THE YIELD OF LAMB CARCASES PREPARED AS "TRIM" AND TRADITIONAL CUTS

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SUMMARY

Carcase data were obtained for 172 lambs representing 2 sexes (86 ewes, 86 wethers) and covering a wide range of carcase weight (16.0-25.6 kg) and fatness (6.0-23.0 mm at the GR site which is defined as over the 12th rib 110 mm from the midline).

Of the carcases 87 were prepared into the full range of "Trim" lamb cuts which are boneless and fat denuded. The remaining 85 carcases were prepared into traditional trimmed bone-in cuts. Percentage yields of saleable meat, based on 3 combinations of cuts were determined.

Only GR was significant ($P < 0.05$) for the prediction of the percentage yield of traditional cuts. For prediction of the yield of Trim cuts both hot carcase weight (HWT) and GR were significant ($P < 0.05$). The accuracy with which percentage yield could be estimated was similar irrespective of the combination of cuts used (r.s.d. values ranging from 1.41-1.48%). The R^2 values for the models ranged from 0.63-0.74. In all models as GR increased percentage yield decreased, and in addition, for Trim cuts, as HWT increased yield percentages decreased. Application by retailers of the yield estimates, as a basis for determining the average price per kilogram they must charge when selling Trim and traditional cuts, is discussed.

Keywords: lamb, carcase, yield, Trim.

INTRODUCTION

Increased knowledge of consumer preferences for lamb meat (Thatcher and Couchman 1983; Hopkins and Congram 1985) lead to the development of a range of alternative cuts (Anon. 1984; Currie and Thatcher 1988). Further development of alternative cuts has seen the creation of "Trim" lamb (TL). The TL range of cuts are all boneless and heavily denuded of fat so that most comply with National Heart Foundation guidelines of having a fat content less than 10%. Trim lamb was designed to satisfy changing consumer preferences for leaner, more versatile cuts with low waste. To retail new cuts at a profit, retailers must be able to determine how much saleable meat they can expect from different types of carcases so as to establish appropriate cut prices. This is particularly relevant to a comparison with traditional cuts, as there has been concern expressed by butchers that the prices which must be charged for TL cuts to make a profit are higher than consumers are willing to pay.

This paper reports preliminary results from a large study where objective (such as Video Image Analysis) and subjective carcase measurements were obtained on 260 lamb carcases which were prepared into either traditional or TL cuts, so that estimates of relative profitability for carcases of varying specifications could be made.

MATERIALS AND METHODS

Carcase data reported here were obtained for 172 lambs representing 2 sexes (86 ewes, 86 wethers). The ewe lambs and 51 of the wethers were sired by Poll Dorset rams, from Border Leicester x Merino ewes, and for the balance of the wethers breed was unknown.

All lambs were slaughtered in an abattoir by standard commercial practice. The kidneys, kidney and channel fat and skirt were removed and weighed, subsequent to weighing the carcases hot to give an AUS-MEAT standard carcase weight. Fatness (tissue depth) at the GR site (defined as over the 12th rib 110 mm from the midline) was measured in the chiller using a GR knife within 3 hours of slaughter. The chilled carcases were transported under refrigeration to the Butchery School at the East Sydney Institute of Technology and held in chillers at approximately 4°C for between 3 to 8 days when they were prepared into retail cuts. Prior to butchering, the carcases were weighed, the GR measured again and the fat depth measured over the deepest part of the *M. Zongissimus thoracis et lumborum* at the 12th rib (FATC).

Trim cuts were prepared from 87 carcasses (42 ewes, 45 wethers) as described below. The chump was removed from the long cut leg by cutting through the hip joint. The bone from the short leg was removed by tunnel boning, leaving the shank intact, which was subsequently trimmed by removing the meat from the tibia. The round roast was removed from the trimmed leg by following the natural seam between the round and silverside muscles. The patella, cap and connective tissue were trimmed from the round. The remaining portion of the leg, called the silvertop roast, was trimmed and then the topside roast removed by following the natural seam between the topside and silverside muscle. The cap was removed from this cut. This left the silverside which was trimmed, including removal of the silver skin.

