overseas and has proved that palatability can be measured with confidence. The results are extremely robust, showing continued repeatability of consumer eating quality perceptions and product scores. This provides great confidence in the system.

To achieve a guarantee of the quality of MSA beef for each of the grades, 'pathways' from 'paddock to plate' have been developed which highlight the critical control points affecting eating quality. Everyone in the production chain has a role to play in ensuring or enhancing eating quality. The quality assurance required at each point in the chain is outlined in the grade specifications for MSA.

This system should not be the 'target' for all producers. Commercial returns will depend on individual production systems with live cattle exports and manufacturing grade product, for example, remaining the best option for some.

Guaranteeing Eating Quality

To guarantee the eating quality of beef MSA needs to:

1. Be able to measure palatability with confidence;
2. Determine factors that impact on palatability and put in place quality assurance at critical control points;
3. Ensure the system works; and
4. Maintain the integrity of the MSA Scheme.

1. Measuring Palatability with Confidence

Palatability is the combination of all those factors that make beef enjoyable to eat. Sensory analysis determined that tenderness, juiciness and flavour are the key attributes required by consumers. MSA then developed a protocol for measuring palatability with input from Australian and international specialists in this area.

The results to date prove that the testing protocols are extremely robust. A major strength is the tight control of detail to ensure a consistent testing environment and unambiguous results.

Highlights of the protocol include:

- **Cut preparation** - five 25mm steaks taken for consumer testing from each cut after 14 days aging. Each steak is allocated a unique random code, vacuum packed individually and frozen. Other portions are prepared, labelled and frozen for trained panel and objective testing. Similar procedures are used for roasts and slow cooking samples.
- **Presentation** - a computerised procedure generates the list of individual steaks for each testing session. Each week the products tested come from a mix of research and commercial cattle, a minimum of two abattoirs and product that covers the full range of palatability. The meat is presented within a very tight statistical framework known as a Latin Square. This assures that each product tested is eaten in each order position and both before and after each other test product to remove any bias.
- **Choosing consumers** - consumers are recruited from Metropolitan Sydney and screened to represent a diversity of socio-economic, geographic and family characteristic backgrounds. Consumers selected prefer steaks cooked medium and eat it at least once a fortnight.
- **Cooking the steaks** - steaks are cooked to very tightly defined conditions. Degree of 'doneness' is determined by accurate steak thickness, consistent temperatures and precise cooking times.
- **Eating/evaluating** - the cooked steaks are halved and served to two consumers each. The first steak served to each group is common to help standardise the rating scales and then the subsequent six follow the appropriate Latin Square format. Consumers are asked to eat at least three bites from each steak before recording their scores.

A line scale is used to record ratings for tenderness, juiciness, flavour and overall satisfaction. A box is also ticked to record quality judgement - (eg. unsatisfactory, good everyday, better than everyday or premium).

- **Results:** - Within beef palatability, Consumers give:

Tenderness a rating of 40%

Juiciness 10%

Flavour 20%

and Overall Liking 30%

Consumer scores are weighted by these ratings to produce the **CMQ4 score**.

Once the large variation in tenderness is removed then flavour increases in importance to match tenderness.

- The grade boundaries in the diagram depict the results of consumer testing - each week this includes 180 consumers and 1260 beef samples eaten and scored. The results obtained from this exhaustive and highly disciplined testing regimen have been very consistent indicating both the robustness of the process and relatively common judgement of cooked steak across the population.

MSA recognised that if the scheme was to be maximised, evaluation of all major cuts and a full range of cooking methods, in addition to grilled steaks, should be carried out. Accordingly, the protocols include both roasting and slow cooking procedures. By June 1998 MSA will have tested over 70,000 beef samples using 10,000 consumers. This includes roasting samples and a full range of cuts both grilled and roasted. It is significant that the boundaries between roasting grades is almost identical to those for grilling.

- **MSA Grade Requirements**

To establish Pathways groups of cattle are selected for testing. Each test week utilises seven groups of 18 cattle each selected to add information on specific issues. Before a Pathway can be approved cattle meeting the proposed criteria must meet standards for both average score and maximum failure rates. All live animal, carcass, abattoir and ageing data is entered in the MSA database

The figures below are the cumulative maximum percentage of samples that for each MSA grade can be rated by consumers as below each score.

