THE RELATIONSHIP BETWEEN CARCASS VALUATION AND CARCASS DESCRIPTORS IN LAMB

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SUMMARY

Forty-seven carcasses were assessed by 5 wholesalers and 5 retailers. These carcasses came from 3 1 cryptorchid and 16 ewe lambs and represented 6 genotypes. Each assessor ranked the carcasses on a 1 to 5 scale (1 = very good; 2 = good; 3 = acceptable; 4 = poor; 5 = very poor) for the following characteristics: fat distribution, fat level, meat colour, conformation of the hindleg, forequarter, loin and over all. Each wholesaler valued every carcass given current wholesale prices as did each retailer given current prices.

For the ewe carcasses, conformation of the loin was found to significantly ($P < 0.001$) affect carcass value for both groups of assessors, with retailers also considering meat colour in their valuations. Carcass weight and GR explained levels of variation in carcass value equivalent to the best subjective characteristics. A quadratic effect for carcass weight was found for both retailers and wholesalers with maximum value being ascribed to carcasses weighing between 17-18 kg. If assessor was included as an explanatory variable, then the variance accounted for was increased significantly ($P < 0.05$) ($R^2 = 0.51$) for both wholesalers and retailers when compared to the best subjective characteristics.

Valuation of cryptorchid carcasses by retailers was most strongly related to conformation of the loin and fat distribution. Of the objective characteristics, carcass weight had a significant effect, there being a quadratic effect with a maximum value equivalent to a 25 kg carcass. The amount of variance explained, however, was low, suggesting a weak association between carcass weight and ascribed value. Relationships for wholesalers were poor irrespective of whether subjective or objective characteristics were considered. As for ewe carcasses, assessor had a significant ($P < 0.001$) effect on the strength of the relationships.

The correlation co-efficients between the overall conformation score given for the carcasses and the EUROP conformation score was $r = 0.50$ ($P < 0.001$) showing only a moderate association between the two scores. The EUROP score was less useful at explaining the variation in ascribed carcass value than conformation score of the loin.

Keywords: lamb, carcass, value, description

INTRODUCTION

Numerous opinions exist about which characteristics should be used to describe lamb carcasses to reflect their value, with a divergence of systems used around the world. Promotion of the value-based marketing concept (Save11 and Cross 1991) to industry has stimulated discussion about the methods of valuing carcasses. In Australia most carcasses are described by their weight and the GR measurement that can now be measured at chain speed with a probe (Hopkins *et al.* 1995a). This information provides retailers with the basis for estimating the value of a carcass because it enables them to determine the approximate weight of different cuts, the amount of trimming required and the saleable meat yield. It has been suggested previously, however, that there is a need for other descriptors such as conformation (Moxham and Brownlie 1976). Consultation with industry has revealed a dependence on conformation for 'grading' carcasses (Hall et *al.* 1994).

Although some recent work with Video Image Analysis (VIA) has investigated the potential of systematically measuring 'conformation', there has been minimal effort at establishing how industry uses carcass descriptors such as conformation and the relationship of these to carcass value. Hopkins (1995) showed that both retailers and wholesalers use a mixture of characteristics for 'grading' carcasses which influences perceived carcass value.

The results reported here indicate for a group of wholesalers and retailers the relative importance of various carcass characteristics in relation to perceived carcass value. The issue of 'grading' is discussed in relation to the results.

MATERIALS AND METHODS

Forty-seven lamb carcasses (31 cryptorchids; 16 ewes) representing 6 genotypes (PD x BLM, T x BLM, PD x M, T x M, BL x M and M x M; where PD = Poll Dorset, T = Texel, BLM = Border x Leicester x Merino, and M = Merino) were assessed by 5 wholesalers and 5 retailers.

The objective was to display carcasses that differed significantly in carcass weight, fat levels, conformation and fat distribution. All carcasses were weighed hot at slaughter, a hot GR measurement taken (total tissue thickness at the 12th rib, 110mm from the midline) and a EUROP conformation score given by an assessor. The kidneys and internal fat were removed after slaughter and before chilling.

