MEAT & LIVESTOCK AUSTRALIA

APPENDIX C:

THE AUSTRALIAN MEAT LANGUAGE

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EXECUTIVE SUMMARY

Language is used across all sectors of the beef industry from genetic selection to final consumer purchase. By far the most formalised and widely used portion of Australian beef language is that directly relating to carcase and cut description. This “meat” section is addressed in this paper while companion papers will cover livestock and consumer language sections. The meat language has been administered by AUS-MEAT since 1987 with application enforced by legislation in export markets.

The language has been continually enhanced and developed to maintain relevance and facilitate trade in meat and meat products. By any measure it has been highly successful and the enormously complex array of beef and veal products traded is testament to the fact. This is not to say that further refinement is not possible or desirable however and the history of innovation and development must continue to maintain relevance.

This paper summarises the principal detail of the existing language and seeks to stimulate discussion over potential areas identified as worthy of consideration. Perhaps the most fundamental issue is to ensure that the language remains flexible and that it can be equally effective as an objective classification tool, reflecting its origins, and in further applying objective elements as inputs to systems that require language to accurately describe a result including carcase yield and consumer satisfaction with cooked individual meal portions.

STRENGTHS OF THE CURRENT LANGUAGE

The outstanding strength of the current meat language is the flexibility that enables objective description of the full range of product traded at any desired level of detail. Beef can be described as purely “beef” or in great detail in regard to the source carcase, cutting lines, visual appearance, production system, packaging and predicted eating quality. This enables virtually any type of beef product desired to be described and successfully traded.

A further significant strength is that it is widely known, understood and utilised across domestic and international markets.

WEAKNESSES OF THE CURRENT LANGUAGE

The current language is based on objective description of observed traits that, by and large, are understood by those trading and reflect their experience and common trading practice. However, if the consumer is regarded as the ultimate customer, language might be judged more by the simplicity and accuracy of performance delivered. On this basis the current language can still deliver but is more conflicted and restricted by a strong orientation toward fundamental description at alternative category level, based on sex and dentition, that has only a poor at best relationship to results whether at the trade level of yield or the consumer level of predictable meal satisfaction.

SUMMARY OF ISSUES ARISING WITHIN SEGMENTS OF THE MEAT LANGUAGE

CARCASE LANGUAGE ISSUES

1. Consideration of changing bull and veal from basic to alternate categories. While requiring federal legislative change this may simplify product description within an enlarged *A* basic category and better relate to prospective production systems now common in other countries while also aligning better with scientific findings in regard to product characteristics.
2. Review alternative means of assessing animal age.
3. Reassess the validity of sex distinction within alternate categories against scientific evidence and current market demand.
4. Monitoring and evaluation of existing and potential technologies that may provide improved accuracy in estimating yield incorporating fat and muscling variation.
5. Review alignment of weight class, fat class and muscling with live animal language.
6. Consider strengthening livestock language to consolidate all live animal information to be carried forward under a single NLIS indexed link with further consideration of implementing farm licensing and auditing.

CHILLER ASSESSMENT ISSUES

A number of issues are evident within the chiller assessment language, standards and application that require evaluation including:

1. Verification of chiller assessment conditions and interaction with colour and marbling measures.
2. Possible current and future technical capacity to utilise objective measurement for key existing or alternative criteria. Examples could be imf% (intramuscular fat%) in lieu of marbling, image analysis evaluation of marbling, meat colour, EMA, rib fat and other measures or electronic meat colour assessment.
3. Graduation of meat colour chips to a linear numeric scale to replace 1a, 1b and 1c.
4. Do we need two marbling systems or should we reduce to the MSA standard?
5. Clarification of the relative roles and benefits of alternative age and maturity measures. This should reflect two separate objectives; the prediction of eating quality, where ossification may be expected to replace dentition given current knowledge, and the assessment of animal age to meet BSE oriented objectives.
6. Validation of hot and cold ossification score relationships.
7. Further research from additional data to improve the accuracy of hump height as a direct MSA model input.
8. Consideration of inherent conflict between alternative category and MSA description and potential solutions including creating an Eating Quality Graded alternative category together with incorporating this in applicable country to country agreements.

CUT LANGUAGE ISSUES

Some issues identified as warranting consideration within the current cuts language structure include:

1. Examination of multiple descriptions, ciphers and symbols for individual cuts or items to identify possible simplification.
2. Consideration of additional H.A.M. codes to facilitate packing of Eating Quality graded product within a cooking method description without mandatory cut identification allowing companies to pack mixed cuts with common eating quality outcomes.

BACKGROUND

While AUS-MEAT Ltd is responsible for quality standards and uniform description of meat and livestock (Anon, 2014) the meat component of the language is by far the most recognised and utilised.

In considering beef language the White Paper is adopting a broader view of language elements starting with genetic data used in sire selection, continuing throughout the live animal phase, linking to conversion to meat and ultimately to final consumer meal description.

In essence this may be viewed as three interlinked language sections: Live Animal, Meat (carcases and cuts) and Meal (consumer).

This background paper addresses the meat language component which in general usage is commonly referred to as "the AUS-MEAT language".

The meat language was established within AUSMEAT in 1987 and has been continually enhanced, with 302 amendments to August 2014 (Anon, 2014b), to serve industry needs in both the Australian domestic and export markets. Further evolution from White Paper recommendations may continue this process.

The language was established to make a deliberate move away from subjective quality assessments such as First Grade, Second Grade etc to a classification basis that facilitated tight objective specification for trading (Polkinghorne & Thompson, 2010). Buyers and sellers could use standard language to describe a product that best met their requirements with Beef *A* at one extreme being a pure undifferentiated species definition. A critical early step was to define and enforce a standard carcase trim to facilitate over the hooks (OTH) trading and reporting. This meant that carcase weights could be compared across different plants and markets without the need to make adjustments for inclusion or exclusion of specific trim items.

Inclusion of alternate categories based on dentition and sex with measures for hot carcase weight (HSCW), P8 fat and bruising were further augmented by the introduction of the Chiller Assessment Language which provided for standardised assessment of marbling, meat colour and fat colour. *The Handbook of Australian Meat* (HAM) (Anon, 2005) further extended language to specify cuts and cutting lines which are utilised within the carcase classification traits to provide the framework for beef cut description and trading. This classification framework provides an excellent base to describe the physical visual characteristics of carcases and cuts and remains the major description used in export trading. The HAM cut descriptions have also been adopted by the UNECE as a voluntary international standard (Anon, 2012).

Industry research based on consumer perception began in the 1990's and grew into the Meat Standards Australia (MSA) grading system. This also utilised the available AUS-MEAT language descriptions plus additional information to predict consumer satisfaction with individual cuts. The new measures have been incorporated into the language as has MSA grade.

While there is some tension between language designed to describe physical visual characteristics and that designed to describe a cooked meal outcome both are within the current language. The White Paper will examine these relationships including areas that are in conflict or complimentary.

