MEAT STANDARDS AUSTRALIA, A 'PACCP' BASED BEEF GRADING SCHEME FOR CONSUMERS. 4) A CUT BASED GRADING SCHEME TO PREDICT EATING QUALITY BY COOKING METHOD

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Background

The Meat Standards Australia (MSA) grading scheme has gone through a rapid evolution. Consumer sensory testing for the development of the carcass pathways commenced in June 1997 and in November 1997, the first MSA carcass pathways were released for use in the pilot study, which was undertaken in Brisbane. Subsequent to this, there were a number of modifications and additions to the carcass pathways as new results emerged from the consumer testing. In mid 1998, the concept of extending the carcass based grading scheme to a cuts-based grading scheme was initiated. Over the next six months, consumer tests on individual cuts from several experiments which incorporated different cattle breeds from different finishing systems and post-slaughter treatments were conducted. The results from this exercise have underpinned the development of a cuts-based grading system, which will be introduced to the Australian domestic market in mid 1999. The new scheme provides a substantial increase in the accuracy of predicting the palatability of meat. Moreover, it provided the ideal framework for a new system of value-adding and accurate end-use labeling of meat for consumers.

The evolution of the MSA grading scheme

Carcass grading: The MSA carcass pathways scheme used a total system approach, whereby compliance with Critical Control Points (CCPs) from the production, processing and value-adding sectors of the meat production chain were used to assign a carcass grade (ie, unsatisfactory, 3 star, 4 star or 5 star). In this instance, the carcass grade was based on the palatability of the striploin and only four cuts (striploin, cube roll, rump and tenderloin) were eligible to be sold as graded product. The specifications were described at two levels, the first being a set of generic criteria that were aimed to minimising quality losses during the pre-slaughter period and optimising the post-slaughter environment. The second set of criteria were specific to the individual grades and included factors such as breed, growth path, hanging, chiller assessment traits and ageing times. The carcass pathway approach evolved from a need to satisfactorily 'sort' carcasses so that failure rates could be reduced to achieve grade standards established from consumer testing for the four primal cuts. It was acknowledged that the tenderloin would have a higher palatability score than the striploin, even though the carcass carried the same grade. What was important was that all cuts from that carcass, which were sold as graded product achieved the minimum palatability standards.

This approach worked well from the consumers' point of view, in that it reduced the risk of them receiving an unsatisfactory steak. When compliance was verified against striploin palatability scores in the database, it showed that if a carcass met, or exceeded, the specifications for '3 star' then the risk of failure (based on CMQ4 score) was 11%. If the carcass did not meet the '3 star' specifications then the risk of failure increased to 29%, although the corollary to this was that 71% of the carcasses that failed to meet '3 star' specifications were deemed acceptable by consumers. The large proportion of carcasses that failed grading criteria and yet had acceptable palatability was acknowledged as a problem with the carcass pathways system, but if the grading scheme was to work, a minimal risk approach was necessary in the interests of guaranteeing consumer satisfaction.

Cuts based grading: The development of a cuts-based grading scheme was predicated on the need to improve accuracy of predicting palatability in beef at the retail level and the need to expand the MSA grades to more than just the four high value muscles in the carcass. Preliminary analysis of the database showed that the variation explained by muscles was approximately 60 times greater than that explained by the variation between animals for the same muscle. Consumer sensory results for striploins clearly showed that *Bos indicus* content, growth path and tenderstretching had a large impact on palatability, whilst other factors such as days on feed were less important.

The analysis specific to the development of the cuts based model is outlined by Thompson et al (1999). The regression approach allowed changes in CMQ4 score to reflect the estimated effects of the independent variables, rather than using the approach of non-negotiable cut-offs in specifications. Rather than defined carcass pathways as before, there were now a large number of combinations that could be used to achieve a specified outcome. This was considered desirable, as the consumer is not concerned by the means a muscle achieved a palatability score, rather, that its palatability matched its description. A sample output from the cuts-based model is shown in Figure 1. The model incorporates the major effects and their interactions that impact on palatability. In selecting the prediction parameters for the model, the emphasis has been on measurable effects rather than possible causes. For example grain feeding was found to have a beneficial effect on palatability, as compared with pasture finishing. But rather than use grain feeding as a parameter in the model, its effect on the CMQ4 score was found to be quite adequately explained by the increase in carcass weight and marbling score. It is important that the model continue to be dynamic incorporating new results to improve accuracy and to incorporate new technology.

Implications for the consumer, retail, processing and production sectors

Consumer: The implementation of a cuts-based grading scheme will enable consumers to purchase more consistent beef. In addition, implementation of processing technology should increase the palatability of meat being sold as graded product. The sale of meat on a palatability/cooking technique basis should dispense with the need for cut names, particularly those that provide no information on

how best to cook and prepare the product. The pilot program demonstrated that if consumers were presented with a consistent graded product they had a high repurchase rate and price was not a critical factor.