For example in 4 star beef a maximum of 35% of product may be below 64 of which a maximum of 17.5% may be below 58 and 7.5% may be below 47 with 0% below 41. In addition the mean MQ4 score for 4 star must be 64+.

Table: Maximum percentage of samples for each MSA grade allowable below each MQ4 score

Consumer Score	< 41	41-47	48-57	58-63	64-74	75-79	80+	MQ4
3 star grade	7.5%	20%						48
4 star grade	0%	7.5%	17.5%	35%				64
5 star grade	0%	0%	0%	7.5%	17.5%	35%		80

Having resolved what consumers require from beef (ie palatability) and with procedures in place that are absolutely robust in measuring these requirements the next step is to determine the factors that impact on palatability and put in place quality assurance at critical control points.

	Ungraded	3 Star Grade	4 Star Grade	5 Star Grade
	Grinding Beef	Superior Tender	Succulent tender	First class Gourmet
MQ4 Cutoff Scores	<48	48 - 63	64 - 79	80+

MQ4

The MQ4 score is a means of combining the four different sensory dimensions into a single parameter, which has a greater discriminatory ability. The MQ4 score is the sum of the tenderness, juiciness, flavour and overall acceptability scores are multiplied by 0.4, 0.1, 0.2 and 0.3, respectively.

2. Guaranteeing the Quality of MSA Beef

Research has identified that guaranteeing eating quality of beef is best achieved through the utilisation of Palatability Analysis at Critical Control Points.

Making the Grade:

Flow

Results from the extensive consumer testing of beef have identified that cattle genetics, animal production factors, and carcass processing are all important in ensuring minimum palatability specifications (3 Star) are met. A number of these specific factors (or critical control points) are then sequentially added together to make the MSA standards for each Grade. In addition to these minimum criteria, postmortem tenderising strategies such as tenderstretch and postmortem aging are currently being used to increase the range of cattle eligible for receiving a 3 Star grade. This ensures that the risk of delivering unacceptable beef to the consumer is virtually eliminated.

Detailed analysis of the MSA palatability database confirms that a PACCP approach which focuses resources to critical areas of the Australian beef production process, does substantially reduce the risk of marketing poor quality beef products.

The responsibility of each sector, and the importance of each MSA grade Critical Control Point in guaranteeing the quality of MSA beef is demonstrated in the figure above.

The importance of each of these MSA Grade Critical Control Points, when used as a single selection parameter is detailed below. To determine the final grade standards, each of these parameters (or critical control points) are added together - each critical control point is addressed as a question in order of determination during the beef production

process.

Further Information

Question 1. What is the Bos indicus content of the steer or heifer?

Question 2. Was the carcass postmortem pH decline rate in the "window"?

Question 3. Was the carcass tenderstretch hung? Question 4. Have the carcasses met the minimum MSA carcass grade criteria?

Question 5. What is the AUS-MEAT marbling score? Question 6. What feeding regime is required?

Question 7. What is the effect of post-mortem aging?

3. Does the MSA System Really Work?

Results from consumer tests (the research that led to the setting of pathway specifications) identified that the MSA system really does work. Customers of Australian beef graded to the MSA specifications can be confidently guaranteed that it consistently meets consumer grade standards.

Not only that but the MSA Scheme also outperforms the USDA grading system (the 'benchmark') in meeting consumer requirements.

Overall, these results are extremely positive for consumers, processors, wholesalers and retailers of beef. Producing beef with a quality guarantee to consumer set specifications can be achieved, and is the responsibility of all the players in the pathway from the paddock to the plate. Ensuring that participants in the scheme are responsible is now the critical issue for without industry integrity the MSA Scheme cannot guarantee the quality of beef to consumers or international customers.

4. Maintaining the Integrity of the MSA Scheme

Unless everyone in the industry plays their part MSA cannot guarantee the quality of beef. The requirements for industry participants are detailed in the MSA Certification Rules and License Agreements established under commercial law - consumer requirements are transmitted through the MSA communication program. All participants are subjected to a desk audit of QA manuals, a certification audit and the possibility of random audits. The certifications rules are clear with violators expelled from the scheme and damages set at \$1000 per day of violation for small enterprises and \$5000 per day per establishment for larger enterprises. Currently there are no provisions for readmission to the Scheme.

