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CLARIFICATION OF MSA GRADE PROCESS AND GRADE STRUCTURE

Thank you for the opportunity to appear before the committee in Albury last Tuesday and for your interest in my submission which I appreciate. In a subsequent submission from another party a number of assertions were made in regard to MSA grading, including a statement that there were 18 grades. This and a number of other assertions indicate that the witness may be confused and I write to ensure the factual detail is known to the committee. My intention is to only address the factual detail rather than to contest various opinions which I may also disagree with but I recognise that everyone is entitled to their own view.

For the record there are only three MSA grades, 3*, 4* and 5* other than an “ungrade” or failure category which cannot receive a grade. In practice most MSA graded meat to date has been sold simply as “MSA”, indicating that it meets or exceeds the minimum standard for the lowest 3* grade but may also be 4* or 5* product that has been “packed down”. The degree of packing down to 3* is of concern and potentially reduces revenue based on consumer willingness to pay (WTP) data. WTP results from over 10,000 Australian consumers since 1996 consistently indicate that consumers value unsatisfactory beef at 48% of a 3* price whereas they value 4* at 145% of 3* and 5* at 198%.

At a more detailed level MSA grades are determined by a computerised calculation process that uses a number of animal, carcass and processing inputs to estimate an MQ4 score between 0 and 100 for each of 40 muscles at any desired days of ageing, each cooked by up to 8 cooking methods. The MSA grade for each muscle is determined by the MQ4 score with any under 45.5 ungraded, those above 45.5 but under 64 graded 3*, those from 64 to 76.5 points 4* and those 77 and above 5*.

The score is a weighted composite of tenderness (30%), flavour (30%), juiciness (10%) and overall satisfaction (30%), hence meat quality, four variables or MQ4, with the weightings derived from consumer testing. To date over 81,000 Australian consumers and more than 14,000 international consumers have each evaluated 7 samples of beef representing a wide range of cattle, cuts, processing treatments and cooking methods. This data, the largest consumer data set in the world, has been used to develop the prediction model. The model is used during grading to calculate the MQ4 score for 145 muscle by cook combinations for every carcass.

Figures 1 and 2 present two carcasses of different quality to illustrate the process. The box to the left in each figure displays the grading inputs; % tropical breed content, sex, HGP (growth hormone) status, if a milk fed vealer, if supplied via a saleyard, whether carcass infusion was used, carcass weight, carcass hanging method, hump height, skeletal ossification, marbling, rib fat, ultimate pH

and temperature and days aged which while shown in these examples as a common 14 days for all cuts is actually calculated for each cut individually.

Figure 1: MSA Grade result for a higher quality carcass.

Description	Format	Name	Input	cut	muscle	GRL	RST	SFR	TSL	YAK	SSB	SCT	CRN
Estimated % Bos Indicus	% or X if doubt	EPBI	0	spinalis	SPN081	83	72	82	78	84			
Animal Sex Type	M/F	Sex	m	tenderloin	TDR034	83		77					
Hormone Growth Promotant	Y or ? / N	HGP	n	tenderloin	TDR062	79	78	81	76	71	68		
MikFedVealer	Y/N	MFV	n	tenderloin	TDG062	78							
SaleYard	Y/N	SIYrd	n	cube roll	CUB045	72	73	73	73	74			
Rinse/Flush	Y/N	RnFI	n	striploin	STA045	69	70	72	68	71	63		
Hot Std Carcase Weight	Weight in Kg	HSCW	300	striploin	STP045	68	69	72	68	69	62		
HangMethod	AT/TS/TL/TC/TX	Hang	tx	oyster blade	OYS036	66	62	69	70	70			
Hump Height	mm	Hump	50	blade	BLD095			45	50				
Ossification USDA	USDA measure	uoss	140	blade	BLD096	58	62	64	63	65	51	64	
Marbling USDA	USDA measure	umb	350	chucktender	CTR085		52	55	60			63	
RibFat	mm	RbFt	6	rump	RMP131	61	70	69	72	67	59	65	
Ullimate pH	5	UpH	5.44	rump	RMP231	64	73	72	71	75			
Loin Temp at Grade	Metered Temp C	Utmp	7	rump	RMP005	66	70	74	74	76			
Days of Ageing from Kill	Days Aged	Age	14	rump	RMP032			73	75				
				rump	RMP087		61	66	66			64	
				knuckle	KNU066	55	68	63	67	65		56	
				knuckle	KNU098			63	68			65	
				knuckle	KNU099	45	56	53	60	56		61	
				knuckle	KNU100	69		69	73	71		64	
				outside flat	OUT005	49	49	52	62	63	50	65	58
				eye round	EYE075	50	54	52	54	55		54	53
				topside	TOP001	51		62	64	68		61	
				topside	TOP033	45		61	67	67		69	
				topside	TOP073	46	54	54	64	64	56	63	
				chuck	CHK068		49	54				66	
				chuck	CHK074	61	58	63	69	60		73	
				chuck	CHK078	56	59	60	63	60	46	71	
				chuck	CHK081			62	66	61		76	
				chuck	CHK082			53	57				
				thin-flank	TFL051			64				64	
				thin-flank	TFL052			73	65			70	
				thin-flank	TFL064			67	64			66	
				rib-blade	RIB041			53					
				brisket	BRI056			45	59	54		61	39
				brisket	BRI057			42	50	49		65	
				shin	FQshin							67	
				shin	HQshin							71	
				intercostal	INT037			59					

5 Day aged AT hung for Producer
 MSA INDEX 64.46

Figure 2: MSA Grade result for a lower quality carcass.

Description	Format	Name	Input	cut	muscle	GRL	RST	SFR	TSL	YAK	SSB	SCT	CRN
Estimated % Bos Indicus	% or X if doubt	EPBI	50	spinalis	SPN081	64	54	63	60	65			
Animal Sex Type	M/F	Sex	F	tenderloin	TDR034	67		61					
Hormone Growth Promotant	Y or ? / N	HGP	Y	tenderloin	TDR062	62	62	64	59	55	52		
MikFedVealer	Y/N	MFV	n	tenderloin	TDG062	61							
SaleYard	Y/N	SIYrd	n	cube roll	CUB045	44	44	44	44	45			
Rinse/Flush	Y/N	RnFI	n	striploin	STA045	36	37	38	35	38	31		
Hot Std Carcase Weight	Weight in Kg	HSCW	300	striploin	STP045	34	35	37	33	35	28		
HangMethod	AT/TS/TL/TC/TX	Hang	AT	oyster blade	OYS036	54	51	57	58	58			
Hump Height	mm	Hump	75	blade	BLD095			29	33				
Ossification USDA	USDA measure	uoss	590	blade	BLD096	36	40	42	41	43	30	42	
Marbling USDA	USDA measure	umb	250	chucktender	CTR085		33	35	40			43	
RibFat	mm	RbFt	6	rump	RMP131	36	44	42	46	41	34	39	
Ullimate pH	5	UpH	5.44	rump	RMP231	39	46	45	45	49			
Loin Temp at Grade	Metered Temp C	Utmp	7	rump	RMP005	43	47	50	51	53			
Days of Ageing from Kill	Days Aged	Age	14	rump	RMP032			47	49				
				rump	RMP087		36	41	41			39	
				knuckle	KNU066	32	44	39	43	41		33	
				knuckle	KNU098			39	44			41	
				knuckle	KNU099	22	33	30	36	33		37	
				knuckle	KNU100			45	49	46		40	
				outside flat	OUT005	29	28	31	40	41	29	43	37
				outside flat	OUT029			36	43			37	
				eye round	EYE075	27	30	28	30	32		30	29
				topside	TOP001	26		37	39	43		36	
				topside	TOP033	23		39	43	43		45	
				topside	TOP073	22	30	30	39	39	31	38	
				chuck	CHK068			33	38			49	
				chuck	CHK074	44	41	46	51	44		56	
				chuck	CHK078	40	42	43	46	43	30	53	
				chuck	CHK081			45	48	44		58	
				chuck	CHK082			37	40				
				thin-flank	TFL051			41				41	
				thin-flank	TFL052			49	42			46	
				thin-flank	TFL064			44	40			43	
				rib-blade	RIB041			29					
				brisket	BRI056			28	41	37		43	23
				brisket	BRI057			25	33	32		47	
				shin	FQshin							37	
				shin	HQshin							40	
				intercostal	INT037			39					

5 Day aged AT hung for Producer
 MSA INDEX 41.31

The boxes to the right present the calculated MQ4 value for each muscle by cooking method at 14 days aged in these examples. The columns are cooking methods; grill, roast, stirfry, thin slice, yakiniku, shabu shabu, slow cook and corn. The two columns at the left show the primary cut and in many cases different muscles within the cut which often also differ in eating quality.

The numbers displayed are the calculated MQ4 values with the shaded colour for each cell indicating the MSA grade; no shading being ungraded, green being 3*, purple 4* and gold 5*. It will be noted that there is no such thing as a common carcass grade as all carcasses include a range of eating quality. In the first example of a higher, but not unusual, carcass there is a substantial amount of 4* and 5* meat and very few failures where in the second example most cuts fail.

These grades reflect the expected cooked meal satisfaction level of typical Australian consumers and can be used to describe beef at a cooked meal level. This could potentially allow beef to be presented very simply at retail purely as an MSA grade level within cooking method as the effect of cut and all other contributing factors is included within the calculation.