CURRENT MEAT LANGUAGE SUMMARY

PRE-SLAUGHTER REQUIREMENTS AND DOCUMENTATION

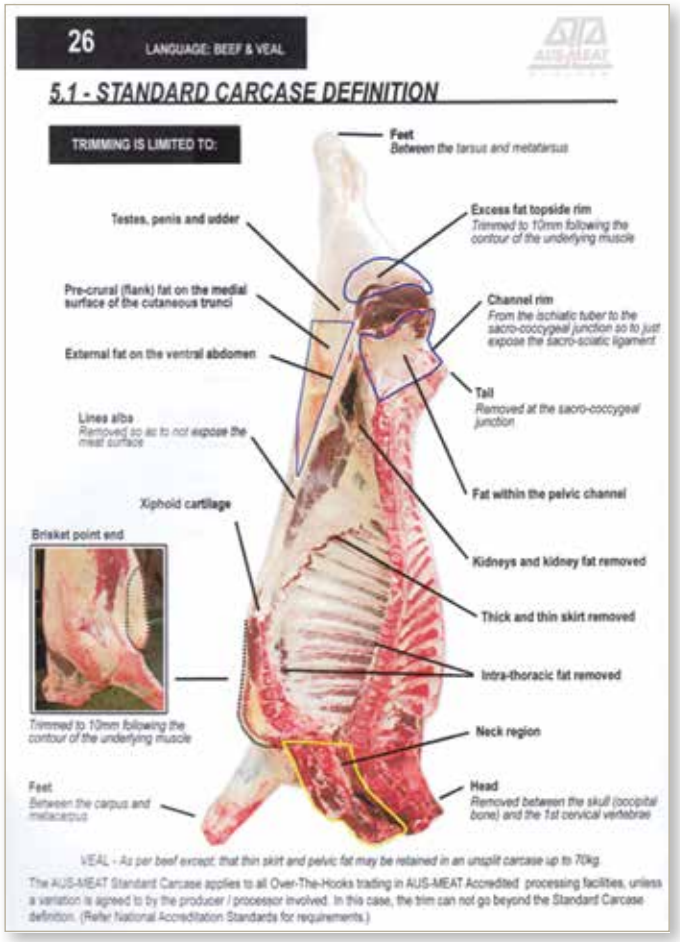
In Australia all cattle must be identified by an RFID device before leaving the farm of birth. Electronic tags must be purchased by the breeder and are registered against the farm of birth within the National Livestock Identification Scheme (NLIS). Each property has a government allocated property identification code (PIC). All subsequent movements of cattle from the property of birth must be recorded within the NLIS to provide lifetime traceability.

A further regulatory requirement is that cattle movements be recorded on a group basis via National Vendor Declarations (NVD) which accompany any cattle movement. The NVD is a statutory declaration utilised to confirm status in regard to market eligibility and status. Other than a summary of the number of head and broad stock type descriptions such as steers or cows the NVD provides information regarding animal treatment withholding periods, exposure to by-product feeds and use or otherwise of hormonal growth promotants (HGP).

Further documentation confirming farm and cattle status is required for European Union (EU) eligibility, National Feedlot Accreditation Scheme (NFAS) eligibility for grainfed cattle, Pasture fed Cattle Assurance Scheme (PCAS) and various alternate organic certifications.

For MSA a declaration regarding tropical breed content (TBC) is required and further breed certification may also be required for specific branding programs. For MSA if the mob being consigned is variable then the highest TBC is stated on the NVD and this is used in the calculation of eating quality.

Relevant data from the above must be aligned with subsequent carcase criteria to establish some meat language descriptions.



CARCASE LANGUAGE

STANDARD CARCASE DEFINITION

In AUS-MEAT licensed plants (only) the language firstly requires a standard carcase trim prior to the scale for cattle sold on an over the hooks (OTH) basis. It should be noted that the standard trim is actually a maximum allowable trim; less may be trimmed if desired to suit alternate specifications. There is no standard trim requirement for processor owned cattle. The carcase must be weighed hot within two hours of slaughter. The diagram on the left illustrates the basic requirements further summarised in the Table 1 (Anon, 2005) on the following page.

Table 1: AUS-MEAT Standard Carcase Definition

HYGIENE REQUIREMENTS	
• Minimum trimming as required by meat inspection services for the carcase to be passed fit for human consumption.	
• Trimming of the neck and neck region may be extended to ensure compliance with "Zero Tolerance" for ingesta contamination, especially where halal slaughter has been performed. This extension of the standard carcase for beef is limited to a hygiene trim and must be controlled by the approved arrangement under the Australian standards.	
STANDARD TRIM REQUIREMENTS	
• Head removed between the skull and first cervical vertebrae.	• Udder, testes, penis and external fat on the ventral abdomen – precural, udder and cod fats.
• Feet between the knee joint and hock joint.	• Fat on the channel rim from the tuber ischi to the sacro-coccygeal junction.
• Tail at the junction between the sacral and coccygeal vertebrae.	• Excess fat on the Topside rim up to 1cm from the underlying muscle.
• Skirts removed (Thin/Thick)	• Xiphoid cartilage and intra-thoracic fat.
• Kidney, kidney fat and fat from within the pelvic channel fat.	• Excess external brisket fat up to 1cm from underlying muscles.

The standard carcase trim, assuming consistent application and use of an unadjusted hot weight, allows direct consistent comparison of hot standard carcase weight (HSCW) and dressing % (HSCW/liveweight) between plants. There are three exceptions however:

- Non AUS-MEAT licensed domestic plants may apply a company specified trim;
- Cattle owned by the plant may be trimmed to any desired specification; and
- Plants utilising vascular infusion (rinse/flush) will elevate HSCW by about 2.5% through the process of pumping a solution through the vascular system immediately post sticking.

The AUS-MEAT standard represents a very heavy trim regime relative to others such as that used in the USA where kidneys and channel fat remain and retention of the tail in many countries and non AUS-MEAT accredited domestic plants. The adoption of a hot weight payment however moved losses from carcase shrink during chilling to the processor. Earlier payment systems were generally based on an estimated cold carcase weight, typically a 2% deduction from hot weight.

To achieve price equity the price paid per kg for a standard trim carcase must be greater than that of a non-standard carcase with a lighter trim or retained kidneys and tail.

Given that processors compete for cattle supply under standard carcase specifications this is assumed to be factored in to pricing.

The standard trim largely supports efficient processing as excess fat and internal organs are efficiently removed on the slaughter chain while the carcase is hot. This is efficient in terms of labour and in reduced refrigeration due to chilling less fat. Also separation of lean and bone is more efficient in hot compared with chilled product. There are a number of further procedures that are more efficiently done on the chain but which may affect HSCW including:

- Hot boning of the neck. This is far easier to do on the hot carcase and can include removal of bone in addition to muscle separation.
- Removal of the paddywack.
- Chining where the cube roll is separated from the feather bones. This results in an improved cube roll shape and easier subsequent boning. The feather bones could also be logically removed at this point.
- Removal of further fat which is far more efficient when done hot with a Wizard rotary knife.