A DNA sample is taken on every carcass graded - in case of a dispute or suspicion of fraudulent activity the grade of any piece of beef (even if cooked and half eaten) can be verified with absolute confidence.

- Consumers: have money back guarantee and a 1800 number to ring if the beef doesn't meet their expectations.
- Restaurants: records maintained on receivables and sales of MSA product - plus audits.
- Butchers: use computer scales for all sales of MSA product and this data is down loaded and provided to MSA appraisal team. 50% of throughput in any store must be MSA product once a pathway for carcasses is approved. A gross balance is conducted of all receivables and sales of both MSA and non-MSA product - plus audits. Product is randomly sampled and put through MSA consumer testing.
- Supermarkets: must have at least one brand which is 100% MSA product. Sales information on MSA and non-MSA product is provided from scan data. A gross balance is conducted of all receivables and sales of both MSA and non-MSA product - plus audits. Product is randomly sampled and put through MSA consumer testing.
- Wholesalers: provide sales information on MSA and non-MSA product. A gross balance is conducted of all receivables and sales of both MSA and non-MSA product - plus audits.

- **Processors:** utilise MSA graders who have been trained and are operating in abattoirs on a fee for service basis. These graders are skilled in identifying all the key factors that may impact on eating quality and they take a DNA sample on each carcass that is graded. Abattoirs' chillers have been inspected to ensure that the beef is not toughened by cold (or heat) shortening. Feedback to vendors on the grade achieved by cattle is provided. Plus audits.
- **Feedlots:** have clear identification of MSA cattle and transport them separately to abattoirs - plus audits.
- **Producers:** CATTLECARE or an equivalent externally audited on-farm QA program will be required for participating producers when the scheme rolls out nationally. Producers will also be licensed. During the pilot producers sign a declaration on the back of the vendor declaration that the cattle meet MSA requirements. Plus audits.

MSA Pathways

(revised 13/7/98)

The MSA pathways have been built on the concept of putting together the critical control points that impact on meat quality from 'paddock to plate'. The following diagram identifies the most important CCP in the meat production chain. All CCPs can be viewed as links in the meat production/processing chain. It only needs one link to fail along the chain to result in poor quality meat. Of all the CCPs listed in the figure below, events during the pre-slaughter, post-slaughter and chilling processes have the greatest impact on eating quality.

CCP - Critical Control Point

A critical control point (CCP) is an event in the production/processing system for meat that has been identified as having a major effect on palatability.

Basic criteria

(revised 13/7/98)

Producer to abattoir requirements – these requirements are common across all grades

- Slaughter by the day after dispatch
- Direct consignment to the abattoir
- Water available and consumed on arrival
- Animal welfare codes of practice observed at all stages from farm to slaughter
- Trained professional stock handlers at all locations
- Guidelines for dark cutting and eating quality observed
- Groups of cattle not to be mixed in lairage
- No secondary sex characteristics
- No females which have calved
- Meat colour scores of 1B, 1C or 2.

PACCP Requirements

- carcass maturity is to be judged by an ossification score which is to be less than 200 (ie notionally less than 30 months of age)
- carcass weight for maturity of greater than 0.6 kg/day
- ultimate pH scores of 5.7 or less
- slaughter process to maintain a temperature and pH relationship within a window of;
- pH above 6.0 while temperature is at or above 35oC
- pH below 6.0 when temperature is at or below 12oC
- greater than or equal to 3mm subcutaneous rib fat with even and adequate coverage across the rib, rump and loin

Prevention of dark cutting

A list of critical control points (CCP) which impact on the frequency of dark cutting in beef have been prepared by the Victorian Department of Agriculture. These CCP cover •on-farm (farm management, mustering, drafting)•transport management

- lairage management•assembly for slaughter
- stunning

For more details on these critical control points refer to the paper by Walker and Warner (1996)

Ossification Score

A subjective score on the degree of calcification of the cartilage of the vertebrae in the carcass.

WAM

Weight adjusted for maturity (WAM) is a measure of the growth pattern of the animal. It is calculated as follows;

$$\text{WAM} = (\text{carcass weight}/0.53) - 35$$

Ossification score in months

The MSA data base shows that WAM is positively associated with palatability and a cut-off figure of an estimated **0.6 kg/day** has been selected.

