COMPOSITIONAL VARIATION OF THREE LAMB CUTS

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SUMMARY: Equations were developed to predict the weight of trimmed (bone-in) forequarter, midloin and leg cuts from 31 lamb carcasses using the variables carcass weight and GR. A similar approach was adopted to enable prediction of the muscle weight of each trimmed cut. All equations explained a large amount of the variation in component weights (r^2 = 0.98 - 0.99).

These models showed that muscle percentage decreased by 4.5, 8.0 and 12.5 percent for the leg, midloin and forequarter cuts respectively as carcass fatness increased from score 1 to score 5.

The impact of these findings on the value consumers receive when purchasing cuts from carcasses of different fatness is outlined.

INTRODUCTION: Domestic marketing of lamb in Australia has been based on a range of bone-in retail cuts. Differential trimming of these cuts results in a wide variation in lean meat content (Harris, 1982). This has undoubtedly contributed to the consumer perception of lamb as being too fat (Hopkins and Congram 1985; Hopkins 1988a).

A new range of boneless lamb cuts (Currie 1986) offers significant improvements in the presentation of lamb. However, a heavy lean carcass (22-25 kg, fat score 2 or 3) is required to make this an economical and aesthetic proposition, and the acceptance of the cuts among consumers has varied (Currie and Thatcher 1988; Hopkins and Saunders 1990).

For traditional cuts presentation can be improved by trimming subcutaneous fat to a consumer-acceptable level. This strategy will not remove the intermuscular fat. The aim of this work was to determine the muscle content of trimmed leg, midloin and forequarter cuts and investigate the impact of changes in fatness on the value consumers receive when purchasing these cuts.

MATERIALS AND METHODS: Data was obtained from 31 ewe carcasses sired by Poll Dorset rams all joined with Border Leicester x Polwarth x Booroola type ewes.

On the basis of liveweight and age at weaning in both December 1985 and 1986 lambs were allocated to two groups. One group (low plane) was run at a high stocking rate, the other (high plane) at a low stocking rate. Sixteen of these lambs were slaughtered in March/April and 15 in May.

In both years the groups were run on irrigated ryegrass/white clover/cocksfoot pasture. Feed allowances to achieve target growth rates as specified by Jagusch et al. (1979) were adopted, resulting in a range of carcass weights and levels of fatness. Further details of management are described by Hopkins (1989).

Lambs were slaughtered under commercial conditions. Prior to butchering carcass weight (i.e. cold and fats out) was recorded and the GR (total tissue thickness at the 12th rib 110 mm from the midline) measured using a GR knife.

All carcasses were divided into half and the left side butchered into a range of cuts, including the leg, midloin and square cut forequarter.

Each cut was weighed, trimmed to a selvedge equivalent of a score 2 carcass by a commercial butcher and reweighed. These trimmed cuts with associated bone and trim were packed in heavy duty bags and stored at -10° C until dissection into muscle, bone and fat using guidelines outlined by Wynn and Thwaites (1981).

Prior to detailed analysis the regularity of the data was examined using normal probability plots. Models were developed using regression analysis with the variables carcass weight and GR. This allowed the weight of each trimmed cut to be predicted and compared with the weight of muscle in each cut.

RESULTS: The carcasses used in this experiment covered the range seen commercially in terms of weight and fatness as shown in Table 1. Details of each cut are also indicated.

Table 1. Means, standard errors and ranges of carcass characteristics (n = 31).

	Mean	± s.e.	Range
Cold carcass weight (kg)	16.2	0.54	10.8 - 24.2
Cold GR (mm)	13.2	0.92	5.0 - 24.0
Trimmed leg (Leg 1) (kg)	5.4	0.16	3.8 - 7.7
Muscle: trimmed leg (Leg 2) (kg)	3.4	0.10	2.4 - 4.7
Trimmed midloin (Mid 1) (kg)	1.9	0.07	1.1 - 2.8
Muscle: trimmed midloin (Mid 2) (kg)	1.1	0.04	0.7 - 1.6
Trimmed Forequarter (FQ 1) (kg)	4.1	0.13	2.6 - 5.8
Muscle: trimmed forequarter (FQ 2) (kg)	2.4	0.07	1.5 - 3.3

All models developed were based on both carcass weight and GR. These all explain a large percentage of the variation (r^2) in the dependent variable.