To comply with the standard carcase weight requirements these processes are done post the scale which requires additional space. Many processors also utilise spray chilling systems to reduce carcase weight loss in the chiller.

BASIC AND ALTERNATIVE CARCASE CATEGORY

Current legislation requires all bovine carcases to be assigned to one of three designated categories: Veal *V*, Beef *A* or Bull *B*. The requirements for each are summarised in Figure 2 (Anon, 2005). Approved ciphers and symbols are extensively used in practical language application and can be used in place of, or in addition to, fully written descriptions. When used in trade description ciphers must appear in a set order and are bracketed by asterisk, for example *A* or, for a cut, *SS – RMP* (Anon, 2014). This is of particular value in conserving space in many labelling applications.

Of note is that the veal *V* primary category is principally defined by HSCW being no more than 150 kg and that bull *B* is primarily defined by the presence of secondary sexual characteristics (SSC) rather than testicles. It is possible for a castrated animal to be classified as bull *B* and for an entire male to be classified as beef *A*. This is a cause for concern and will be discussed in later sections.

Within the basic veal *V* category there are optional supplementary classes as follows:

- VEAL – BOBBY defined as weighing no more than 40kg HSCW.
- VEAL – LIGHT VEAL defined as weighing no more than 70kg HSCW with veal meat colour.
- VEAL defined as weighing 70.1 to 150kg HSCW with veal meat colour.

There are also alternative categories to BEEF *A* and to BULL *B* as presented in Figures 3 and 4 (Anon, 2005).

The Beef *A* alternative categories are based on a combination of sex within dentition categories that, for carcases with no more than 7 permanent incisor teeth, allows specification of male only or male and female but not female only. For example *YGS* is steer only whereas *YG* is steer or heifer. Cow *C* relates only to females with 8 teeth whereas steers with 8 or less teeth and females with no more than 7 teeth can be designated *SS*. Carcases can be “packed down” to a lesser alternative category but not up.

Figure 2: AUS-MEAT category requirements

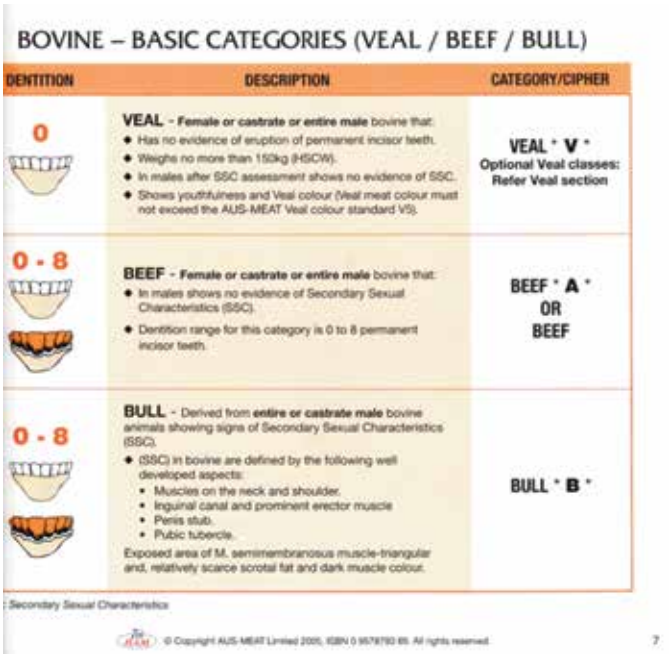


Figure 3: AUS-MEAT alternative categories for BEEF *A*

BOVINE – ALTERNATIVE CATEGORIES (BEEF)

** Chronological age as shown is approximate only*

DENTITION	DESCRIPTION	CATEGORY/CIPHER
0	Carcase is derived from **castrate or entire male** bovine that: ◆ Has 0 permanent incisor teeth. ◆ Has no evidence of Secondary Sexual Characteristics (SSC).	YEARLING STEER * YS * * Up to 18 months
0	Carcase is derived from **female, castrate or entire male** bovine that: ◆ Has 0 permanent incisor teeth. ◆ Has no evidence of Secondary Sexual Characteristics (SSC).	YEARLING BEEF * Y * * Up to 18 months
0 - 2	Carcase is derived from **castrate or entire male** bovine that: ◆ Has no more than 2 permanent incisor teeth. ◆ Has no evidence of Secondary Sexual Characteristics (SSC).	YOUNG STEER * YGS * * Up to 30 months
0 - 2	Carcase is derived from **female, castrate or entire male** bovine that: ◆ Has no more than 2 permanent incisor teeth. ◆ Has no evidence of Secondary Sexual Characteristics (SSC).	YOUNG BEEF * YG * * Up to 30 months
0 - 4	Carcase is derived from **castrate or entire male** bovine that: ◆ Has no more than 4 permanent incisor teeth. ◆ Has no evidence of Secondary Sexual Characteristics (SSC).	YOUNG PRIME STEER * YPS * * Up to 36 months
0 - 4	Carcase is derived from **female, castrate or entire male** bovine that: ◆ Has no more than 4 permanent incisor teeth. ◆ Has no evidence of Secondary Sexual Characteristics (SSC).	YOUNG PRIME BEEF * YP * * Up to 36 months
0 - 7	Carcase is derived from **castrate or entire male** bovine that: ◆ Has no more than 7 permanent incisor teeth. ◆ Has no evidence of Secondary Sexual Characteristics (SSC).	PRIME STEER * PRS * * Up to 42 months
0 - 7	Carcase is derived from **female, castrate or entire male** bovine that: ◆ Has no more than 7 permanent incisor teeth. ◆ Has no evidence of Secondary Sexual Characteristics (SSC).	PRIME BEEF * PR * * Up to 42 months
0 - 7	**OX** – Carcase is derived from **female (only)** bovine that: ◆ Has no more than 7 permanent incisor teeth.	OX * S * * Up to 42 months
0 - 8	**OX – STEER** – Carcase is derived from **castrate or entire male** bovine that: ◆ Has up to 8 permanent incisor teeth. ◆ Has no evidence of Secondary Sexual Characteristics (SSC).	OX * S * or STEER * SS * * Any age
0 - 8	Carcase is derived from **female** bovine that: ◆ Has 8 permanent incisor teeth.	COW * C * * All ages

Figure 4: AUS-MEAT alternative categories for BULL *B*

BOVINE – ALTERNATIVE CATEGORIES (BULL)

DENTITION	DESCRIPTION	CATEGORY/CIPHER
0 	Carcase derived from **entire male** not assessed for SSC. ◆ Has no evidence of eruption of permanent incisor teeth. ◆ Carcase weighs more than 150kg *(HCSW).	YEARLING ENTIRE * **YE** *
0 - 2 	Carcase derived from **entire male** not assessed for SSC. ◆ Has no evidence of eruption of more than 2 permanent incisor teeth. ◆ Carcase weighs more than 150kg *(HCSW).	YOUNG ENTIRE * **YGE** *
0 - 2 	Carcase derived from **castrate or entire male** bovine that: ◆ Has no evidence of eruption of more than 2 permanent incisor teeth. ◆ Show signs of Secondary Sexual Characteristics (SSC). ◆ Carcase weighs more than 150kg *(HCSW).	YOUNG BULL * **BYG** *

** (HSCW) Hot Standard Carcase Weight.*

While these alternative categories allow accurate description of the specified criteria there appears to be an element of subjective judgement relative to sex related specification, possibly reflecting trade demand or industry opinion, but not scientific evidence. Relevant issues in this regard include:

- The segregation of male sex but not female in young categories in conflict with livestock description.
- The grouping of 8 tooth male carcases in *S* with restriction of females to a maximum of 7 teeth.
- The use of dentition as a proxy for age and applied equally to males and females. If age is the desired outcome total accuracy would be delivered by date of birth with further alternatives ossification in conjunction with sex or recorded joining periods or progressive branding dates.
- The use of dentition as a proxy for eating quality. Scientific evidence (Watson et al., 2008) suggests a very poor relationship between dentition and eating quality with ossification providing a superior estimation input.