This approach represents worlds' best practice being the only grading system that delivers a consumer based individual meal estimate. All other global systems simply describe a carcass; they group carcasses of similar appearance but deliver very little in regard to indicating a consumer meal result. The Torbay system that was mentioned in submissions also acknowledged that MSA grade supplanted all other inputs where available but sought to describe carcasses, essentially by dentition and sex, where they were not eligible for MSA grades. While our traditional AUS-MEAT language was built on sex and dentition as a base carcass description the extensive consumer testing undertaken during development of MSA found dentition to be very poorly related to eating quality leading to its exclusion as a model input in favour of ossification.

The output shown in the two figures is complex and in practice not displayed during grading but held within the DCU used by the grader to enter their inputs. If desired it can be produced and for a butcher who is breaking up individual bodies can be used to manage each individual cut for an optimum eating quality result. I have personally used and developed this approach in a retail environment.

For major processors however carcasses are grouped and run through the boning room in batches without individual cut identification. Consequently all rumps from a common batch are packed together under a single description which, effectively, describes the lowest value for that cut in the batch. This applies to all cuts from the group of carcasses that are within the batch or boning run.

As the grouping is at carcass level all cuts are defined by the best and worst within a run of carcasses leading to decisions as to which cuts are most important and what grade by what days aged and which cooking method they are to be selected by and packed under. To simplify this process in the early introduction of MSA to major works a series of 18 alternative boning groups were provided.

Each boning group designated a grade result for individual cuts so that, for example, in a boning group 7 the tenderloin had to be a minimum 4* at 5 days as a grill, roast, stirfry and thin slice whereas the cube roll had to be a 3* at 5 days, the striploin 3* at 5 days and so on with 52 cut descriptions at the boning group 1 level reducing to only 3* tenderloin for a boning group 18. Processors selected one or more boning group levels that suited their marketing or cattle supply and then grouped carcasses pre boning, as an example, into boning group 1 to 7, possibly with a second run of boning group 8 to 12 and so on. ***In all boning groups, and for all cuts within boning group, however there were a maximum of 3 possible grades.***

Over time (10 years or more) a number of problems in this approach became evident as MSA was utilised at more sophisticated levels. A major issue was that for a carcass to be placed in a designated boning group all nominated cuts and their cooking methods had to meet the grade shown in the boning group specification even though many of these cuts or cooking methods were not sold as MSA. Consequently cuts that were desired could be missed as other cuts that were not

packed MSA caused a carcass to fail. The boning group system is currently being replaced by MSA Optimisation which provides a capacity for processors to establish customised boning runs that include only the cuts they wish to market as MSA and at their individual elected grade levels.

A further unintended consequence was that processors not only grouped carcasses into boning groups but also based cattle purchasing on them leading to producers confusing boning group with grades. This would appear to also relate to the “18 MSA grades” comment made at the Albury hearing.

In practice boning group is a poor description of actual carcass merit as, while the boning group specifications are fixed, the actual grade relationship between cuts within a carcass varies widely due to the differential impact of grading inputs with bos indicus content, ossification and HGP major factors. To provide a superior indicator of carcass potential an MSA Index has recently been introduced. This is shown in the lower left of the two figures with values of 64.46 and 41.31 respectively. The index is calculated by extending a standard yield for each of 39 muscles by their MQ4 score for a designated cooking method and is an excellent representation of carcass potential and a useful measure, similar to an EBV (estimated breeding value), to assist producers in breeding and management decisions.

I hope that the above provides some clarity on the actual basis of MSA grade assignment. I am also forwarding a peer reviewed research paper by Griffiths and Thompson that reports on premiums obtained for MSA graded beef, the additional industry revenue and its distribution between retail, wholesale and producer sectors. The last period reported is 2011/12 at which point the authors estimated the value to industry as \$523 million and at least \$200 million above all developmental and implementation costs. Given that annual graded numbers have increased from the 1.4 million head reported in this study (2010/11) to 2.4 million in 2012/13 the current value of MSA to producers and industry is likely to be much greater. This is a very positive story on what can be accomplished by MLA levy funded research with considerable further value available from more comprehensive application of the science and additional research based development. This remains my personal focus and passion. If possible I would like the paper to be tabled as an enquiry document.

Should it be desired I would be pleased to provide any additional explanations to the Committee in person or via correspondence. Thank you once again for the opportunity to appear in Albury.

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Paper 2

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The Aggregate Economic Benefits to the Australian Beef Industry from the Adoption of Meat Standards Australia: updated to 2010/11 ⁺

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Abstract

Meat and Livestock Australia and the Cooperative Research Centre for Cattle and Meat Quality funded a major R&D program in the mid 1990s to investigate the relationships between observable beef and cattle characteristics, cooking methods and consumer appreciation of beef palatability. Out of this R&D program grew the Meat Standards Australia (MSA) voluntary meat grading system which was aimed primarily at providing an accurate prediction of beef eating quality for the domestic market. The MSA system commenced operations in 1999/2000. The gross benefits associated with using the MSA system were quantified by using data on the number of carcasses graded and certified, a survey of retailers and wholesalers based on prices for MSA graded beef (3 star or better) versus ungraded beef, and market reports of prices paid for MSA quality cattle versus non-MSA quality cattle.

Over the period 2004/05 to 2010/11, beef consumers across Australia were prepared to pay on average \$0.30/kg extra for MSA branded beef on a carcass weight equivalent basis to guarantee tenderness. This beef is primarily sold through independent butcher shops, although one of the major supermarket chains has now started selling MSA branded beef. The retailers kept about \$0.06/kg and paid their wholesale suppliers the remaining \$0.24/kg to source MSA compliant cattle and MSA graded carcasses. About \$0.13/kg was passed back to cattle producers on average. The cumulative retail-level economic benefit of the MSA system to 2010/11 is estimated to be around \$523 million, with a current annual benefit of around \$77 million over the past three years. After accounting for all the costs of development and implementation, net benefits are at least \$200 million.

1. Background

Meat Standards Australia (MSA) is a voluntary beef grading system aimed at describing and predicting the eating quality of individual cuts in the beef carcass prepared using a number of cooking methods. The MSA system represents a new approach to the grading of beef. First, the grades are based on taste panel responses using untrained consumers. Second, it uses a Total Quality Management approach, whereby the system addresses all critical control points along the supply chain, from the genetics of the animals to the cooking method used by the consumer (Polkinghorne *et al.* 1998, Thompson 2002).

Whilst development of the MSA system was an advance in accuracy over other grading schemes, it was simply a model to predict the eating quality of beef. By itself, it offered little commercial advantage to the Australian beef industry, unless it was integrated into a business model that included procurement, value

⁺ This paper is an update of Griffith *et al.* (2009), so much of the material in sections 1 and 2 is simply a repeat of the material already published.

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adding and retailing. Polkinghorne *et al.* (2008b) described a commercial model which utilised the MSA grading system to retail meat based on eating quality and cooking method, independently of the traditional cuts of beef. The commercial model proposed by Polkinghorne developed a payment system to the wholesaler and producer based on a fixed proportion of retail value, which made it easier to reward partners in the supply chain for small increments in eating quality, as opposed to the conventional marketing grid system which often provided little or no incentive for improvements in eating quality. Whilst the MSA scheme was initially developed for the Australian domestic market, more recently it has been used to describe eating quality of beef for several export markets (MLA 2008). Therefore the MSA prediction model provides a tool which if integrated into a process for beef procurement and retailing, can be used to deliver a guaranteed eating quality outcome to the consumer. Over time the application of MSA has the potential to improve overall beef quality, and given development and refinement of feedback systems and pricing differentials which reflect differences in eating quality, to strengthen supply chain linkages.

As described by Watson *et al.* (2008), much of the empirical modelling underpinning the MSA system was based on research that was either in the public domain, or was commissioned by Meat and Livestock Australia (MLA) and the Cooperative Research Centre for Cattle and Meat Quality (Beef CRC). The research undertaken by Beef CRC and MLA focused on quantifying the relationships between animal traits (the proportion of *Bos indicus*, HGP status, carcass weight, marbling and ossification scores), lairage (ultimate pH), processing (pH/temperature decline and hanging method), value adding (ageing or conditioning of the cut post-mortem) and cooking methods (grill, roast, stir fry, slow cooking and corning), with consumer palatability of the beef. As part of the initial taste panels, untrained consumers were asked to score meat samples cooked using a particular cooking method for tenderness, juiciness, like flavour and overall liking. They were then asked to classify the samples into one of 4 grades: 2 star (unsatisfactory), 3 star (good everyday), 4 star (better than everyday) or 5 star (premium). These scores were then analysed using a discriminant analysis, to firstly combine the individual scores for tenderness, juiciness, flavour and overall liking into a single meat quality score (MQ4), and secondly, to determine the boundaries of the 2, 3, 4 and 5 star grades on the new MQ4 scale. The end result was the development of a model to predict palatability of beef using commercially measurable traits. The MSA model accounts for approximately 50 per cent of the variance in consumer scores (Thompson *et al.* 1998) which was approximately four to five times more accurate than the US beef grading scheme (Smith *et al.* 1987). Since this research commenced in 1996, over 80,000 consumers have participated in MSA consumer taste testing, providing palatability scores on over 560,000 cuts of beef (MLA 2011). The original release was a 12-cut version (Polkinghorne *et al.* 1998). The current (fourth commercial) version now predicts 135 cut-by-cooking method consumer outcomes for each graded carcass (Polkinghorne *et al.* 2008a).