The models were:

$$\text{Leg } 1 = 0.38(\pm 0.013)CWT - 0.061(\pm 0.015)GR \quad r^2 = 0.99,\ r.s.d = 0.25$$

$$\text{Leg } 2 = 0.25(\pm 0.014)CWT - 0.049(\pm 0.016)GR \quad r^2 = 0.99,\ r.s.d = 0.26$$

$$\text{Mid } 1 = 0.11(\pm 0.006)CWT - 0.012(\pm 0.007)GR \quad r^2 = 0.99,\ r.s.d = 0.11$$

$$\text{Mid } 2 = 0.08(\pm 0.007)CWT - 0.014(\pm 0.008)GR \quad r^2 = 0.98,\ r.s.d = 0.13$$

$$\text{FQ } 1 = 0.26(\pm 0.010)CWT - 0.010(\pm 0.012)GR \quad r^2 = 0.99,\ r.s.d = 0.20$$

$$\text{FQ } 2 = 0.17(\pm 0.011)CWT - 0.029(\pm 0.014)GR \quad r^2 = 0.99,\ r.s.d = 0.22$$

The coefficients of the equations developed to predict the trimmed weight of each cut show similarity to those reported previously (Hopkins 1989). As the GR measurement increases at a constant carcass weight the models all predict a decrease in the percentage of muscle in trimmed cuts. This is demonstrated in Table 2 using a carcass weighing 15 kilograms with either a GR measurement of 5 or 25 mm.

Table 2. Percentage of muscle in trimmed cuts according to changes in fatness.

	GR (mm)	
Cut	5	25
Leg	65.0	60.5
Midloin	71.0	63.0
Forequarter	62.5	50.0

The decrease of muscle percentage in these cuts as fatness increases is consistent with that reported on a whole carcass basis Hopkins (1988b).

DISCUSSION: It is apparent that compositional variation occurs within lamb cuts as fatness changes. This is largely a reflection of the amount of intermuscular fat which occurs in the different cuts, the forequarter having extensive depots of this fat. This is verified by the decrease in percentage terms of trimmed cut weights as fatness increases. For example the weight of trimmed forequarter from a carcass weighing 15 kilograms and with a GR of 25 mm is 95% of the weight of a forequarter from the same weight carcass but with a GR of 5 mm. In contrast for the leg the value is 82% implying that more fat can be trimmed in the leg than the forequarter.

As suggested (Hopkins 1988b) this finding relates directly to the value consumers receive when purchasing lamb cuts. The data in Table 2 suggests that a consumer who purchases a leg from a carcass with a GR of 5 mm would acquire more protein (muscle) than one who purchased a leg from a carcass with a GR of 25 mm. The same trend is evident for the three cuts, though as outlined the impact is greatest for forequarters.

Because forequarters and midloins are commonly sold in the form of chops this effect can be minimized by allowing the consumer to see the extent of intermuscular fat deposition. For the leg although it shows the smallest decrease in muscle content it is commonly sold whole and as a result it is more difficult for consumers to discern the protein (muscle) content.

The importance of these factors is directly influenced by the level of trimming imposed and in many circumstances this is much less than the standard used in this work. The consequences for consumers are then more profound.

To counter the effect of these results, lamb can be sold as boneless cuts (Currie 1986). However this approach is not likely to be universally adopted because of the requirement for a large lean lamb. It remains that production of overfat lamb must be discouraged, through breeding schemes utilizing the negative relationship between fatness and the proportion of lean tissue (Cameron and Smith 1985) and payment systems that reward lean meat production (Hopkins, 1989).

CONCLUSIONS: The composition of trimmed lamb cuts shows variation with changes in fatness. Of the cuts studied, the forequarter exhibits the most marked change and the leg the least. As a result the value consumers receive when purchasing lamb cuts decreases in protein terms as fatness increases, but consumers have more opportunity to overcome this with forequarter and midloin meat than legs because of the form in which it is commonly sold.

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