The bull *B* alternative categories are defined by dentition and HSCW. Of note is that the first two alternative categories, *YE* and *YGE* apply to entire males where SSC are not assessed and that all three relate only to carcases with two or less permanent incisor teeth. The BYG category can include both entire males and castrates showing SSC.

Some issues of potential relevance include:

- The possibility of *YE* and *YGE* being directly equivalent to *Y*, *YS*, *YGS* and *YG* given no signs of SSC.
- Potential management of young bull carcases produced with table beef as the planned use rather than breeding.
- Uncertain definition of bull for MSA model input.

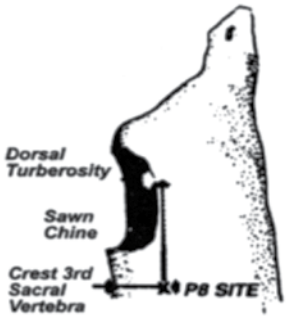
Young bulls are a very common beef production system in some countries including New Zealand and in particular continental Europe where bulls are often more prevalent than steers. Early international studies have found small and variable differences in eating quality in several beef cuts collected from bull and steer carcases (Jacobs et al., 1977; Dransfield et al., 1984). More recent data where animals were sourced from intensive pasture based systems typically producing carcase weights over 350kg at 16 months of age have illustrated little difference to steer equivalents in the same environment (Polkinghorne, Thompson and Watson, unpublished data). Further clarification of entire males without SSC and castrates with SSC in relation to eating quality outcomes is required to clarify appropriate required description.

OTHER CARCASE MEASURES

Other carcase based measures assessed on the hot carcase and used in company specifications and included in producer feedback are:

Mandatory

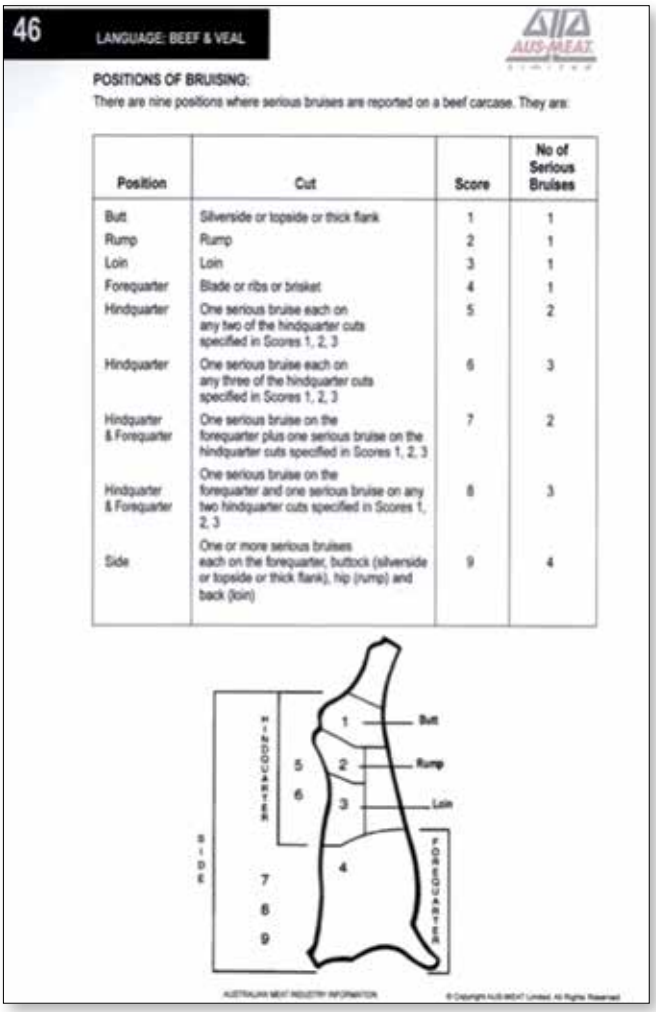
- Hot Standard Carcase Weight (HSCW). Ownership is transferred at the slaughter floor scales for over the hooks (OTH) trading. The carcase weight must be reported.
- P8 fat depth – a measure of external fat thickness at the P8 site (rump). Originally this site was selected from a number of potential sites on the carcase as being a better predictor of percentage carcase yield and having less tearing due to hide puller operation (Johnson and Vidyadaran 1981). However more recent evidence would dispute that there is any less hide puller damage at the P8 compared with the 12th rib site (Hopkins, 1989). The greatest concern is that most live animal assessment of fatness is done at the lumbar site as it is more difficult to assess live animals at the P8 site. This is because at the lumbar site the soft tissue (both fat and muscle) can be palpated against the bone whereas this is not possible at the P8 or sacral site. Better alignment between live animal and carcase would be an advantage in enhancing communication between different sections of the supply chain.



Optional

- Butt shape – assessed against 5 (A, B, C, D and E) carcase silhouettes and adopted as a proxy indication of carcase muscling with implication for carcase yield. A number of researchers have examined the relationship between butt shape and percentage carcase yield (Barton, 1967; Dikeman et al., 1977; Taylor et al., 1990). Without exception these studies have failed to show a relationship between butt shape or conformation and percentage carcase yield.
- Bruise score – A standard bruise reporting system specifies the location of serious bruising in accordance with Figure 5 (Anon, 2014). A bruise qualifies as scorable if; an area of muscle exposed by trimming into the muscle tissue exceeds a 100mm diameter circle or equivalent area or the area is less than 100mm diameter and deeper than 20mm (Anon, 2005).