MSA commenced implementation with a trial in Brisbane in 1996, followed by a staggered national rollout in 1999/2000. All sectors of the beef marketing chain are expected to receive economic benefits from the adoption of MSA. For producers, MSA provides standards and best practice guidelines to achieve compliance with specified target grades. Being a registered MSA producer means that they can get feedback on the quality of the carcasses that they are providing and access to tools to improve on-farm management decisions. The MSA system also means that pricing signals could be passed more easily along the supply chain. For example, a producer's decision to alter a certain management practice could affect the grade of their cattle and thus the prices they could get.

For processors, MSA provides standards that will achieve better and more consistent eating quality. For retailers and wholesalers, MSA provides a guarantee of eating quality and allows retailers to more easily identify the quality of the product they buy. The grading system also established an option for an MSA brand, which could be carried through to the retail level, enabling consumers to identify the eating quality of the product. The MSA brand has not always been carried through to consumers. For example, until recently large supermarkets often substituted their own private label brands for that of MSA (Woolworths now explicitly market their beef as MSA).

Currently the adoption of MSA technology is increasing and this would suggest that an adequate level of return can be generated. However, the potential returns could be much higher if the principles of MSA were fully adopted to grade meat on quality (eg the system described by Polkinghorne *et al.* 2008b). A study commissioned by MLA identified eating quality as a key determinant of consumer satisfaction, even outweighing price as the most important consideration when buying beef (Millward Brown 2003). This

same study found that perceptions of beef quality had improved in the period 2000 to 2003, with 38 per cent of those surveyed identifying improvements in beef quality compared to only 13 per cent who viewed quality as worsening over the same period. More recent surveys suggest that consumer satisfaction has improved over the whole period of the program (Millward Brown 2007a). Some part of this improvement in the perception of beef quality must reflect the development of the MSA system.

The purpose of this paper is to provide an updated estimate of the magnitude of the aggregate benefits to 2010/11 of this large research and development investment by the Australian beef industry.

2. Economic Framework for Evaluation

Quality-enhancing research has become increasingly important. However, compared with the number of studies undertaken to assess the economic benefits from cost-reducing (or yield-increasing) research, economic analysis of research that aims to improve the desirable characteristics of a commodity has not been widely covered in the literature. In addition, there is some debate about how to model research-induced quality improvements.

One approach is to model quality improvements in agricultural commodities as a change in the demand for these commodities, so that an improvement in the quality of the product can be shown to result in an upward or rightward shift in the ordinary demand curve for the product (Ladd and Suvannunt 1976; Unnevehr 1986, 1990). In this type of analysis, an approximation of the gross gain from the demand expansion effect of improved product quality is the initial increase in retail price times the initial output (or, with the assumption of a fixed margin, the initial increase in the farm price times the initial output). This is sometimes called the incremental profit approach, where this increased “profit” is eventually distributed to producers and consumers in relation to the relative slopes of the demand and supply curves, as the market adjusts over time to the new level of consumer willingness-to-pay¹.

An alternative approach is to view quality-enhancing research as a change in supply conditions rather than as a change in demand conditions. In this approach, different qualities of a commodity are defined as different commodities (e.g., normal wheat and high-lysine wheat would be treated as two separate, even if highly substitutable, commodities) and a technical change that leads to a change in quality is modelled as a shift in the supply of the commodities in question rather than as an *ad hoc* shift in demand (Brennan, Godyn and Johnston 1989; Voon 1991, 1992, 1996). A common assumption in these types of studies is that there is no substitution in demand between the different wheat qualities. However, when a product is treated as a heterogeneous commodity, with discrete variations in quality defined in terms of quality characteristics, the different product types are likely to be related through both production and consumption. This can lead to serious measurement difficulties in the welfare of identifiable groups.

However, a more fundamental problem for the present application is that MSA is fundamentally just a grading system – it is an improvement in the reliability of information surrounding exchanges. In fact, the MSA logo says “tenderness guaranteed”. Thus there is no change in quality *per se*, so there is unlikely to be higher aggregate consumption of beef in the domestic market. There may be some substitution between MSA-graded beef and non-MSA-graded beef, but there is no information on the price elasticities of demand for these two segments nor on the respective quantities involved at the retail level. The only data available are for the number of carcasses graded for MSA by meat processors, the number of carcasses that actually achieve the MSA grade and the unit premiums attributed to MSA product at the live animal, carcass and retail market levels. This means that a simple incremental profit analysis is all that can be done, and what we are measuring is the premium that wholesalers, food service operators, beef retailers and final consumers are willing to pay to have a tenderness guarantee on their beef purchases.

3. Carcass Gradings and Compliance

MSA has recorded the numbers of beef carcasses which have been graded since the introduction of the national rollout in 1999/2000 (see MLA (2011) and previous issues). These are shown in Figure 1. The number of carcasses graded rose gradually from an initial 225,000 in 1999/00 to 366,000 in 2001/02. At this stage cost recovery for grading services was introduced and numbers plateaued for a year before increasing sharply to just over 838,000 in 2007/08 and again in successive years to over 1,420,000 in

¹ The benefits to other participants in the supply chain can be calculated using more complicated industry models. See for example the earlier work of Zhao *et al.* (2001) and Mounter *et al.* (2005, 2008).

2010/11. Queensland represents about half of all MSA gradings in recent years, followed by West Australia and New South Wales with between 150,000 and 200,000 each, but numbers graded are increasing rapidly in some of the smaller states such as Tasmania and South Australia. The total number of carcasses graded to June 2011 exceeds 9.1 million.

Carcass gradings now represent around a third of the total number of carcasses slaughtered for the domestic market (based on ABARE 2009), although Polkinghorne *et al.* (2008a) suggest that the number of carcasses graded represents a much higher proportion of all “eligible” carcasses destined for the domestic market.

The other part of the quantity side of the analysis is the level of compliance to MSA specifications. That is, of the carcasses graded for MSA, what proportion achieved the MSA tag? According to MLA (2009), compliance in 2006/07, 2007/08 and in 2008/09 was over 90 per cent, down from around 92 per cent in the immediately preceding couple of years but up substantially from levels around 85 per cent in the initial years of operation. In the last three years, compliance has continued to improve and exceeded 94 per cent in 2010/11 (MSA 2011). These data are also shown in Figure 1. Failing to meet the meat colour specification was the most common cause of non-compliance, with higher than acceptable pH levels also a problem.

4. Price Premiums

Meat Standards Australia began conducting pricing surveys during 2005 (MLA 2005). Initially, face to face and telephone interviews were conducted each week from January to September, across the wholesale, food service and retail sectors in Brisbane, Sydney, Melbourne, Adelaide and Perth, for 13 separate cuts of beef. Some 25,900 prices in total were collected during the survey across these three market levels. Another round of price surveys commenced in July 2006 for the 2006/07 financial year (Millward Brown 2007b), and the process was repeated during succeeding years (MLA 2008, 2009, 2010, 2011). The average annual retail and wholesale prices for MSA and non-MSA product, and the premiums attributable to MSA grading, are shown in Tables 1 and 2 respectively, for all time periods.

4.1 Retail

The value of the MSA scheme is created at the retail level, where final consumers are willing to pay premiums for beef cuts that are guaranteed tender compared to those cuts that are not guaranteed tender. The data show that the MSA-graded product has been well differentiated at the national retail level, with MSA prices higher than non MSA-prices in all but one product group. These data are shown in Tables 1a-1f for 2005/06 through to 2010/11. Average retail premiums of between \$1.19/kg and \$5.35/kg were achieved on more than half the cuts measured during the 2005 reporting period, and the national average retail premium on the ten cuts showing different prices was \$2.18/kg. During the 2006/07 period, average retail premiums of between \$0.93/kg and \$3.31/kg were achieved on the four high value cuts, with the national average retail premium on the 11 cuts showing different prices being \$1.63/kg. During 2007/08, retail premiums for MSA grading ranged up to \$3.87/kg for cube roll, with an average over all graded cuts of \$1.70/kg, while during 2008/09 the premiums were over \$2/kg for the three high value cuts and \$1.36/kg over all cuts graded. Retail premiums were retained at similar levels during 2009/10, but were reduced somewhat during 2010/11.

Although not shown here, there have been some large differences in price levels and price premiums for the various cuts across the states and over time, at both the retail and wholesale levels. These detailed data are available on the MSA website (MLA 2007, 2008, 2009, 2010, 2011).

Our quantity data are the number of carcasses graded, so for a consistent evaluation of the economic impacts of the adoption of the MSA grading scheme we need to convert these reported price differences across a dozen or so retail cuts of beef into a carcass equivalent value. This was done using the data in Table 3, which shows the proportions of a standard 260kg domestic “trade” carcass made up by the various MSA cuts as well as all the other components of the carcass.

Applying these proportions to the retail prices for all the individual cuts and the other components of the carcass allowed the MSA premium to be calculated on a retail carcass equivalent basis (Tables 1a – 1f).² This premium was calculated as \$0.39/kg, or 6.3 per cent above the non MSA-graded carcass equivalent for the 2005 period³, with the premium for the meat-only component of the carcass being \$0.56/kg. The carcass equivalent retail premium for the 2006/07 period was \$0.27/kg, or 4.5 per cent, with the premium for the meat-only component of the carcass being \$0.44/kg, while for the 2007/08 period the premium was \$0.30/kg on a carcass equivalent basis or 4.8 per cent, and for the 2008/09 period the premium was \$0.29/kg on a carcass equivalent basis or 4.3 per cent. For 2009/10 the average premium was \$0.24/kg or 3.7 per cent, and for 2010/11 the premium was \$0.22/kg or 3.3 per cent. So although price levels for beef have increased slightly from early 2005 to 2010/11 (ABARE 2009), the margins for MSA product at retail have contracted a little.

