COMPUTER PROGRAMS WHICH ENABLE PRICING OF SHEEP AND LAMB CARCASSES BASED ON YIELD ESTIMATION SUITABILITY AND FINANCIAL PARAMETERS

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Summary

A computer program called LAMPRO has been developed for use by the Australian meat industry to assist with the pricing of lamb carcasses. Based on a series of prediction equations and accounting for the cost structure of a meat processor the program allows the real value of a carcass to be established. The concept has also been extended to cater for mutton carcasses destined for either domestic or export markets incorporated in a program called MUTONPRO.
(**Key Words**: Computer Programs, Lamb, Sheep, Carcasses)

Introduction

Transmission of consumer preferences and control over production and marketing are features enjoyed by the intensive animal enterprises around the world. In Australia sheep and lamb production is by comparison almost exclusively extensive and marketing is much more diffuse. Despite these constraints there has been a move to more objective and direct forms of marketing (Ashton-Jones, 1986). The potential of such an approach to overcome diffuse market signals has been previously proposed (Harris, 1982).

Several initiatives have been taken within the Australian red meat industry encompassing a common description language and a computer management system for processors (Phillips, 1988). Within these areas computer technology has enabled programs to be developed which base the purchase price of lambs and sheep on those factors which affect price. A computer program for lamb called LAMPRO is based centrally on yield estimates as previously described (Hopkins et al., 1990). The concept of basing purchase price on yield has been applied previously in the beef industry (Phillips et al., 1982) but largely because of numbers the notion has not been extended to sheep and lamb. Details of LAMPRO and its counterpart for mutton, MUTONPRO will be discussed in this paper.

Materials and Methods

A range of lamb carcasses were butchered as previously described (Hopkins, 1989) into the following retail lamb cuts: leg - chump and shank on, forequarter-square cut five ribs, shank - from forequarter, ribloin - seven ribs with flap off, ribloin - one rib with flap off, breast, flap and neck. A series of prediction equations were developed using the predictors carcass weight (i.e. cold and fats out) and "GR" (this being the total tissue thickness at the 12th rib 110 mm from the midline) which is a measure of fatness. These equations were incorporated into a program written in Borland Turbo Pascal V 5.0. To run the program an IBM compatible computer with at least 256 random access memory and 1 floppy disk drive is required. Within the program all those parameters which determine the cost of processing a carcass and the returns expected are included. This enables calculation of the price which a processor can afford to pay for a specified carcass - called the equilibrium price.

Adopting a similar approach a series of prediction equations have been developed for cuts from mutton carcasses destined for either domestic

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or export use. Models for predicting the weight of these cuts have been outlined elsewhere (Hopkins et al., 1991; Hopkins et al., 1992).

Results

For any lamb carcass LAMPRO will predict an estimated weight for each trimmed cut when the carcass weight and GR is nominated as shown in table 1. In this case it estimates a trimmed leg to weigh 5.66 kg from a 17 kg carcass with a GR measurement of 8 mm. The program uses the estimated weights and cost and return information supplied by the processor to calculate the equilibrium price. The return information is the price per kilogram that the processor expects to receive for each cut multiplied by the estimated weight of the cut. The price can be adjusted to reflect a specified profit margin. All costs are based on direct delivery of the lambs to the processor by the producer. Repeating this procedure for other specified carcasses serves to create a matrix of prices or price grid (table 2). Each grid is accessed and stored by date and number. Creation of the equilibrium price for a carcass weighing 17 kg's and with a GR measurement of 8 mm using fictitious costs and returns is shown in table 1. This shows that a processor paying 123 ¢/kg for this carcass would return a 5% profit margin based on the cost and return information supplied.

It should be noted that chump weight is not predicted but there is a facility for it to be included if known, in which case the weight of leg will be adjusted automatically. The returns for shanks can be calculated on a per kg basis or without regard to weight. As shown there are several options for costing of boning based on previous work which demonstrated it takes significantly longer to bone fat carcasses (Hopkins, 1989).

The prices indicated are for the mid point of the weight by GR cells and those corresponding to the local market cells are based on lower returns for legs. LAMPRO will calculate a grid for carcasses within the 8 to 30 kg weight range.