Table 5: AUS-MEAT Bruise Scoring System (Anon, 2014)



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AUS-MEAT

POSITIONS OF BRUISING:

There are nine positions where serious bruises are reported on a beef carcase. They are:

Position	Cut	Score	No of Serious Bruises
Butt	Silverside or topside or thick flank	1	1
Rump	Rump	2	1
Loin	Loin	3	1
Forequarter	Blade or ribs or brisket	4	1
Hindquarter	One serious bruise each on any two of the hindquarter cuts specified in Scores 1, 2, 3	5	2
Hindquarter	One serious bruise each on any three of the hindquarter cuts specified in Scores 1, 2, 3	6	3
Hindquarter & Forequarter	One serious bruise on the forequarter plus one serious bruise on the hindquarter cuts specified in Scores 1, 2, 3	7	2
Hindquarter & Forequarter	One serious bruise on the forequarter and one serious bruise on any two hindquarter cuts specified in Scores 1, 2, 3	8	3
Side	One or more serious bruises each on the forequarter, buttock (silverside or topside or thick flank), hip (rump) and back (loin)	9	4

Both P8 fat and butt shape are used as a proxy for yield (saleable meat kg often expressed as a % – kg saleable meat/HSCW) estimates and, while assessed against defined standards, are widely regarded as being deficient due to:

- Overall carcase fat distribution being poorly reflected by the P8 site measurement, sometimes due to site damage but also due to variable distribution.
- Irregular assessment of butt shape between assessors and difficulty in attaining consistent outcomes.
- Saleable meat yield estimates utilising HSCW, sex, dentition, P8 and butt shape proving to have low accuracy, with addition of eye muscle area (EMA) where available providing little improvement.
- Allocation of blame/responsibility for bruising; did it occur on farm, during transport or at the abattoir?

Despite these perceived shortcomings the measures are commonly included within company specifications and payment grids with consequent impact on value. Existing alternatives include the EUROP system which utilises either visual or computerised vision systems to assess total carcase muscling and fat distribution.

Active consideration of alternatives including potential advanced technologies appears warranted.

WEIGHT AND FAT CLASSES

Optional standard carcase weight and fat classes are defined in AUS-MEAT language and may be used to classify carcases or sides, quarters or portions derived from carcases (Anon, 2014). Weight class is expressed as a number being maximum HSCW/10 with, as examples, 4 being up to 40kg HSCW, 7 from 40 to 70kg, 28 from 260 to 280kg and 46 above 440kg.

Fat classes are based on the P8 measurement and range from 1 (up to 2mm P8) to 6 (32mm and higher). Fat classes 2 to 6 may be further subdivided into – and + with, for example, 3- being a P8 of 6 to 9mm and 3+ being 9 to 12mm.

Both the weight and fat class definitions use common values as the upper limit of one class and the lower of the next so that, as used in the preceding example a P8 of 9 could be 3- or 3+. In carcase weight classes a HSCW of 280 could be either a 28 or 30. This should be amended for clarity.

An issue to consider in regard to fat and weight classes is their relationship to live animal language and consistency of descriptions used within NLRS (National Livestock Reporting Service), Auctions Plus, the Eastern Young Cattle Indicator (EYCI) and AUS-MEAT Livestock language. A combination of AUS-MEAT weight and fat class is commonly used in livestock description but far less so in meat trading where specifications are typically more specific as applied at cut level. The weight and fat class system is perhaps more applicable to the carcase trade which has declined in the Australian domestic market. Any increase, including exported quarter beef, may result in wider application and a consequent need to review or confirm the existing standards.

Any examination of carcase trade description might also consider major international systems including EUROP where the E.U.R.O and P refer to muscling and are used in conjunction with a 1 to 5 number to signify fat cover.

ACCELERATED CONDITIONING

An AC symbol may be used in addition to base carcase description to describe alternative accelerated conditioning methods used for other than cow and bull categories (Anon, 2014). Approved methods are electrical stimulation, tender stretched and controlled pH reduction.

AGEING

An AGED symbol and description can be used where the method of ageing is approved by AUS-MEAT, documented and monitored within company quality assurance programs.

FEEDING STANDARDS AND RAISING CLAIMS

Standard descriptions to define grainfed beef have been used for a considerable period and are incorporated in AUS-MEAT language. Early usage in State controlled carcase strip branding schemes is now uncommon but not precluded. The two commonly used grainfed symbols are GF and GFYG with GFD (grainfed domestic) a supplementary specification for purple strip branding (Anon, 2014).

Both categories require a minimum feedlot feeding period and minimum carcase criteria defined by AUS-MEAT base and chiller assessment criteria. While there is no MSA grade requirement a majority of these carcases are routinely MSA graded. This reflects the standards being established prior to the development of MSA and raises questions as to whether the use of days on feed and dentition within the standards might be reviewed and potentially replaced by MSA based eating quality criteria.

Use of the GF and GFYG description is restricted to National Feedlot Accreditation Scheme (NFAS) accredited feedlots. The NFAS is an industry self-regulatory quality assurance scheme administered by AUS-MEAT on behalf of the feedlot industry (Anon, 2014). To be eligible all cattle presented for slaughter must be accompanied by an NFAS delivery docket or agents declaration.

GRAINFED SYMBOL GF SPECIFICATIONS ARE:

- Minimum of 100 days on feed with further specification of minimum ration specification.
- 6 permanent incisor teeth maximum except where carcases have only partially ossified thoracic vertebrae.
- 7 mm minimum P8 fat depth.
- Meat colour score of
- 1a, 1b, 1c, 2 or 3.
- Fat colour score of 0 to 3.

GRAINFED YOUNG BEEF SYMBOL GFYG SPECIFICATIONS ARE:

- Minimum of 70 days on feed for steers and 60 days for females with further specification of minimum ration specification.
- 0 to 2 permanent incisor teeth.
- 5 mm minimum P8 fat depth.
- Meat colour score of 1a, 1b, 1c, 2 or 3.
- Fat colour score of 0 to 3.

PCAS:

A pasture fed cattle assurance scheme (PCAS) has recently been introduced which requires externally audited producer certification of compliance with four mandatory and two optional production based elements. Carcase assessed criteria include Meat Standards Australia (MSA) compliance. The mandatory elements comprise:

1. Identification and lifetime traceability.
2. Non confinement for the purpose of intensive feeding for production.
3. Lifetime pasture fed.
4. Minimum eating quality standards with MSA accreditation.

The optional elements are:

1. HGP free.
2. Antibiotic free.

ORGANIC/BIODYNAMIC:

The Australian national standards for organic and biodynamic production were first introduced in 1992 and are administered by AQIS and implemented by six independent AQIS accredited organisations (Anon, 2015).

The feed and raising claim specifications differ from the previous described language usage in two areas:

1. They require a transfer of certified information with the live cattle to establish eligibility.
2. The NFAS and PCAS systems require additional information from chiller assessment.

PRODUCER INFORMATION REQUIRED ON DELIVERY FOR SLAUGHTER

Currently there are many and diverse livestock related information inputs that may be required at slaughter including the standard National Vendor Declaration (NVD) inputs for HGP use, animal health treatments and access to by-product feeds, EU, NFAS, PCAS or organic eligibility plus breed and other declarations or weigh bills. These are accumulated from multiple sources, often paper based, creating considerable work post arrival and a risk of mistakes. Given that all cattle must carry the NLIS electronic tag the option of utilising this as an index to electronic data that contains other required data may warrant consideration. A further and related consideration could be to strengthen use and consistent application of the livestock language by consolidating all pre slaughter data sources within its jurisdiction, possibly related to on farm auditing and licensing.