4.2 Wholesale

Wholesale premiums are the extra amounts that retailers will pay to processors who are able to supply carcasses that meet MSA grades. The data show that MSA-graded product has also been well differentiated at the wholesale level, with MSA prices higher than non MSA-prices in all product groups over all time periods, with only a couple of exceptions. The national average data are shown in Tables 2a-2f. During 2005, average wholesale premiums of between \$1.11/kg and \$6.00/kg were achieved on the four major cuts, with the national average wholesale premium on the 12 cuts showing different prices being \$1.39/kg. During the 2006/07 period, average wholesale premiums of between \$1.69/kg and \$4.01/kg were achieved on the four high value cuts, with the national average wholesale premium on the seven cuts showing different prices being \$1.59/kg. During 2007/08, wholesale premiums were more evenly spread across cuts and ranged between \$1.27 and \$3.21 for the four major cuts, while during 2008/09 the average margins were much lower, being \$1.60/kg for the four major cuts and \$1.32/kg over all MSA cuts, and there were some negative margins evident. Wholesale margins picked up again in 2009/10 and 2010/11, with premiums of between \$0.70/kg and \$3.64/kg for the four major cuts, a higher aggregate margin and margins more evenly spread over all the differentiated cuts.

In a similar manner as for the retail data, a MSA premium on a wholesale carcass equivalent basis can be calculated (Tables 2a -2f).⁴ This premium was calculated as \$0.29/kg, or 9.7 per cent above the non MSA-graded carcass equivalent for the 2005 period. For the 2006/07 period, the wholesale premium on a carcass equivalent basis was \$0.20/kg, or 6.2 per cent, while for the 2007/08 period it was \$0.29/kg or 9.0 per cent and for 2008/09 it fell to \$0.09/kg or 2.9 per cent. Wholesale margins then recovered in 2009/10 and 2010/11, to around \$0.25/kg, or about 7.5 per cent of the wholesale value of the non MSA-graded carcass equivalent.

² The underlying price data supplied by MLA only relates to those cuts that are branded and sold as MSA. Prices during 2005 for the non-MSA components of the carcass were taken directly from the MLA spreadsheet of the underlying carcass breakdown (C. Dart, pers. com.). These prices were increased over the following survey periods in the same proportion as the increases in price for the non-MSA graded cuts. From 2006/07, the price for chuck roll was not quoted. It was estimated to be the same base price as chuck tender based on the MLA spreadsheet of the underlying carcass breakdown. Similarly, the prices of navel end brisket, point end brisket, thin skirt, flank steak and trimmings were not quoted. They were estimated to be the same base price as trimmings based on the MLA spreadsheet of the underlying carcass breakdown. In the 2006/07 to 2010/11 data, topside price was not quoted. It was estimated by applying the same percentage difference from thick flank and silverside from Table 1a.

³ Applying this same procedure to similar food-service sector price data for 2005 produced a premium for MSA product of \$0.37/kg above the non MSA-graded carcass equivalent (Rodgers *et al.* 2007).

⁴ From 2006/07, the wholesale prices for cube roll and sirloin were reported for both grainfed and grassfed product. In the calculations of the carcass equivalent prices, an average was taken. Silverside price was not quoted from 2006/07, so it was set the same as the price of topside.

4.3 Over-the-hooks

Live cattle submitted for MSA grading are sent to processors on consignment. Producers must certify that certain criteria are met relating to each animal and the production system where it has been grown out to slaughter weight. Base price levels and premiums and discounts for whether the cattle meet the various market specifications offered by that processor are known beforehand, but the actual price for each animal is only known after slaughtering and grading, thus “over-the-hooks”. Over-the-hooks cattle prices for MSA cattle were collected from Queensland and New South Wales commencing January 2007 by MLA’s National Livestock Reporting Service (NLRS), and for other states from 2007/08. These are the premiums that processors will pay to producers who are able to supply cattle that meet MSA grades (MLA 2009).

Over-the-hooks prices for 170-230kg yearling cattle in New South Wales for February-June 2007 show an average premium for MSA cattle of \$0.04/kg, although with sub-periods of both much larger premiums and other periods of discounts. Queensland prices for the same weight range and time period show a premium for MSA cattle over grain-fed yearlings of \$0.17/kg, and again with sub-periods of larger premiums and discounts. During 2007/08, the average premium for MSA 170-230kg cattle was \$0.07/kg in New South Wales and \$0.26/kg in Queensland (MLA 2008), while during 2009/09, the average premium for MSA 180-220kg yearling cattle was \$0.13/kg in New South Wales and \$0.11/kg in Queensland (MLA 2009). Over-the-hooks premiums continued to grow during 2009/10 and 2010/11, reaching \$0.15/kg and \$0.19/kg respectively across all states and weight ranges.

4.4 Summary

Thus, across Australia over the period 2004/05 to 2010/11, retail beef consumers were prepared to pay on average \$0.30/kg extra for MSA branded beef on a carcass weight equivalent basis to guarantee tenderness. This beef is primarily sold through independent butcher shops. These retailers kept about \$0.06/kg and paid their wholesale suppliers the remaining \$0.24/kg to source MSA compliant cattle and MSA graded carcasses. About \$0.13/kg was passed back to cattle producers on average (Figure 2). However premiums for live cattle that eventually grade MSA are relatively new, and vary considerably by State. In New South Wales where the MSA wholesale margin was typically well under the national average, less than \$0.10/kg was passed back, while in Queensland where the wholesale margin was a little higher than the national average, around \$0.18/kg was passed back.

Thus based on the average c/kg distribution of consumer willingness to pay over the period 2005/06 to 2010/11, retailers retain about 20 per cent of the value, wholesalers receive about 35 per cent of the value and cattle producers receive some 45 per cent.

5. Estimated Economic Impact

5.1 Aggregate benefits

In relation to the approximate economic analysis framework described above, we now have the two basic sets of data required to implement the calculations.

First though, we only have retail and wholesale price premiums for part of 2005 and for 2006/07 onwards. There were no similar price surveys done in previous years, so we need to estimate what the price premiums are likely to have been from 1999/00 until 2004/05. Although there is some anecdotal evidence that large premiums were available for some specialist butcher shops in the early days of MSA (Cameron Dart, pers. com., Rod Polkinghorne, pers.com.), we have made the very conservative assumption that there was no premium in the first year, and that premiums increased in a simple linear manner from 2000/01 until 2004/05, and continued at that level for 2005/06 (as shown in Tables 1a and 2a). Actual premiums for 2006/07 are available from Tables 1b and 2b, those for 2007/08 are in Tables 1c and 2c, those for 2008/09 are in Tables 1d and 2d, those for 2009/10 are in Tables 1e and 2e, and those for 2010/11 are in Tables 1f and 2f. The assumed and estimated premiums over time are shown in Tables 4 and 5 for the retail and wholesale market levels respectively.

A similar procedure was applied to the OTH premiums. These were first measured in 2006/07, so they were assumed to be 10c/kg for 2004/05 and 2005/06, and then to linearly trend back to zero in 1999/00. The assumed and estimated OTH premiums over time are shown in Table 6.

The appropriate weight to use for MSA graded carcasses is also an issue. As noted above, the over-the-hooks' prices reported by the National Livestock Reporting Service to indicate premiums for MSA quality in the live cattle market are for the weight ranges 170-230kg, and 230kg+. On the other hand, the proportions of individual cuts used by Meat and Livestock Australia to derive weighted average values, as shown in Table 3, are based on a 260kg carcass. Initially, we used 250kg as the average weight of MSA graded and compliant carcasses (John Thompson, pers. com., March 2009). However we now have access to the actual average weights of MSA graded carcasses. These are reported in Tables 4, 5 and 6.

Multiplying the estimated and assumed premiums by the known number of carcasses graded and compliant and the known carcass weights provides an estimate of the gross annual economic value at the retail, wholesale and OTH levels of the improvement in certainty about beef quality brought about by the MSA system, over the years 2000/01 to 2010/11. At the retail level, recent annual gross benefits range between \$70-\$83 million, and the cumulative value to 2010/11 is estimated to be \$523 million. At the wholesale level, recent annual gross benefits range between \$22-\$98 million, and the cumulative value to 2010/11 is estimated to be just over \$430 million. At the OTH level, recent annual gross benefits range between \$29-\$72 million, and the cumulative value to 2010/11 is estimated to be just under \$250 million. All of these estimates are in current \$ values, without applying any discounting or compounding.

5.2 Distribution of benefits

These annual gross benefits are eventually distributed to producers, wholesalers, retailers and consumers in relation to the relative slopes of the demand and supply curves at all the various market levels, as the market adjusts over time to the new level of consumer willingness-to-pay for guaranteed tenderness. This is the sort of information provided by equilibrium market models such as the one reported in Zhao *et al.* (2001).

Based on the calculated aggregate economic values reported in Tables 4, 5 and 6, cattle producers have received about 48 per cent of the total retail value, wholesalers have received about 35 per cent, and retailers have retained about 17 per cent. These are quite close to the shares calculated on the basis of c/kg carcass equivalent values in section 4.4 and as shown in Figure 2.