Of the wholesalers who assessed the carcasses, four operate businesses in Sydney and supply about one third of Sydney's lamb to independent retailers and the fifth is based in Canberra. The 5 retailers were selected on the basis that they had considerable experience in the preparation and sale of value-added boneless lamb cuts because it was believed they would be more responsive to variation in cut size and shape. They were thus not representative of the retail industry.

After 4 days of chilling the cryptorchid and ewe carcasses were randomly displayed and the hot weight of each carcass identified. All assessors were asked to rank each carcass (whole not cut) on a 1 to 5 scale (1 = very good; 2 = good; 3 = acceptable; 4 = poor; 5 = very poor) for the following characteristics: fat distribution, fat level, meat colour, conformation of the hindleg, forequarter, loin and over all. Wholesalers valued each carcass independently using their current wholesale prices (cents/kg). Each retailer indicated the price they would have been prepared to pay for each carcass in relation to their business. After completing carcass assessments the assessors were asked to score each carcass for conformation using the EUROP system where E indicates the "best" conformed carcass and P the "worst".

After the assessment, the depth and width of M. *longissimus thoracis et lumborum* (LL) was measured and the depth of subcutaneous fat (Fat C) over the position of greatest LL depth.

Regression analysis was used to develop models for wholesalers and retailers separately to detect which of the characteristics used to describe the carcasses significantly affected the ascribed carcass value (the dependent variable). These models were compared with those based on hot carcass weight and GR. Each wholesaler and retailer were assigned a specific number so that assessor could be used as an independent variable. Analysis was confined within sex groups because of the spread in carcass weight (ewes much lighter) and the knowledge that this would influence market destination.

RESULTS

As shown in Table 1 the fat levels of the ewe carcasses exhibited more variation than those of the cryptorchid carcasses which were much heavier. Those characteristics shown to significantly ($P < 0.05$ or $P < 0.001$) influence carcass value are outlined in Table 2.

Table 1. Characteristics of cryptorchid and ewe carcasses used for whole carcass assessment

	Cryptorchids (n = 31)		Ewes (n = 16)	
	Mean	SD	Mean	SD
Hot carcass weight (kg)	25.3	2.93	17.5	1.43
Hot GR (mm)	14.0	2.75	10.4	4.11
Fat C (mm)	3.4	1.18	2.7	1.48
LL depth (mm)	30.3	3.24	25.1	3.05
LL width (mm)	59.9	4.71	58.8	4.50
LL area (cm^2)	14.6	2.47	11.9	2.11

For the ewe carcasses, conformation of the loin was found to significantly ($P < 0.001$) affect carcass value for both groups of assessors, with meat colour also significant for retailers. Characteristics that can be measured objectively such as weight and GR explained equivalent levels of variation in carcass value to the best subjective characteristics (Table 2). A quadratic effect for carcass weight was found for both retailers and wholesalers with maximum value being ascribed to carcasses weighing between 17-18 kg. Inclusion of wholesaler as an independent variable with conformation score, significantly ($P <$

0.05) ($R^2 = 0.51$) increased the variance accounted for in value. A similar effect was found for retailers. Addition of wholesaler as an independent variable to carcass weight and GR provided a small significant improvement ($P < 0.05$) in explaining the variation in carcass value.

Valuation of cryptorchid carcasses by retailers was most strongly related to conformation of the loin and fat distribution. For the objective characteristics, carcass weight had a significant linear and quadratic effect with a maximum value for a 25 kg carcass. The variance explained was low, suggesting a weak association between carcass weight and value. For wholesalers, the relationships were poor irrespective of whether subjective or objective characteristics were considered and no significant quadratic effect for carcass weight on value was found. Inclusion of wholesaler as an independent variable significantly (P c 0.001) increased the variation explained. Combinations of the best subjective characteristics and carcass weight and fatness provided marginal improvement in accounting for the variation in carcass value. Retailer values were significantly higher than wholesaler carcass values.