Three star pathways

(revised 13/7/98)

Three star pathways comprise those critical control points which have been shown by the consumer tests to deliver meat which has a MQ4 score between 48 and 64. For a group of cattle there will always be a variance in palatability and so to achieve a three star rating the group of cattle tested for the pathway must have achieved at least 80% of the animals with an MQ4 score of greater than 48.

In addition to meeting the specifications in the basic criteria section, the CCP which have to be met for three star pathways are listed on the next page;

Four star pathways

(revised 13/7/98)

Four star pathways comprise those critical control points which have been shown by the consumer tests to deliver meat which has a mean MQ4 score between 64 and 80. For a group of cattle there will always be a variance in palatability and so to achieve a four star rating the group of cattle tested for the pathway must have achieved at least 60% of the animals with an MQ4 score of greater than 64.

In addition to meeting the specifications in the basic criteria section, the CCP which have to be met for four star pathways are listed on the next page;

Five star pathways

(revised 13/7/98)

Five star pathways comprise those critical control points which have been shown by the consumer tests to deliver meat which has a mean MQ4 score of greater than 80. For a group of cattle there will always be a variance in palatability and so to achieve a five star rating the group of cattle tested for the pathway must have achieved at least 60% of the animals with an MQ4 score of greater than 80.

In addition to meeting the specifications in the basic criteria section, the CCP which have to be met for five star pathways are on the next page;

MEAT STANDARDS AUSTRALIA (MSA) GRADES

The new pathways established so far for carcasses to be graded as
MSA 3, 4 or 5 Star.

Other pathways are to be examined by consumer testing.

Basic Grading Requirements (for ALL Grades)

General Requirements

- Steers & non calved heifers eligible
- Carcasses under **30 months** (by carcass ossification score <200)
- Average Daily LWG of **0.6 kg/day** minimum
- Not required for Tenderstretched Carcasses
- **Direct consignment** to Abattoir, slaughter day after dispatch
- Various transport/handling requirements

Carcass Measures

- Minimum **3mm Rib Fat Depth & even adequate distribution**
- pH above 6.0 while temperature is at or above 35C
- pH below 6.0 when temperature is at or below 12C
- Ultimate pH 5.7 maximum when temperature is at or below 12C
- Meat colour score 1b to 2
- No secondary sexual characteristics
- No Dark Cutters

3 Star Grade Carcase

***"Good tender beef for everyday meals".
Only 7% expected to be "Tough"***

Approved Pathway

- Maximum 25% Bos Indicus content
- Max Ossification Score 150
- Min Carcase Wt = 150kg
- 0.6 wt/day gain min
- Pasture OR Grain Finished
- No minimum Marbling Requirement
- Tenderstretched
- Aged 5 days

3 Star Grade Vaccuum Packed

***"Good tender beef for everyday meals".
Only 7% expected to be "Tough"***

Approved Pathway

- **Maximum 25% Bos Indicus content**
- **Pasture OR Grain Finished**
- **Aged 14 days**

Approved Pathway

- **Maximum 25% Bos Indicus content**
- **Pasture OR Grain Finished**
- **No Wt/Age Requirement**
- **Tenderstretched**
- **Aged 14 days**

Approved Pathway

- **Bos Indicus content 26% to 50%**
- **Pasture OR Grain Finished**
- **Tenderstretched**
- **Aged 14 days**

4 Star Grade**Vacuum Packed**

“Succulent tender beef for special dishes”.

Guaranteed NONE will be “Tough”

Approved Pathway

- Maximum 25% Bos Indicus content
- **Grain** Finished minimum **100 days**
- Minimum **Marble Score 1**
- Aged 21 days

Approved Pathway

- Maximum 25% Bos Indicus content
- Pasture OR Grain Finished
- Minimum **Marble Score 2**
- Aged 21 days

4 Star Grade**Carcase**

“Succulent tender beef for special dishes”.

Guaranteed NONE will be "Tough"

Approved Pathway

- **MILK VEALER**
- Maximum 25% Bos Indicus content
- Max ossification score 130
- Minimum carcass wt = 140kg
- No wt/age requirement
- **Tenderstretched**
- Aged 5 days

5 Star Grade

Vacuum Packed

"First class gourmet tender beef".