The shortloin (1 rib) was split down the vertebra and then the fillet removed. All bone was removed from the shortloin, the paddywhack removed and the subcutaneous fat if deemed necessary, to give a fat level equivalent to a fatscore 2 (GR 6-10 mm) carcase. The resulting boneless shortloin was trimmed to give a 150 mm tail from the eye. From the boneless shortloin the eye of loin was removed and then the silver skin removed. The ribloin (7 rib) was trimmed of subcutaneous fat and then "feathered" (intercostal muscles removed). The flap was prepared into either sausage or lean trimmings. From the 5 rib forequarter, with the breast and neck removed the rib bones were removed, then the best neck eye muscle and the overlying muscles from the rib section were separated from the shoulder via the natural seam to leave the boneless neck fillet roast and bone in oyster cut shoulder. The forequarter shank was removed from the shoulder and prepared into lean trimmings. Throughout 2 types of trimmings were prepared; lean and sausage defined as being 90% and 75% visual lean.

For the remainder of the carcases (44 ewes, 41 wethers) the following traditional cuts were prepared. The chump was removed from the long cut leg by cutting through the hip joint, leaving a short leg with shank attached which was trimmed. The shortloin (1 rib) was split down the vertebra and the fillet removed, after which the subcutaneous fat was trimmed if necessary the paddywhack removed and the rib bone. The shortloin was trimmed to give a 100 mm tail from the eye. The ribloin (8 rib) was trimmed of subcutaneous fat and then "feathered". The flap was prepared into either sausage or lean trimmings. A 4 rib forequarter was prepared by removing the neck, shank and breast. Sausage trimmings were prepared from the neck and breast.

All cuts were prepared by an experienced butcher and were weighed before and after trimming at each stage of preparation. All trimmings, fat and bone were also weighed. All the combinations of cuts applicable to TL were prepared and the cut weights determined.

Percentage yields, based on 2 combinations of TL cuts are presented here along with the yield for traditional cuts (Yield 1). For the TL cuts 1 combination (Yield 2) was based on preparation of the silvertop roast and boneless loin, and all remaining cuts and the other combination (Yield 3) was based on the topside, silverside and boneless loin and all other cuts as described. Yield values were determined by adding the weight of all the trimmed cuts and dividing this value by the cold weight of the carcase before butchering. No trimmings were included in the calculation.

Regression analysis was used to develop models for prediction of the dependent variables Yield 1, 2 and 3. The base model for prediction included the independent variables hot carcase weight (HWT), GR and the interaction term HWT x GR.

The effect of sex on the final models was also investigated by including this as an independent variable. SYSTAT V5.03 (Wilkinson 1990) was used for all analyses.

RESULTS

The mean (s.d.) carcase data for the 2 groups of lambs are shown in Table 1. Carcases with fatscores of 2 to 5 and weighing from 16.0 to 25.6 kg were represented in the sample.

For the prediction of Yield 1, it was found that GR was significant ($P < 0.05$) but HWT was not significant ($P > 0.05$). By contrast, for prediction of Yields 2 and 3, HWT was found to be significant ($P < 0.05$) along with GR. In no case was the interaction term HWT x GR found to be significant (I' > 0.05).

Table 1. Mean (s.d.) carcase measurements, hot carcase weight (HWT; kg), GR (mm) and fat depth over the eye muscle (FATC; mm) for 87 carcases prepared as Trim cuts and 85 prepared as traditional cuts

	HWT (kg)	GR (mm)	FATC (mm)	Yield 1 (%)	Yield 2 (%)	Yield 3 (%)
Trim	20.4 (2.21)	13.3 (3.80)	3.5 (1.69)		52.9 (2.37)	50.1 (2.28)
Trad.	20.1 (2.17)	13.1 (3.69)	3.2 (1.70)	71.7 (2.89)		

The models for predicting the 3 yields which were significant ($P < 0.001$) are as follows:

Yield 1 = 80.6 (± 0.60) - 0.68 (± 0.04) GR $r^2 = 0.74$; r.s.d. = 1.48

Yield 2 = 62.6 (± 1.46) - 0.44 (± 0.05) GR - 0.19 (± 0.08) HWT $r^2 = 0.63$; r.s.d. = 1.46

Yield 3 = 59.5 (± 1.41) - 0.42 (± 0.04) GR - 0.19 (± 0.08) HWT $r^2 = 0.63$; r.s.d. = 1.41

The accuracy with which percentage yield can be estimated is similar irrespective of the combination of cuts used as reflected by comparing the residual standard deviation values. In all cases as GR increases percent yield decreases. For TL cuts as HWT increases, the yield decreases for both combination of cuts. In no case was sex found to have an effect on the models. The effect of fatness on the various yields is demonstrated in Table 2.