Retailer: Supermarkets using boxed beef and butchers being supplied with carcasses can both participate in the MSA scheme. There will be an opportunity for retailers to price cuts using a palatability/cooking technique basis. Results from the consumer panels show that the oyster blade and striploin are equally palatable to consumers and yet they have traditionally been sold at different prices/kg. Moreover, seaming of muscles from traditional cuts and identifying the optimum cooking method for them has the potential to improve the yield of high palatability cuts from the carcass.

Processing: New opportunities are available to processors in the way they process carcasses and market the cuts. The use of the prediction model in combination with other decision support software offers scope for processor to customise their boning/value-adding operations to better match their specific customer needs. The system will facilitate the grading of cuts on the carcass and sorting carcasses in groups to be boned that will maximise the separation of cuts on their potential value and reduce the variation in palatability scores within a box of primal cuts. The level of complexity will vary between processors depending upon their perceived market opportunities and operational constraints. A labeling system that describes the cut grade in relation to cooking technique and days aged has been developed (Figure 1 b). Therefore the grade placed on a cut at boning is not fixed, but is a function of the recommended cooking technique and length of ageing applied. This simplifies the decision of when to supply a cut into the retail sector, as the opportunity cost to achieve the next increment in grade can be quickly calculated.

Production: The model provides a tool by which the producer can assess the impact of various production decisions on palatability. This will allow the producer to optimise marketing decisions for a particular lot of cattle, but perhaps more importantly, to predict the impact of possible changes in future management decisions. The importance that is placed on production changes aimed at improving palatability will depend upon the price differentials that the industry places on the various grades. The ability of the model to give answers to 'what if' questions is a very powerful one that has not previously been available to the producer. Price models have been developed which allow a relative value to be placed on the carcass at five days ageing. This should provide a relative basis for valuing the carcass as raw material into the food chain to be value-added. Providing a pricing model will ultimately allow the value of the raw product and the benefits of value-adding to be better defined. Ultimately, a total package will include the value differentials associated with both yield and palatability.

Conclusion

The cuts-based grading system provides opportunity for change to all levels of the meat production chain. If these opportunities are embraced it will pave the way for a value-based trading system which delivers an improved consistency and palatability to the consumer.

Figure 1. a) The output from the cut-based grading model, which uses grading parameters to predict eating quality (CMQ4 score and star grade) for individual cuts prepared using a range of cooking techniques. The shaded areas represent cut/cooking combinations that have not been tested to date.

Model inputs include: Hanging method, tenderstretch or normally hung options are available, although other techniques such as Tendercut are currently being evaluated. Sex, male or female. Estimated *Bos indicus* content, assessed from a combination of vendor declaration and phenotype. Photographic standards for phenotype are available. Carcass weight, AUS-Meat hot standard carcass weight in kg. Ossification score, US ossification score. Lifetime growth pattern is assessed from the regression of carcass weight nested within ossification score. Days aged can be specified for all cuts, or individually (in the example below all cuts are aged for 14 days with the exception of the striploin which is aged for 21 days).

The basic criteria, which are pre-requisites to carcasses being eligible for grading, are as follows: cattle must be consigned directly to slaughter and slaughtered the day after dispatch. Cattle must be handled according to a code of practice and there must be no mixing in lairage. At slaughter the pH/temperature decline must fall within the prescribed window. Carcasses must have an ultimate pH < 5.7, a US colour score < 300, an ossification score < 200 and > 3mm rib fat with an even and adequate coverage of fat across the loin, rib and rump.

b) A sample label showing cut and grade for cooking technique/days aged combinations. This label can be placed on the primal carton in the boning room, or inserted by the retail butcher in the vacuum pack at boning.

a)

Grading Parameters	
Hang (AT, TS)	TS
Sex (M, F)	M
Bos Indicus %	0
Carcass weight	250
US Ossif. Score	140
US Marb score	330

Days aged (all cuts)	14

Days age	Cut	Grill	Star	Roast	Star	Stir Fry	Star	Slow cook	Star	Corn -ing	Star
	Brisket							38	X		
	Outside flat			48	3			49	3	57	3
	Topside			53	3	49	3	46	3		
	Eye Round			53	3			50	3		
	Knuckle	53	3	66	4	62	3	48	3		
	Blade	60	3	62	3			62	3		
	Rump	63	3	72	4						
21	Striploin	71	4	67	4						
	Oyster Blade	68	4	65	4	70	4				
	Cube Roll	70	4	71	4						
	Tenderloin	78	4	76	4						
	Spinalis	80	5			79	4				

b)

M S A				Works A					Rump							
Day	0	5	6	7	8	9	10	12	14	16	18	20	21-28	29-35	35-42	Max
GRL	02-Feb	3	3	3	3	3	3	3	3	18-Feb	4	4	4	4	4	4
RST	02-Feb	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Wgt	22.6		No of Cuts						4				Div	3		