PRODUCER FEEDBACK

Where cattle are sold to AUS-MEAT accredited abattoirs mandatory feedback data must be provided to the producer. For all cattle other than cows and bulls, individual carcase data recording hot carcase weight, P8 fat measurement (mm), dentition and bruise score must be provided. For cows and bulls, individual carcase data recording must include hot carcase weight, bruise score, and where P8 fat measurement is used to determine price, P8 fat measurement (mm) and, where dentition is used to determine the alternative category Young Bull *BYG*, dentition (Anon, 2006).

CARCASE LANGUAGE ISSUES

1. Consideration of changing bull and veal from basic to alternate categories. While requiring federal legislative change this may simplify product description within an enlarged *A* basic category and better relate to prospective production systems now common in other countries while also aligning better with scientific findings in regard to product characteristics.
2. Review alternative means of assessing animal age.
3. Review inclusion of butt shape as an indicator of carcase yield
4. Reassess the validity of sex distinction within alternate categories against scientific evidence and current market demand.
5. Monitoring and evaluation of existing and potential technologies that may provide improved accuracy in estimating yield incorporating fat and muscling variation.
6. Review alignment of weight class, fat class and muscling with live animal language.
7. Consider strengthening livestock language to consolidate all live animal information to be carried forward under a single NLIS indexed link with further consideration of implementing farm licensing and auditing.

CHILLER ASSESSMENT LANGUAGE

ASSESSMENT CONDITIONS

Standard conditions are mandated for chiller assessment to facilitate uniform and accurate appraisal. Ribbing and assessment must only proceed after the following post slaughter period (Anon, 2014).

1. 8 hours where the carcase has been electrically stimulated;
2. 18 hours where electrical stimulation has not been used;
3. Other time periods approved under AUS-MEAT controlled pH reduction systems; or
4. Other approved periods.

The carcase must have reached an ultimate pH value prior to assessment with the loin temperature below 12˚C. The assessment site must also be free of bone dust and irregularities or damage that may impact assessment. Further conditions relate to lighting via a standard torch, adequate room to assess and positioning of the assessor and torch.

The carcase must be ribbed at least 20 minutes prior to assessment to allow blooming and assessed within 3 hours of ribbing unless the exposed eye has been covered with a film.

Recent research evidence suggests that these conditions achieve the desired pH criteria and in general align with adequate bloom time for colour assessment other than in as yet unexplained circumstances where meat colour remains initially high relative to pH but eventually changes to a normal relationship.

There is also a long-standing observation that marbling results are better after a 48 hour or longer chill suggesting that time and temperature relationships are not as yet fully understood. This was recently investigated in ca. 200 carcases by assessing alternate sides quartered at 24 and 48 hours. Marble score was found to increase 0.8 units over this period (Thompson, J.M unpublished data).

ASSESSMENTS

Chiller assessment language (Anon, 2005) is applied to describe carcases after chilling and quartering, with hump height and ossification also able to be measured on the hot carcase. The basic AUS-MEAT chiller assessment elements may be used alone or augmented by further measures for MSA grading. Chiller assessment language components are:

- **Meat colour** assessed within 9 categories for beef *A* and 5 categories for veal *V*. Whereas the veal colour standards are numbered 1 to 5 with redness increasing with number the beef standards commence with 1a, 1b and 1c then continue as whole numbers from 2 to 7 with 7 being anything darker than the 6 chip. In all cases the standards used (a set of chips purchased from AUS-MEAT for use by certified assessors) represent the darkest colour within the standard.
- **Fat colour** assessed within 10 categories from 0 to 8 in increasing colour with 9 being any colour darker than the 8 chip.
- **Rib fat depth** assessed by measuring the thickness of the subcutaneous fat in mm at a specified rib. The grader can make an adjustment if they observe evidence of fat tearing. This figure has an 'E' after the fat depth estimate.
- **Eye muscle** (*M.longissimus dorsi* muscle) area (EMA) measured using a transparent grid which is placed over the eye muscle and recorded in cm^2.
- **Marbling** assessed under either or both of two systems – AUS-MEAT and MSA. The AUS-MEAT marbling standards (computer generated images of eye muscles with differing levels of marbling) are numeric from 0 to 9 with assessment above 6 requiring assessors to hold a high marbling endorsement. The AUS-MEAT marbling score signifies the amount of visual marbling fat in the eye muscle.

  The MSA marbling standards utilise the same standards but numbered in increments of 100 to 1100. Further subdivision to tenths is applied by the MSA grader who records marbling as 310, 320 etc from 100 to 1190. MSA marbling assessment includes evaluation of the fineness and distribution of marbling pieces. All chiller assessors must pass correlation tests against the computerised AUS-CAP system each 8 weeks.
- **Ossification** assessed against pictorial standards from 100 to 590 in tenths. Individual standards in units of 10 are provided from 100 to 200 with broader divisions between 200 and 590. The ossification scores provide a scale for assessment of physiological maturity of an animal. While the standard ossification assessment is made on a chilled carcase it may also be calculated by adding 10 points to a hot carcase appraisal. With many large processors utilising the hot ossification option the veracity of this relationship should be tested further.

  While ossification scores increase with animal age the rate of increase varies with individual animals related to the environmental conditions under which they were raised and hormone levels associated with pregnancy and HGP use so that while actual age, ossification and dentition all increase they are generally not well correlated.
- **Hump Height** measured in mm and used as a cross check against advised TBC or as a direct estimate of TBC in the MSA model. The cross check calculation was originally designed to check hump height range versus carcase weight and declared TBC% to indentify inconsistencies rather than as a direct estimating tool. The direct estimate of TBC% from hump height is conservative and not accurate (unpublished data Watson, MSA Pathways Committee). Further data are required to establish an appropriate eating quality relationship using hump height as a direct input to MSA grading.
- **Ultimate pH** measured by a calibrated pH meter and recorded to two decimal places with the associated temperature. An upper limit of 5.70 is required for MSA grading. pH is measured as the negative log of the hydrogen ion activity in the muscle. The hydrogen ion activity is a function of temperature. Therefore at warmer temperatures there is a greater concentration of H^+ ions present due to the release of protons from buffers and the pH reading of the muscle will be lower or more acidic than if measured at a cooler temperature when less H+ ions are present due to binding by the buffers. A correction proposed by Bendall and Wismer-Pedersen (1962) is applied so that the pH reading of the muscle is adjusted to 7°C.

MSA GRADE AND SUBSEQUENT CARCASE GROUPING

Where cattle are MSA graded chiller assessment language components (marbling and ossification scores, hump height, ribfat and pH) are utilised together with primary language components of sex, HSCW and carcase suspension plus additional live animal data for HGP, TBC and whether the animal was weaned to calculate the MSA grade (Fail or ungraded, 3*, 4* and 5*). This result is determined at the time of chiller assessment by entering the required data in a DCU (data capture unit) for processing. There is no single carcase grade but rather a current 146 individual cut by cooking method outcomes indicating the predicted consumer satisfaction with each of 39 individual muscles cooked by specific methods. A maximum meat colour score is included as a threshold MSA grade criteria but forms no part of the eating quality prediction.