However there is considerable variability underlying these average values. It has already been mentioned that there have been some large differences in price levels and price premiums for the various cuts across the States and over time, at both the retail and wholesale levels, and that premiums for live cattle that eventually grade MSA also vary considerably by State and over time. For example, see the detailed pricing reports available in MLA (2011). This variability in the underlying raw data translate into the distribution estimates, as shown in Figure 3. In a competitive market we would expect the retail premium to exceed the wholesale premium which in turn would exceed the producer premium. This was certainly the pattern in the early years. But in recent years the expected pattern has been overturned. In 2008/09 the wholesale premium was less than the producer premium, while in 2009/10 and 2010/11 the retail premium was less than the wholesale premium. MSA grade beef was used as a loss-leader. This is not necessarily irrational behavior given the general deflationary price environment in recent years, the fact that supermarkets are paying more attention to beef and that specialists butchers have to respond, and the large structural changes that have been occurring in the processing sector (Umberger and Griffith 2011).

5.3 Benefits in relation to costs

Previous analyses (Griffith *et al.* 2009) have compared estimated benefits with the estimated total costs of the R&D and the subsequent development of the MSA system. An ex post R&D benefit-cost ratio to 2008/09 was estimated to be 4.7:1 when valued at the retail level – all past R&D expenditure has been covered and on top of that a substantial additional benefit has been generated. Including the broader range of implementation and compliance costs brought the industry benefit-cost ratio down to about 2:1.

A recent evaluation of the broader Meat and Livestock Australia investment in red meat eating quality R&D has been completed by CIE (2012). This report suggests that total expenditures for beef eating quality in nominal terms have been between \$255 million and \$304 million over the period 1998/99 to 2009/10, depending on assumptions about how Beef CRC costs are included. These costs include direct MLA investments, Beef CRC investments, on-farm compliance costs and costs of adoption by beef processors.

These estimates imply a net benefit to the Australian beef industry from the MSA innovation of between \$219 million and \$268 million, or benefit cost ratios of between 1.72 and 2.39. These values are close to the industry benefit cost ratio of around 2:1 estimated by Griffith *et al.* (2009). To date, all past R&D expenditure has been covered, all industry adoption costs have been covered, and on top of that a substantial additional benefit has been generated. These net industry benefits are expected to continue to grow in future years as throughput increases and ongoing development and operational costs stabilise.

6. Conclusions

MLA and the Beef CRC undertook a major R&D program in the mid 1990s to investigate the relationships between observable beef characteristics, cooking methods and consumer appreciation of beef palatability. This research established a base by which beef could be graded, using consumer responses to different combinations of live animal and carcass traits in combination with cooking methods. Out of this R&D grew the MSA voluntary meat grading system which was aimed primarily at providing an accurate prediction of beef eating quality. The MSA system commenced operations in 1999/2000.

The cumulative retail-level economic benefit of the MSA system to 2010/11 is estimated to be \$523 million, the wholesale value \$432 million and the OTH value \$250 million. Based on these calculated aggregate economic values, cattle producers have received about 48 per cent of the total consumer willingness to pay, wholesalers have received about 35 per cent, and retailers have retained about 17 per cent.

These estimates have been calculated using an approximation to the true economic surplus values, and they are based on the raw survey data, without any statistical analysis of the significance of any differences in mean values. However, this study took a deliberately conservative approach to valuing the benefits from the adoption of the MSA grading system – only those benefits actually evident to date. In the absence of the required data, a conservative approach was also taken to assuming past price premiums for MSA cuts. Finally, it should be noted that these benefits were realized by using MSA in its simplest form, simply discriminating between graded (3 star or better) and ungraded beef cuts. It would be assumed that the gross benefits would be much larger if the industry adopts the full range in quality grades and sells 3, 4 and 5 star with corresponding increases in prices (Lyford *et al.* 2010). Whether the full potential of MSA is realized will depend upon how successfully the technology is extended and whether the net returns justify the extra inputs (see also Morales *et al.* 2008, 2009).

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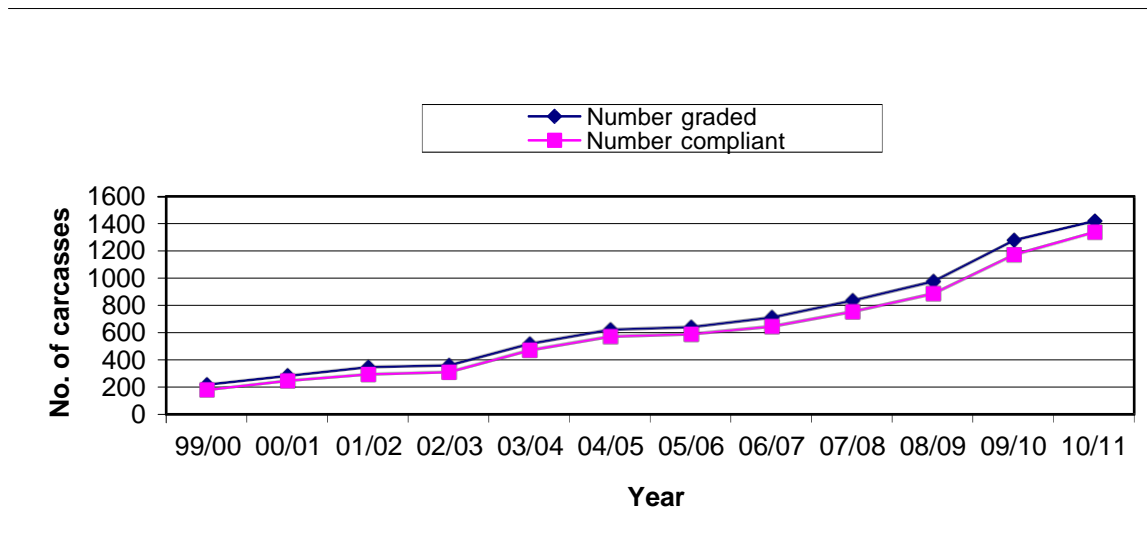
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Figure 1: Number of Carcasses Graded and Compliant as MSA, 1999/00-2010/11



Source : MLA (2009)