Table 2. Estimated percentage yield for 2 carcases weighing 20 kg hot weight and with a GR of 10 or 20 mm when prepared as Trim and traditional cuts

	Yield Type		
GR (mm)	1 (Trad.)	2 (Trim)	3 (Trim)
10	73.8	54.4	51.5
20	67.0	50.0	47.3

DISCUSSION

The negative relationship between fat levels and percentage yield for lamb has been reported many times in the past (Kempster *et al.* 1976; Hopkins 1988), but it is difficult to compare the results of other studies with those presented here because different combinations of cuts and trim levels were employed. In the present study every effort was made to reduce the influence of differing trim levels by using a set criteria. Given these criteria the models developed in this study can be used to provide estimates of the likely yield for different carcases prepared a specific way as shown in Table 2. This shows that if combination 3 is used as opposed to combination 2 it is expected to obtain approximately 3% less of the carcase as saleable cuts, where most of this difference would be taken up by more lean and sausage trim.

Using yield estimates like those shown in Table 2 retailers can easily determine the average price they must charge when selling carcases either as TL or traditional lamb cuts. For example if a carcase weighing 20 kg costs a retailer $3.00/kg to purchase, and this cost includes an allocation for overhead costs, the retailer must be able to recoup $60.00 plus a desired level of profit which may be $20.00. If the carcase had a GR measurement of 10 mm it is estimated to yield 74% of saleable cuts (for Yield 1). This implies that to achieve the desirable level of profit, the cuts must be retailed at an average of $5.40/kg (ie. 80/(20 x 0.74)). If the cuts were prepared from a carcase with a GR measurement of 20 mm the retailers profit would be reduced from $20.00 to $12.00 due to a reduction in the yield of saleable cuts from 74 to 67% (ie. 0.67 x 20 x 5.40 = $72).

By comparison, for the TL cuts (Yield 2, silvertop roast and boneless loin) to achieve the same profit margin of $20 for a 20 kg, 10 mm carcase the cuts would have to be retailed at an average of $7.40/kg (ie. 80/(20 x 0.54)). If Yield 3 was selected this average price for the same carcase would have to rise to $7.80/kg. These average prices are lower than required for other combinations of TL cuts using the same dollar values for costs and the profit margin (Hopkins *et al.* 1993). An assessment of profitability estimates must however be undertaken with due attention to what customers like to purchase, for although a particular combination may be more profitable on paper the retailer must be able to sell the specific cuts.

Obviously the prices which a retailer is required to achieve will depend on how the trimmings of the carcase are utilised, but this yield data does demonstrate that higher prices per kilogram will need to be charged for TL cuts than for traditional cuts.

With the introduction into some abattoirs of ticketing and fat measurement equipment, retailers can now receive carcases bearing a ticket that describes their weight and fatness. The results presented here demonstrate that this information will provide the basis for estimating expected yields from different types of carcases, bearing in mind that each estimate has a degree of error. The strategy that has been adopted to communicate the findings of this study to the retail sector has focused on development of simple ready reckoners which enable butchers to determine what prices they should charge to meet specified profit levels. Educational material has also been published which illustrates the effect of carcase weight and fatness on gross returns. This material has been used as a part of the Australian Meat and Livestock Corporation's Select Butcher Program which has been launched subsequent to this study with the specific aim of increasing the sales of TL cuts.

The linking of estimated yield and profitability to carcase description will hopefully be developed to the point that retailers associate the ticket information and yield. This should encourage transmission of price signals throughout the lamb retailing, processing and production chain, providing incentive for change towards a leaner product which is more likely to be acceptable to consumers. Further to this retailers can offer their customers a new range of lamb cuts with a full understanding of the minimum average prices they need to charge. Education of the association between yield, profitability and carcass description is being tackled by Market Development personnel working in both Sydney and Melbourne and is a major area of focus for the Prime Lamb Program (McLaughlin 1992).

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