To facilitate carcase marshalling for boning it is common for various combinations of these cut x cook results to be established as MSA Boning Groups (BG) or plant boning runs (PBR) which are currently replacing the traditional standard MSA boning groups. Carcases are grouped and boned in the assigned runs with the cut descriptions aligned to the broad language and MSA outcomes.

MSA PRODUCER FEEDBACK

Where carcases are MSA graded primary MSA grade inputs must be provided for each carcase via producer feedback together with the grading outcome. These add sex, ossification, AUS-MEAT and MSA marbling, meat colour, hump height and rib fat depth to the mandatory OTH trading measures (HSCW, P8 fat depth and bruise score). Further data may also be provided in MSA feedback and are available via the MyMSA website. The additional measures available are hormone growth promotant (HGP), RFID, hang method, fat colour, milk fed veal (MFV), tropical breed content (TBC%), eye muscle area (EMA), pH and the associated loin temperature, fat distribution, hide puller damage and the MSA Index (Anon, 2007).

CHILLER ASSESSMENT LANGUAGE APPLICATION IN TRADITIONAL DESCRIPTION COMPARED TO MSA

Prior to the introduction of MSA, chiller assessment elements were used in conjunction with alternative category and other descriptions to describe product, with the factors used and related standards determined purely by commercial agreement. A particular cut could therefore be specified as *YGS-Shortloin* MC:1a-3 FC:0-3 MB2-4 with further specification of GF 200 days and so on. This remains current practice in most export trade and is centred on describing product in terms of appearance and assessed factors that in combination the trade believe will meet a market requirement. Early efforts to develop Australian grading standards adopted this approach with the GF and GFYG descriptions reflecting some of these endeavours.

The essential difference with MSA application is that, while most of the same factors are assessed, they are used as inputs to prediction equations for each muscle with the output carried forward as a predicted level of consumer satisfaction. The cut described above might be described as GRL MSA 4* @ 14 days. Consequently the 8 or so inputs, arguably including the cut itself, become irrelevant

as they are superceded by a single outcome related result. This can dramatically simplify description while improving the accuracy of a final consumer result. A subtle but significant result of this is that the onus on predicting the final outcome, presumably the critical issue for table meats, moves to industry from the purchaser who under conventional chiller assessment must grapple with the mix of inputs and their interaction to meet a desired standard. This does not diminish the essential value of the traditional chiller assessment system; it remains critical to assess eating quality inputs used in the background for grade calculation and for forward direct customer description in terms of outcome, portion weights, packaging and any desired preparation standards.

It may be noted that while dentition assumes a central role in defining the alternative category it is not utilised in the MSA prediction as it has not proved to be useful. There is often some conflict where MSA grading is applied after grouping carcases on traditional alternative category lines resulting in further carcase marshalling and cut labelling complexity. For example the product above may be described as *YG-SHORTLOIN* MSA with a GRL MSA 4* @ 14 day description. As *YG* reflects dentition it is unrelated to the MSA grade outcome but carcase marshalling must segregate *YG* to ensure truth in labelling. Further there may well be another boning run of *YP* carcases of identical MSA grade description but not able to be mixed unless the *YG* group are “downgraded” to *YP*.

The situation is further complicated where company livestock purchasing grids or customer specifications use a mix of alternative category, chiller assessments and MSA grading and where international access agreements include AUS-MEAT language terminology based on alternative category.

Potential solutions to these complications may include creating a further alternative category of “Eating Quality Graded” which could be used as a substitute for the dentition based ciphers. Where there are no external cipher requirements this can be achieved at present by packing a cut under the primary category of Beef so that rather than a striploin being labelled *PR-STL* MSA it can be labelled STRIPLOIN MSA providing the label also carries the generic Boneless Beef wording.

CHILLER ASSESSMENT ISSUES

A number of issues are evident within the chiller assessment language, standards and application that require evaluation including:

1. Verification of physical chiller assessment conditions and their interaction with colour and marbling measures.
2. Possible current and future technical capacity to utilise objective measurement for key existing or alternative criteria. Examples could be imf% (intramuscular fat%) in lieu of marbling, image analysis evaluation of marbling, meat colour, EMA, rib fat and other measures or electronic meat colour assessment.
3. Graduation of meat colour chips to a linear numeric scale to replace 1a, 1b and 1c.
4. Do we need two marbling systems or should we reduce to the MSA standard?
5. Clarification of the relative roles and benefits of alternative age and maturity measures. This should reflect two separate objectives; the prediction of eating quality, where ossification may be expected to replace dentition given current knowledge, and the assessment of animal age to meet BSE oriented objectives.
6. Validation of hot and cold ossification score relationships.
7. Further research from additional data to improve the accuracy of hump height as a direct MSA model input.
8. Consideration of inherent conflict between alternative category and MSA description and potential solutions including creating an Eating Quality Graded alternative category together with incorporating this in applicable country to country agreements.

CUTS LANGUAGE

Standard cut language is a continuation from carcase language with primary or alternative category linked to common code ciphers and cut descriptions/names. Further specification of cutting lines and preparation detail is detailed within the Handbook of Australian Meat (HAM). One of the undoubted strengths and successes of AUS-MEAT language is the extensive standardised description of cuts as expressed in the HAM, exemplified by adoption of HAM carcase and cut description as a UNECE standard and continued strong demand for copies from many countries (I King, pers.comm.). Further language detail provides for specification of packaging and extensive detail in relation to application and labelling. These language components are extensively and successfully used in all markets.

Further extension into standardised retail cut descriptions via the register of cuts and items has been less extensively adopted and there are many inconsistencies in common cut naming across states, retailers, food service outlets and in export markets.

Key components of cuts-based language include:

THE HANDBOOK OF AUSTRALIAN MEAT (HAM)

The HAM provides a solid reference point for description of carcases, and major carcase portions including quarters, pistola hindquarters, butts and both bone in and boneless cuts together with manufacturing packs. Each HAM product item is assigned a 4 digit numeric code and accompanied by a diagram depicting the source carcase location and a photograph. A written description of cut preparation and points requiring further specification such as minor muscles that may be included or removed from the primal cut is provided.

Related codes that represent different levels of standard preparation from a common primal are mostly assigned closely related codes in a logical order so that a full tenderloin is 2150, a side strap off tenderloin 2160 and a butt tenderloin 2170 for example. Some cuts are assigned two alternative codes under different widely used names, for example Topside 2000 and Inside 2010, reflecting differences in domestic and export terminology.

Provision is also made for combination packs allowing for mixed hindquarter, forequarter or other combinations of cuts under individual product item codes. Further definition is provided for boneless beef manufacturing packs and for trimmings, diced meat, strips and mince with additional provision for agreement between buyer and seller.