Figure 2: Average Distribution of the MSA Retail Premium, 2004/05-2010/11

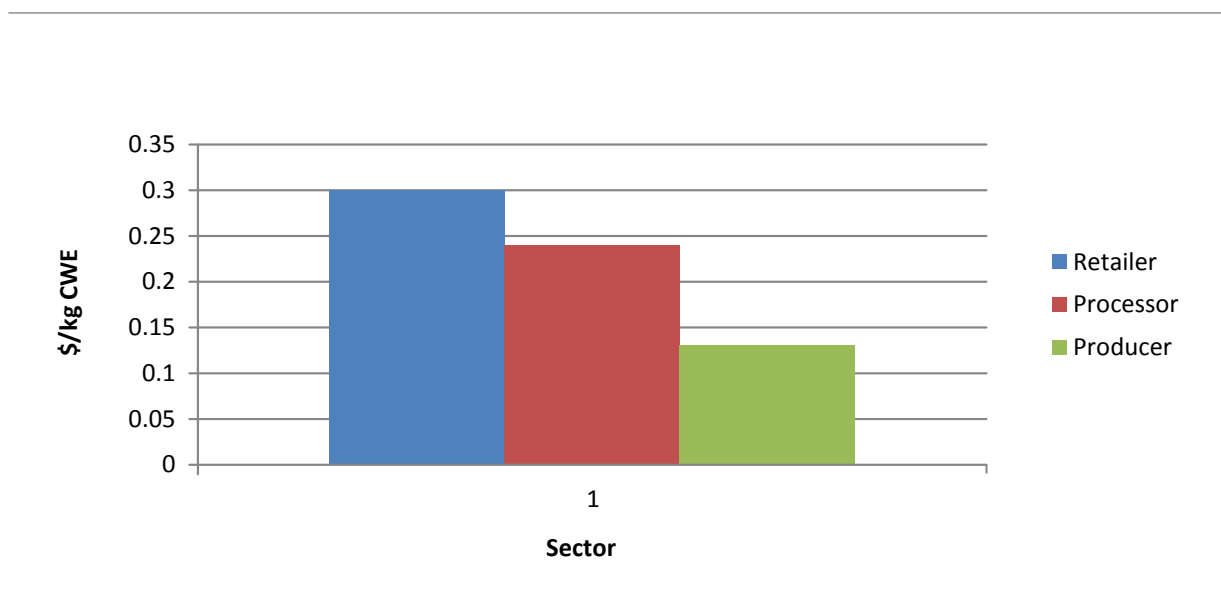


Figure 3: Variability of MSA Premiums Over Time, 2004/05-2010/11

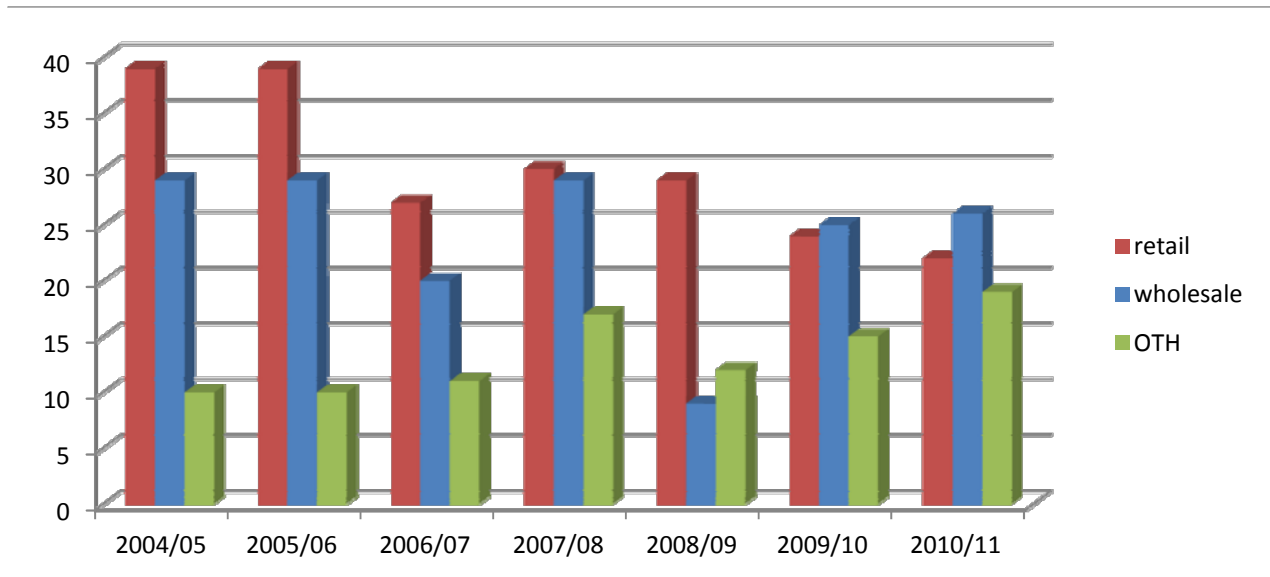


Table 1a: National Average Retail MSA Premium on a Carcass Equivalent Basis, January-September 2005^a

Cut	Retail MSA Price (\$/kg)	Retail Non-MSA Price (\$/kg)	Retail MSA Margin (\$/kg)	Retail MSA Margin (%)
HINDQUARTER				
Topside	16.51	14.05	2.46	17.5
Thick Flank (knuckle)	14.03	13.37	0.66	4.9
Outside (silverside)	11.33	12.51	-1.18	-9.4
D-Rump (rump)	19.83	18.64	1.19	6.4
Tenderloin (butt fillet)	34.05	31.32	2.73	8.7
Striploin (sirloin)	27.12	23.27	3.85	16.5
FOREQUARTER				
Navel End Brisket	8.00	8.00	-	-
Point End Brisket	8.00	8.00	-	-
Cube Roll	28.82	23.47	5.35	22.8
Blade	12.85	12.17	0.68	5.6
Chuck Roll	15.13	15.13	-	-
Chuck Tender (stir fry)	19.45	15.13	4.32	28.6
Shin Shank (diced)	13.56	12.96	0.60	4.6
Thin Skirt	8.00	8.00	-	-
Flank Steak	8.00	8.00	-	-
Trimmings (mince)	8.00	8.00	-	-
Meat Yield	9.44	8.88	0.56	6.3
Fat	0.30	0.30	-	-
Bone	0.05	0.05	-	-
HSCW Equivalent	6.53	6.15	0.39	6.3

Source: MLA (2005)

^a Chuck roll not quoted; estimated to be the same base price as chuck tender based on the MLA spreadsheet of the underlying carcass breakdown.

Navel end brisket, point end brisket, thin skirt, flank steak and trimmings not quoted; estimated to be the same base price as trimmings based on the MLA spreadsheet of the underlying carcass breakdown.

Table 1b: National average retail MSA premium on a carcass equivalent basis, July 2006-June 2007^a

Cut	Retail MSA Price (\$/kg)	Retail Non-MSA Price (\$/kg)	Retail MSA Margin (\$/kg)	Retail MSA Margin (%)
HINDQUARTER				
Topside	13.41	13.41	-	-
Thick Flank (knuckle)	13.58	12.96	0.62	4.8
Outside (silverside)	12.24	11.74	0.50	4.3
D-Rump (rump)	19.49	18.56	0.93	5.0
Tenderloin (butt fillet)	33.52	30.42	3.10	10.2
Striploin (sirloin)	25.94	23.30	2.64	11.3
FOREQUARTER				
Navel End Brisket	9.02	9.02	-	-
Point End Brisket	9.02	9.02	-	-
Cube Roll	27.67	24.36	3.31	13.6
Blade	12.49	11.70	0.79	6.8
Chuck Roll	13.88	13.88	-	-
Chuck Tender (stir fry)	15.05	13.88	1.17	8.4
Shin Shank (diced)	13.09	12.26	0.83	6.8
Thin Skirt	9.02	9.02	-	-
Flank Steak	9.02	9.02	-	-
Trimmings	9.02	9.02	-	-
Meat Yield	9.32	8.92	0.40	4.5
Fat	0.30	0.30	-	-
Bone	0.05	0.05	-	-
HSCW Equivalent	6.45	6.18	0.27	4.5

Source: MLA (2007)

^a topside price was not quoted. It was estimated by applying the same average percentage difference from thick flank and silverside from Table 1a.

Chuck roll not quoted; estimated to be the same base price as chuck tender based on the MLA spreadsheet of the underlying carcass breakdown.

Navel end brisket, point end brisket, thin skirt, flank steak and trimmings not quoted; estimated to be the same base price as trimmings based on the MLA spreadsheet of the underlying carcass breakdown. These prices were assumed to have changed in the same proportion as the average price of non-MSA cuts changed between Table 1a and Table 1b (up 12.7 per cent).

Table 1c: National average retail MSA premium on a carcass equivalent basis, July 2007-June 2008^a

Cut	Retail MSA Price (\$/kg)	Retail Non-MSA Price (\$/kg)	Retail MSA Margin (\$/kg)	Retail MSA Margin (%)
HINDQUARTER				
Topside	13.55	13.55	-	-
Thick Flank (knuckle)	13.90	13.17	0.73	5.5
Outside (silverside)	12.21	11.79	0.42	3.6
D-Rump (rump)	20.19	18.87	1.32	7.0
Tenderloin (butt fillet)	35.10	31.41	3.69	11.7
Striploin (sirloin)	26.72	23.95	2.77	11.6
FOREQUARTER				
Navel End Brisket	9.23	9.23	-	-
Point End Brisket	9.23	9.23	-	-
Cube Roll	29.22	25.35	3.87	15.3
Blade	12.58	11.73	0.85	7.2
Chuck Roll	14.28	14.28	-	-
Chuck Tender (stir fry)	15.19	14.28	0.91	11.2
Shin Shank (diced)	13.10	12.43	0.67	5.4
Thin Skirt	9.23	9.23	-	-
F flank Steak	9.23	9.23	-	-
Trimnings	9.23	9.23	-	-
Meat Yield	9.54	9.10	0.44	4.8
Fat	0.30	0.30	-	-
Bone	0.05	0.05	-	-
HSCW Equivalent	6.60	6.30	0.30	4.8

Source: MLA (2008)

^a topside price was not quoted. It was estimated by applying the same average percentage difference from thick flank and silverside from Table 1a.

Chuck roll not quoted; estimated to be the same base price as chuck tender based on the MLA spreadsheet of the underlying carcass breakdown.

Navel end brisket, point end brisket, thin skirt, flank steak and trimnings not quoted; estimated to be the same base price as trimnings based on the MLA spreadsheet of the underlying carcass breakdown. These prices were assumed to have changed in the same proportion as the average price of non-MSA cuts changed between Table 1b and Table 1c (up 2.3 per cent).

Table 1d: National average retail MSA premium on a carcass equivalent basis, July 2008-June 2009^a

Cut	Retail MSA Price (\$/kg)	Retail Non-MSA Price (\$/kg)	Retail MSA Margin (\$/kg)	Retail MSA Margin (%)
HINDQUARTER				
Topside	13.60	13.60	-	-
Thick Flank (knuckle)	14.69	13.81	0.88	6.4
Outside (silverside)	12.70	11.87	0.84	7.0
D-Rump (rump)	20.75	19.46	1.28	6.6
Tenderloin (butt fillet)	35.73	32.76	2.97	9.1
Striploin (sirloin)	26.98	24.95	2.03	8.1
FOREQUARTER				
Navel End Brisket	9.58	9.58	-	-
Point End Brisket	9.58	9.58	-	-
Cube Roll	29.58	26.77	2.81	10.5
Blade	12.96	12.18	0.78	6.4
Chuck Roll	14.87	14.87	-	-
Chuck Tender (stir fry)	15.89	14.87	1.02	6.9
Shin Shank (diced)	13.88	12.88	1.00	7.0
Thin Skirt	9.58	9.58	-	-
Flank Steak	9.58	9.58	-	-
Trimmings	9.58	9.58	-	-
Meat Yield	9.82	9.41	0.41	4.4
Fat	0.30	0.30	-	-
Bone	0.05	0.05	-	-
HSCW Equivalent	6.80	6.51	0.29	4.3

Source: MLA (2009)

^a topside price was not quoted. It was estimated by applying the same average percentage difference from thick flank and silverside from Table 1a.

Chuck roll not quoted; estimated to be the same base price as chuck tender based on the MLA spreadsheet of the underlying carcass breakdown.

Navel end brisket, point end brisket, thin skirt, flank steak and trimmings not quoted; estimated to be the same base price as trimmings based on the MLA spreadsheet of the underlying carcass breakdown. These prices were assumed to have changed in the same proportion as the average price of non-MSA cuts changed between Table 1c and Table 1d (up 3.7 per cent).