Table 2. Regression relationships between carcass valuations (cents/kg;dependent variable) for retailers and wholesalers and the independent variables, hot carcass weight (HCW), GR, conformation score loin (CL), meat colour (MC), and fat distribution (FD) for ewes and cryptorchids

Group	Constant	Independent variables	R^2	RSD	n
		Ewes			
Retailers	282	- 9.8CL-7.1MC	0.39	16.4	71
	- 909	129.6HCW-3.8HCW^2 + 2.6GR	0.39	16.5	
Wholesalers	257	-14.5CL	0.27	27.1	76
	- 1227	163.6HCW-4.8 HCW^2 + 4.4GR	0.31	26.6	
		Cryptorchids			
Retailers	277	- 6.6CL-7.4FD	0.39	13.3	151
	63	14.9HCW-0.30HCW^2	0.07	16.5	
Wholesalers	229	- 5.6FD	0.03	26.4	154
	257	- 1.6HCW	0.03	26.4	

All co-efficients significant , $P < 0.05$.

For the retailers and wholesalers the correlation co-efficients between the overall conformation score given for the carcasses and the EUROP conformation score was $r = 0.50$ ($P < 0.001$) showing only a moderate association between the 2 scores. The EUROP score was less useful at explaining the variation in ascribed carcass value than conformation score of the loin. EUROP scores given by the industry assessors were significantly ($P < 0.001$) correlated with those given by the independent assessor ($r = 0.59$).

DISCUSSION

Conformation was the most important of the subjective characteristics affecting the value ascribed by the 2 sectors. This supports previous work with retailers (Jackson *et al.* 1992). It seems that retailers associate conformation with breed or genotype (Hopkins *et al.* 1993). Since poorer conformed carcasses are usually from slower growing, leaner, lighter lambs it is postulated that both industry sectors therefore consider poorer conformed carcasses inferior and by *defacto* particular genotypes. However conformation per se has minimal impact on the retail value of boneless lamb cuts, provided heavy (> 20 kg) carcasses are used (Hopkins 1995), or on saleable meat yield (Hopkins *et al.* 1995b).

Retailers considered more characteristics, such as meat colour, than wholesalers when determining the value of the carcasses. This probably reflects the importance placed on colour by their clients, the consumers. More variation in carcass value was explained by the subjective characteristics used by the retailers.

As the 2 sex groups were confounded by weight and the wholesalers and retailers had different requirements, it was not surprising that different characteristics were seen to influence value. The

retailers represented a biased sample each operating a business where heavy lamb carcasses were utilised for boneless value-added cuts. They ascribed the highest value for all carcasses to cryptorchid carcasses weighing 25 kg, whereas wholesalers had a linear discount of 1.6 cents for every 1 kg increase in carcass weight. Given the range of weights in the sample this represented a 20 ¢/kg discount for the heaviest carcass with the highest price ascribed to a 20 kg carcass. By contrast for the lighter ewe carcasses both industry groups had a similar weight preference (approximately 18 kg). In addition GR influenced their valuations, suggesting from the sign of the regression coefficients that a proportion of the carcasses were considered too lean. For wholesalers a cryptorchid carcass weighing 20 kg or a ewe carcass weighing 18kg with a GR of 15 mm attracted the highest value given the range of the data.

The results provide little hope for establishment of a generic system of describing carcasses using subjective characteristics, given the large amount of unexplained variance in the carcass value. This indicates that a 'grading' system based on subjective assessments has limited potential as a means of segregating carcasses. Additionally, the issue of repeatability remains for subjective assessment because each assessor, although working on a 1 to 5 scale, seemingly interpreted this in a different way. The strength of the association with a visual standard such as the EUROP conformation score suggested that this could not be transferred across assessors.

The poor relationship between carcass value and measures of fatness (indicated by GR) suggests that this was having a small effect. This is surprising given that the retailers had previously indicated an ideal range for this characteristic (D.G. Hall pers. comm.). It may demonstrate that, without being told the fat level, the assessors could not discriminate between carcasses based on fat levels or that changes in carcass weight simply outweighed all other variables.

In summary, this study has shown that there is poor agreement between subjective carcass characteristics and the valuation of carcasses, with significant differences between and within meat industry sectors. This is also true for relationships based on carcass weight and GR. It is apparent that, although these relationships can be improved by using a conformation score in addition to weight and fat, that standardisation of visual assessments will remain an issue (Abdullah *et al.* 1993). The application of video image analysis may overcome this by providing a more objective assessment of carcass shape which can improve the precision with which value is estimated, or which bears some relationship to other features of carcasses that influence their value.

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