Further basic anatomical, skeletal and muscle identification charts including the Latin muscle names are also included to facilitate correct identification. The HAM also provides a chart of estimated weights for key primal cuts related to carcase weight together with basic descriptions of the AUS-MEAT language including basic and alternative categories, chiller assessment language, packaging and labelling. Principal industry programs including MSA are also summarised.

The HAM is also published as an “International Red Meat Manual” and is widely used as a reference in international trade. This adoption has provided value to Australian exporters in establishing standard Australian descriptions as a common language across many markets somewhat simplifying production and labelling complexity.

REGISTER OF CUTS AND ITEMS: BEEF *(ANON, 2014)*

The register of cuts and items: BEEF defines standard cut names, associated HAM codes for bone in beef cuts and items and boneless derivatives, special references where applicable and in most cases a common two to seven length alpha Common Code cipher. For example Blade is a cut description for HAM code 1620 which is a bone in product and also for HAM code 2300 which is boneless. Both are assigned a common code cipher of CLO.

The common code cipher abbreviations are a mix of direct abbreviation of the register cut name; BOL for bolar blade, BKT for brisket and TDR for tenderloin for example and of

alternative cut name abbreviations; CLO being shortened from CLOD but named Blade and CT from Chuck Tender but named Blade Roll for example. This reflects multiple names, for example clod and blade, blade roll and chuck tender and fillet and tenderloin where the same cut has multiple different names often reflecting either export and domestic or state by state common usage.

In this respect the common codes are more consistent than the cut names in common usage. This is also true of the special references where a bolar blade (BOL) is derived from a clod (CLO) rather than the alternative Blade (CLO). While initial logic may encourage reduction of these naming inconsistencies to a similar common code equivalent basis, history indicates that this may not be an easy path to pursue.

REGISTER OF CUTS AND ITEMS: VEAL *(ANON, 2014)*

The veal section of the register is aligned with the beef format with two weight ranges for cuts and items derived from veal *V* carcases under 70kg and between 70.1 and 150kg HSCW.

In both the beef and veal register sections there is provision to apply for registration of new cuts and further approved abbreviations for items that do not have common code ciphers, for example FQ for forequarter, HQ for hindquarter and CP/Off for cap off.

MSA MUSCLE AND CUT CODES

The MSA program has evolved through research activity commenced in the early 1990's. For research purposes testing has been conducted at a muscle rather than primal cut level where a conventional primal includes multiple muscles. Some muscles are also present in multiple cuts and some vary in eating quality with position. Standard MSA muscle coding was developed with a three character alpha to designate the standard primal, for example STR for striploin followed by a three digit numeric using the HAM muscle list, for example 045 (M. longissimus dorsi) to describe striploin as STR045. Further portions of the same muscle are described as CUB045 in the cube roll and CHK045 in the chuck. Where muscles are seamed out they may be sold under their individual MSA grade and where several are sold together as a primal cut the lowest rating determines the primal cut grade.

These codes are used in MSA grade application but currently are not disseminated beyond that. Again they differ from common code ciphers in some areas with CUB rather than *CUR* and STR rather than *STL* prominent examples. Further anomalies exist due to MSA positional descriptions which have a notional RMP031, which would align with the *RMP* cipher and 031 HAM muscle number expressed as RMP131 and RMP231 to differentiate two muscle portions or STA and STP to differentiate between anterior and posterior striploin *STL* positions. Further effort to achieve standardised coding should be considered.

A further consideration where product has been MSA graded is the possibility of packing under a cooked quality description rather than being obliged to incorporate cut names. Addition of "EQ beef for stir fry" type codes within the H.A.M system would enable companies to pack multiple muscles from possibly divergent carcases where these all were assigned a standard MSA grade such as SFR 3*.

STANDARD CUT DESCRIPTION AND THE AUSTRALIAN COMMON CODE

Standard cut description language is in essence a combination of basic or alternative category and the cut and item register name or cipher with further specification delivered by an associated HAM code. Thus a Striploin may be labelled *YG* STRIPLOIN or *YG-STL* and ordered as HAM2140. Due to the inconsistencies noted in naming conventions the common code ciphers offer benefits both in more consistent description of cuts or items and in physical aspects of available space on carton labels.

A further substantial benefit of the cipher applies when exporting product to some countries, notably the USA, Canada and Japan which accept the ciphers as primary description, sometimes simplifying import inspection. An example (Anon, 2014) is that whereas a carton labelled STEER INSIDES requires opening and inspection by USDA inspection to verify that the carton contains steer insides, if labelled *S-INS* inspection is not required.

TYPE OF PACKAGING

The type of packaging must appear on the outside of the carton or package in accordance with Figure 6. No symbol is required for bulk packed product.

Figure 6: Packaging Type Descriptions and Codes

LABELLING

AUS-MEAT

TYPE OF PACKAGING

The method of packaging cartoned product shall be shown on the carton labels by symbols as follows:

Individually wrapped		IW	Two or more items vacuum packed in a single covering		MW/VAC
Individually wrapped, vacuum packed		IW/VAC	Tray packed		TP
Layer packed		LP	Tray packed, vacuum packed		TP/VAC
Layer packed, vacuum packed		LP/VAC	Modified atmosphere packaging		MAP
Two or more items wrapped in a single covering		MW	Other vacuum packed items, or where multiple vacuum packaging methods are used		VAC
Non specified pieces packed in poly bags		BAGS			

No symbol is required for bulk packed items.

FOOD SERVICE DESCRIPTIONS (ANON, 2014)

AUS-MEAT language includes a provision for use of food service terms and some associated general codes that may be used in specification. Examples include Butterfly and medallion, both code Z, Comminuted or Ground, both code X or Portion, code P, and a generic Vale added coded V. While there is no register for these cuts or items the suffix codes can be added to the H.A.M number and cut/item name to create for example BEEF SHORTLOIN STEAKS – 1550Z.

Retail and food service operators also adopt more creative terms without feeling constrained by standard language conventions!

DOMESTIC LABELLING FOR 8 TOOTH CATTLE

When sold in NSW primal cuts derived from animals with 8 permanent incisor teeth must comply with the Budget Beef Selection Program requirements (Anon, 2014) which include three grades;

- BUDGET OX which can be packed from Ox *S* or Steer *SS* with a maximum of meat colour 4 and fat colour 4.
- BUDGET COW which can be packed from Beef *A* or Cow *C*. Meat and fat colour must each not exceed 5.
- MANUFACTURING packed from male or female 8 teeth carcases in *S*, *SS*, *A* or *C* carcases with no further requirements.

The legislative adoption of the Budget Beef Selection Program in a single state adds complexity in packing meat where the final point of sale may not be known.

CUT LANGUAGE ISSUES

Some issues identified as warranting consideration within the current cuts language structure include:

1. Examination of multiple descriptions, ciphers and symbols for individual cuts or items to identify possible simplification.
2. Consideration of additional H.A.M codes to facilitate packing of Eating Quality graded product within a cooking method description without mandatory cut identification allowing companies to pack mixed cuts with common eating quality outcomes.

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