Table 1e: National average retail MSA premium on a carcass equivalent basis, July 2009-June 2010^a

Cut	Retail MSA Price (\$/kg)	Retail Non-MSA Price (\$/kg)	Retail MSA Margin (\$/kg)	Retail MSA Margin (%)
HINDQUARTER				
Topside	12.51	12.51	-	-
Thick Flank (knuckle)	14.94	14.10	0.84	6.0
Outside (silverside)	11.13	10.79	0.34	3.2
D-Rump (rump)	21.39	20.24	1.15	5.7
Tenderloin (butt fillet)	36.04	33.39	2.65	7.9
Striploin (sirloin)	28.05	25.80	2.25	8.7
FOREQUARTER				
Navel End Brisket	9.61	9.61	-	-
Point End Brisket	9.61	9.61	-	-
Cube Roll	30.29	27.80	2.49	9.0
Blade	13.33	12.83	0.50	3.9
Chuck Roll	14.47	14.47	-	-
Chuck Tender (stir fry)	15.47	14.47	1.00	6.9
Shin Shank (diced)	13.58	12.72	0.86	6.8
Thin Skirt	9.61	9.61	-	-
Flank Steak	9.61	9.61	-	-
Trimmings	9.61	9.61	-	-
Meat Yield	9.76	9.40	0.36	3.8
Fat	0.30	0.30	-	-
Bone	0.05	0.05	-	-
HSCW Equivalent	6.75	6.51	0.24	3.7

Source: MLA (2010)

^a topside price was not quoted. It was estimated by applying the same average percentage difference from thick flank and silverside from Table 1a.

Chuck roll not quoted; estimated to be the same base price as chuck tender based on the MLA spreadsheet of the underlying carcass breakdown.

Navel end brisket, point end brisket, thin skirt, flank steak and trimmings not quoted; estimated to be the same base price as trimmings based on the MLA spreadsheet of the underlying carcass breakdown. These prices were assumed to have changed in the same proportion as the average price of non-MSA cuts changed between Table 1d and Table 1e (up 0.03 per cent).

Table 1f: National average retail MSA premium on a carcass equivalent basis, July 2010-June 2011^a

Cut	Retail MSA Price (\$/kg)	Retail Non-MSA Price (\$/kg)	Retail MSA Margin (\$/kg)	Retail MSA Margin (%)
HINDQUARTER				
Topside	12.96	12.96	-	-
Thick Flank (knuckle)	15.30	14.64	0.66	4.5
Outside (silverside)	11.48	11.16	0.32	2.9
D-Rump (rump)	21.50	20.49	1.01	4.9
Tenderloin (butt fillet)	37.36	34.97	2.39	6.8
Striploin (sirloin)	28.60	26.68	1.92	7.2
FOREQUARTER				
Navel End Brisket	9.95	9.95	-	-
Point End Brisket	9.95	9.95	-	-
Cube Roll	31.53	28.58	2.95	10.3
Blade	13.43	12.94	0.49	3.8
Chuck Roll	15.53	15.53	-	-
Chuck Tender (stir fry)	16.22	15.53	0.69	4.4
Shin Shank (diced)	14.57	13.80	0.77	5.6
Thin Skirt	9.95	9.95	-	-
Flank Steak	9.95	9.95	-	-
Trimmings	9.95	9.95	-	-
Meat Yield	10.08	9.76	0.32	3.3
Fat	0.30	0.30	-	-
Bone	0.05	0.05	-	-
HSCW Equivalent	6.97	6.75	0.22	3.3

Source: MLA (2011)

^a topside price was not quoted. It was estimated by applying the same average percentage difference from thick flank and silverside from Table 1a.

Chuck roll not quoted; estimated to be the same base price as chuck tender based on the MLA spreadsheet of the underlying carcass breakdown.

Navel end brisket, point end brisket, thin skirt, flank steak and trimmings not quoted; estimated to be the same base price as trimmings based on the MLA spreadsheet of the underlying carcass breakdown. These prices were assumed to have changed in the same proportion as the average price of non-MSA hindquarter cuts changed between Table 1e and Table 1f (up 3.5 per cent).

Table 2a: National MSA Premiums on a Wholesale Carcass Equivalent Basis, January-September 2005^a

Cut	Wholesale MSA Price (\$/kg)	Wholesale Non-MSA Price (\$/kg)	Wholesale MSA Margin (\$/kg)	Wholesale MSA Margin (%)
HINDQUARTER				
Topside	4.71	4.48	0.23	5.1
Thick Flank (Knuckle)	4.71	4.48	0.23	5.1
Outside (Silverside)	4.71	4.48	0.23	5.1
D-Rump (Rump)	9.65	8.54	1.11	13.0
Tenderloin (Butt fillet)	27.69	21.69	6.00	27.7
Striploin (Sirloin)	16.37	13.55	2.82	20.8
FOREQUARTER				
Navel End Brisket	5.12	4.89	0.23	4.7
Point End Brisket	5.12	4.89	0.23	4.7
Cube Roll	22.54	17.62	4.92	27.9
Blade	5.12	4.89	0.23	4.7
Chuck Roll	5.12	4.89	0.23	4.7
Chuck Tender (Stir fry)	5.12	4.89	0.23	4.7
Shin Shank (Diced)	4.89	4.89	-	-
Thin Skirt	4.89	4.89	-	-
Flank Steak	4.89	4.89	-	-
Trimmings (Mince)	4.89	4.89	-	-
Meat Yield	4.72	4.30	0.42	9.8
Fat	0.30	0.30	-	-
Bone	0.05	0.05	-	-
HSCW Equivalent	3.29	3.00	0.29	9.7

Source: MLA (2005)

^a Prices for shin shank, thin skirt, flank steak and trimmings were not quoted so they set the same as trimmings. The price of trimmings was taken from Cameron Dart (pers. com. 2006) who provided the MLA spreadsheet of the underlying carcass breakdown (Table 3).

Table 2b: National MSA Premiums on a Wholesale Carcass Equivalent Basis, July 2006-June 2007^a

Cut	Wholesale MSA Price (\$/kg)	Wholesale Non-MSA Price (\$/kg)	Wholesale MSA Margin (\$/kg)	Wholesale MSA Margin (%)
HINDQUARTER				
Topside	5.95	5.88	0.07	1.2
Thick Flank (Knuckle)	6.09	5.81	0.28	4.8
Outside (Silverside)	5.95	5.88	0.07	1.2
D-Rump (Rump)	9.65	7.96	1.69	21.2
Tenderloin (Butt fillet)	26.24	22.23	4.01	18.0
Striploin (Sirloin)	14.93	13.19	1.74	13.2
FOREQUARTER				
Navel End Brisket	5.15	5.15	-	-
Point End Brisket	5.15	5.15	-	-
Cube Roll	20.85	17.79	3.06	17.2
Blade	5.55	5.31	0.24	4.5
Chuck Roll	5.18	5.16	0.02	0.4
Chuck Tender (Stir fry)	5.18	5.16	0.02	0.4
Shin Shank (Diced)	5.15	5.15	-	-
Thin Skirt (Diced)	5.15	5.15	-	-
Flank Steak	5.15	5.15	-	-
Trimnings	5.15	5.15	-	-
Meat Yield	4.90	4.87	4.61	0.29
Fat	0.30	0.30	-	-
Bone	0.05	0.05	-	-
HSCW Equivalent	3.41	3.21	0.20	6.2

Source: MLA (2007)

^a The prices for cube roll and sirloin are the average of separate quotes for grainfed and grassfed product.

The price of silverside was not quoted so it was set the same as topside.

The prices of navel end brisket, point end brisket, shin shank, thin skirt, flank steak and trimmings were not quoted. These prices were assumed to have changed in the same proportion as the average price of non-MSA hindquarter cuts changed between Table 2a and Table 2b (up 5.3 per cent).

Table 2c: National MSA Premiums on a Wholesale Carcass Equivalent Basis, July 2007-June 2008^a

Cut	Wholesale MSA Price (\$/kg)	Wholesale Non-MSA Price (\$/kg)	Wholesale MSA Margin (\$/kg)	Wholesale MSA Margin (%)
HINDQUARTER				
Topside	6.42	5.61	0.81	14.4
Thick Flank (Knuckle)	6.42	5.87	0.55	9.4
Outside (Silverside)	6.42	5.61	0.81	14.4
D-Rump (Rump)	9.09	7.82	1.27	16.2
Tenderloin (Butt fillet)	26.81	23.60	3.21	13.6
Striploin (Sirloin)	15.46	13.68	1.78	13.0
FOREQUARTER				
Navel End Brisket	5.28	5.28	-	-
Point End Brisket	5.28	5.28	-	-
Cube Roll	21.70	19.45	2.25	11.6
Blade	5.68	5.04	0.64	12.7
Chuck Roll	6.07	5.02	1.05	20.9
Chuck Tender (Stir fry)	6.07	5.02	1.05	20.9
Shin Shank (Diced)	5.28	5.28	-	-
Thin Skirt	5.28	5.28	-	-
Flank Steak	5.28	5.28	-	-
Trimnings (Mince)	5.28	5.28	-	-
Meat Yield	5.09	4.87	4.66	0.43
Fat	0.30	0.30	-	-
Bone	0.05	0.05	-	-
HSCW Equivalent	3.54	3.25	0.29	9.0

Source: MLA (2008)

^a The prices for cube roll and sirloin are the average of separate quotes for grainfed and grassfed product.

The price of silverside was not quoted so it was set the same as topside.