Guaranteed **NONE** will be "Tough"

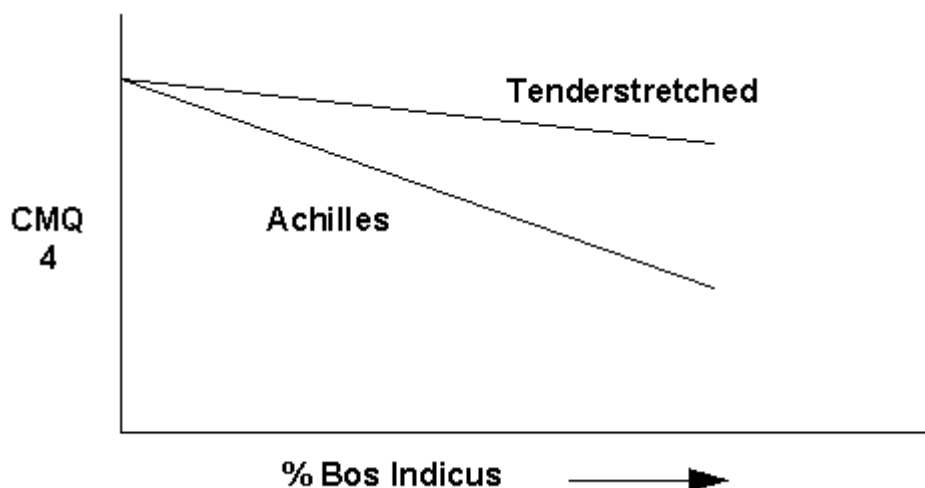
Equiv. High Class Export Japanese product.

Approved

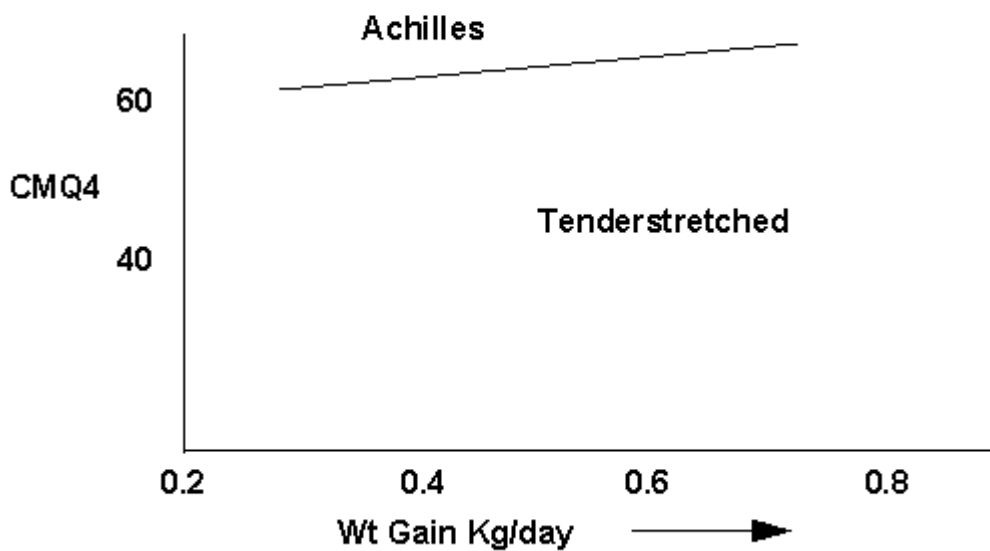
- Maximum 25% Bos Indicus content
- Grain Finished minimum 150 days
- Minimum **Marble Score 3**
- Aged 21 days

Tenderstretch versus Achilles Hung

<u>MSA Cutoff</u>	<u>MSA Score</u>
48 +	3 Star
64 +	4 Star
80 +	5 Star



Tenderstretch benefits tougher carcasses more than tender ones



Supermarket Specifications

WOOLWORTHS

COLES

Hot Carcase Wt	200 - 260 kg	180 - 250 kg
P8 Fat	5 - 16 mm	3 - 15 mm
Meat Colour	1B to 3	1A to 2
Fat Colour	0 to 3	0 to 3
Marbling	0 to 2	0 to 2