The prices of navel end brisket, point end brisket, shin shank, thin skirt, flank steak and trimmings were not quoted. These prices were assumed to have changed in the same proportion as the average price of non-MSA hindquarter cuts changed between Table 2b and Table 2c (up 2.4 per cent).

Table 2d: National MSA Premiums on a Wholesale Carcass Equivalent Basis, July 2008-June 2009^a

Cut	Wholesale MSA Price (\$/kg)	Wholesale Non-MSA Price (\$/kg)	Wholesale MSA Margin (\$/kg)	Wholesale MSA Margin (%)
HINDQUARTER				
Topside	6.23	7.07	-0.84	-11.9
Thick Flank (Knuckle)	6.25	6.31	-0.06	-1.0
Outside (Silverside)	6.23	7.07	-0.84	-11.9
D-Rump (Rump)	9.09	8.51	0.58	6.8
Tenderloin (Butt fillet)	24.36	20.57	3.69	18.4
Striploin (Sirloin)	14.99	12.82	2.17	16.9
FOREQUARTER				
Navel End Brisket	5.32	5.32	-	-
Point End Brisket	5.32	5.32	-	-
Cube Roll	20.83	18.07	2.76	15.3
Blade	5.66	5.62	0.04	0.7
Chuck Roll	5.97	5.68	0.29	5.1
Chuck Tender (Stir fry)	5.97	5.68	0.29	5.1
Shin Shank (Diced)	5.32	5.32	-	-
Thin Skirt	5.32	5.32	-	-
Flank Steak	5.32	5.32	-	-
Trimmings (Mince)	5.32	5.32	-	-
Meat Yield	4.99	4.87	4.85	0.14
Fat	0.30	0.30	-	-
Bone	0.05	0.05	-	-
HSCW Equivalent	3.47	3.38	0.09	2.9

Source: MLA (2009)

^a The prices for cube roll and sirloin are the average of separate quotes for grainfed and grassfed product.

The price of silverside was not quoted so it was set the same as topside.

The prices of navel end brisket, point end brisket, shin shank, thin skirt, flank steak and trimmings were not quoted. These prices were assumed to have changed in the same proportion as the average price of non-MSA hindquarter cuts changed between Table 2c and Table 2d (up 0.7 per cent).

Table 2e: National MSA Premiums on a Wholesale Carcass Equivalent Basis, July 2009-June 2010^a

Cut	Wholesale MSA Price (\$/kg)	Wholesale Non-MSA Price (\$/kg)	Wholesale MSA Margin (\$/kg)	Wholesale MSA Margin (%)
HINDQUARTER				
Topside	6.37	6.06	0.31	5.1
Thick Flank (Knuckle)	6.45	5.81	0.64	11.0
Outside (Silverside)	6.37	6.06	0.31	5.1
D-Rump (Rump)	9.44	7.96	1.48	18.6
Tenderloin (Butt fillet)	24.55	20.91	3.64	17.4
Striploin (Sirloin)	14.79	12.77	2.02	15.8
FOREQUARTER				
Navel End Brisket	5.08	5.08	-	-
Point End Brisket	5.08	5.08	-	-
Cube Roll	21.13	18.40	2.73	14.8
Blade	5.67	5.21	0.46	8.8
Chuck Roll	6.61	5.97	0.64	10.7
Chuck Tender (Stir fry)	6.61	5.97	0.64	10.7
Shin Shank (Diced)	5.08	5.08	-	-
Thin Skirt	5.08	5.08	-	-
Flank Steak	5.08	5.08	-	-
Trimmings (Mince)	5.08	5.08	-	-
Meat Yield	4.99	4.87	0.37	8.0
Fat	0.30	0.30	-	-
Bone	0.05	0.05	-	-
HSCW Equivalent	3.47	3.22	0.25	7.9

Source: MLA (2010)

^a The prices for cube roll and sirloin are the average of separate quotes for grainfed and grassfed product.

The price of silverside was not quoted so it was set the same as topside.

The prices of navel end brisket, point end brisket, shin shank, thin skirt, flank steak and trimmings were not quoted. These prices were assumed to have changed in the same proportion as the average price of non-MSA hindquarter cuts changed between Table 2d and Table 2e (down 4.5 per cent).

Table 2f: National MSA Premiums on a Wholesale Carcass Equivalent Basis, July 2010-June 2011^a

Cut	Wholesale MSA Price (\$/kg)	Wholesale Non-MSA Price (\$/kg)	Wholesale MSA Margin (\$/kg)	Wholesale MSA Margin (%)
HINDQUARTER				
Topside	7.05	6.36	0.69	10.8
Thick Flank (Knuckle)	7.11	6.33	0.78	12.3
Outside (Silverside)	7.05	6.36	0.69	10.8
D-Rump (Rump)	9.05	8.35	0.70	8.4
Tenderloin (Butt fillet)	25.81	24.22	1.59	6.6
Striploin (Sirloin)	16.09	13.36	2.73	20.4
FOREQUARTER				
Navel End Brisket	5.55	5.55	-	-
Point End Brisket	5.55	5.55	-	-
Cube Roll	24.02	20.48	3.54	17.3
Blade	6.00	5.70	0.30	5.3
Chuck Roll	5.81	5.51	0.30	5.4
Chuck Tender (Stir fry)	5.81	5.51	0.30	5.4
Shin Shank (Diced)	5.55	5.55	-	-
Thin Skirt	5.55	5.55	-	-
Flank Steak	5.55	5.55	-	-
Trimmings (Mince)	5.55	5.55	-	-
Meat Yield	5.32	4.87	0.37	7.6
Fat	0.30	0.30	-	-
Bone	0.05	0.05	-	-
HSCW Equivalent	3.70	3.44	0.26	7.5

Source: MLA (2011)

^a The prices for cube roll and sirloin are the average of separate quotes for grainfed and grassfed product.

The price of silverside was not quoted so it was set the same as topside.

The prices of navel end brisket, point end brisket, shin shank, thin skirt, flank steak and trimmings were not quoted. These prices were assumed to have changed in the same proportion as the average price of non-MSA hindquarter cuts changed between Table 2e and Table 2f (up 9.1 per cent).

Table 3: Proportions of retail cuts in a 260kg carcass

Common Name	MSA Name	Proportion of the Carcass (%)	Weight (kg)
HIND QUARTER			
Topside		6.2%	16.1
Thick Flank	Knuckle	3.7%	9.6
Outside	Silverside	5.7%	14.8
D-Rump	Rump	3.8%	9.9
Tenderloin	Butt fillet	1.6%	4.2
Striploin	Sirloin ¹	4.4%	11.4
FOREQUARTER			
Navel End Brisket		3.3%	8.6
Point End Brisket		3.8%	9.9
Cube Roll	Cube Roll	1.7%	4.4
Blade	Blade	5.5%	14.3
Chuck Roll		4.5%	11.7
Chuck Tender	Stir Fry	0.9%	2.3
Shin Shank	Diced	4.6%	12.0
Thin Skirt		0.2%	0.5
Flank Steak		0.4%	1.0
Trimming		18.4%	47.8
Meat Yield		68.7%	178.6
Fat		12.0%	31.2
Bone		19.3%	50.2
HSCW Equivalent		100.0%	260.0

Source: MLA (Cameron Dart, personal communication)

Table 4: Aggregate Economic Value of MSA at the Retail Level

	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11
Carcasses Graded (000)	225	291	353	366	523	626	645	716	839	979	1280	1420
Carcasses Compliant (000)	187	253	300	316	476	576	593	649	758	890	1174	1339
Average Carcass Weight (kg)	228	239	257	237	250	253	250	265	264	271	276	281
Estimated Retail Price Premium (c/kg cw)	0 (a)	7.8 (a)	15.6 (a)	23.4 (a)	31.2 (a)	39.0	39.0	27.0	30.0	29.0	24.0	22.0
Additional Value at Retail (\$m cw)	0	4.7	12.0	17.5	37.1	56.8	58.3	46.4	60.0	69.9	77.8	82.8

(a) No prices recorded, assumed value

Table 5: Aggregate Economic Value of MSA at the Wholesale Level

	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11
Carcasses Graded (000)	225	291	353	366	523	626	645	716	839	979	1280	1420
Carcasses Compliant (000)	187	253	300	316	476	576	593	649	758	890	1174	1339
Average Carcass Weight (kg)	228	239	257	237	250	253	250	265	264	271	276	281
Assumed Wholesale Price Premium (c/kg cw)	0 (a)	5.9 (a)	11.8 (a)	17.8 (a)	23.0 (a)	29.0	29.0	20.0	29.0	9.0	25.0	26.0
Additional Value at Wholesale (\$m cw)	0	3.6	9.1	13.3	27.4	42.3	43.2	34.4	58.0	21.7	81.0	97.8

(a) No prices recorded, assumed value

Table 6: Aggregate Economic Value of MSA at the OTH Level

	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11
Carcasses Graded (000)	225	291	353	366	523	626	645	716	839	979	1280	1420
Carcasses Compliant (000)	187	253	300	316	476	576	593	649	758	890	1174	1339
Average Carcass Weight (kg)	228	239	257	237	250	253	250	265	264	271	276	281
Assumed OTH Price Premium (c/kg cw)	0 (a)	2 (a)	4 (a)	6 (a)	8 (a)	10 (a)	10 (a)	11 (b)	17	12	15	19 (b)
Additional Value at OTH (\$m cw)	0	1.2	3.1	4.5	9.5	14.5	14.9	18.9	34.1	28.9	48.6	71.5

(a) No prices recorded, assumed value

(b) Restricted data available