TABLE 1. CALCULATION OF THE EQUILIBRIUM PRICE FOR A LAMB CARCASS WEIGHING 17 KG'S WITH A GR MEASUREMENT OF 8 MM

Grid Date : 03-06-91
Grid No. : 01

	Predicted kg	Price (¢/kg)	Returns	Create Costs (¢/kg) except those with*	
Leg	: 5.66	¢220	$12.46	Depreciation	¢1
Chump	: 0.00	¢ 0	$ 0.00	Administration	¢1
Forequarter	: 4.53	¢200	$ 9.07	Production	¢2
Shank	: 0.54	¢ 50*	$ 0.50	Variable Costs	
Ribloin	: 1.69	¢250	$ 4.22	Levy*	¢80
Midloin	: 1.86	¢300	$ 5.57	Droving	¢2
Fat	: 0.26	¢ 10	$ 0.03	Killing*	¢400
Bone	: 1.03	¢ 10	$ 0.10	Chilling	¢2
Trim	: 0.04	¢ 50	$ 0.02	Boning(Score 1,2,3)*	¢350
Flap	: 0.73	¢ 50	$ 0.37	Boning(Score 4,5)*	¢0
Neck	: 0.28	¢ 40	$ 0.11	Boning(Special)*	¢0
Breast	: 0.25	¢ 40	$ 0.10	Packing	¢2
Offal	: 0.00	¢ 0	$ 0.00	Freezing	¢1
				Delivery	¢1
Total	16.86 kg		$32.54		$0.61 (per kg)

Carcass shrinkage (%) : 2.0
Profit Margin (%) : 5.0

Equilibrium price : 123.0 ¢/kg

TABLE 2. TRIAL PRICE GRID ¢ / KG DATE 03-06-91 NO. 2

Destination	Carcass Weight (kg)	Fat score/GR mm 1 0-5 mm	2 6-10 mm	3 11-15 mm	4 16 20 mm	5 21-25 mm
Local	14.1-16	111	117	115	113	111
Local	16.1-18	114	123	120	117	114
Export	18.1-20	125	137	133	129	125
Export	20.1-22	127	141	136	132	127
Export	22.1-24	128	144	139	134	128

TABLE 3. CALCULATION OF CUT PRICES FOR A LAMB CARCASS WEIGHING 17 KG'S WITH A GR MEASUREMENT OF 8 MM

	Predicted kg	Returns	Price per kg	Price Carcass Weight : 17 kg GR : 8 mm Costs	
Leg	: 5.66	$18.97	¢335	Purchase Cost	: 35.00 $
Chump	: 0.00	$ 0.00	¢ 0	Buyers Costs	: 3.00¢
Forequarter	: 4.53	$ 9.07	¢200	Transport Costs	: 50.00¢
Shank	: 0.54	$ 0.50*	¢ 50	Processing Costs	: 60.82¢
Ribloin	: 1.69	$ 5.06	¢300	− Skin Value	: 8.00 $
Midloin	: 1.86	$ 6.32	¢340	Profit Margin	: 5.00%
Fat	: 0.26	$ 0.03	¢ 10		
Bone	: 1.03	$ 0.10	¢ 10		
Trim	: 0.04	$ 0.01	¢ 40		
Flap	: 0.73	$ 0.22	¢ 30		
Neck	: 0.28	$ 0.08	¢ 30		
Breast	: 0.25	$ 0.05	¢ 20		
Offal	: 0.00	$ 0.00	¢ 0		
Total	16.86 kg	$40.41		Total	$40.27
		Return - Costs = 0.14 ($)			

This system provides buyers with objective buying limits based on carcass specifications. A further feature of the program is the capacity to establish the prices of cuts based on known market prices for lambs. If the prevailing market price of a particular type of lamb is known this is added to the processing costs and a profit margin included to give an amount which should equal total returns.

Manipulation of the cut prices is then undertaken to balance total returns and costs. This can be repeated when the relativity of prices change or an order for a cut at a particular price is received. This is demonstrated in table 3.

Development of the program for mutton took account of all the possible combination of cuts that can be derived from a mutton carcass based on export and domestic markets. These combinations are:

A	B
Bone in leg	Bone in leg
Backstraps	Backstraps
Fillet Short	Fillet Short
Trunk 80	Trunk 90
Trunk 50	

C	D
Bone in Leg Tipped	Bone in Leg Tipped
Backstraps	Backstraps
Fillet Short	Fillet Short
Trunk 80	Trunk 90
Trunk 50	

E	F
Boneless Leg Fillet in	Boneless Leg Fillet in
Backstraps	Backstraps
Fillet Short	Fillet Short
Trunk 80	Trunk 90
Trunk 50	

G	H
Boneless Leg Fillet in	Boneless Leg Fillet out
Backstraps	Backstraps
Fillet Long	Fillet Long
Trunk 80	Trunk 90
Trunk 50	

I	J
Total Meat 80	Total Meat 90
Trunk 50	

A price grid can be calculated for each combination and the associated range of carcasses and thus the program is more complex than LAMPRO. A completed input stage for a carcass weighing 23 kg with a GR of 8 mm and based on combination A is shown in table 4. As for LAMPRO the processor must enter all the costs of processing and the expected price per kilogram for each cut or carcass component. MUTONPRO then calculates an equilibrium price which can be adjusted as for LAMPRO to reflect a specified profit margin.

Because of its structure there can be numerous grids created within MUTONPRO reflecting the different combinations possible. Similarly to LAMPRO there is a option which allows the user to establish the prices of cuts based on known market prices for mutton.

Discussion

LAMPRO calculates that the heaviest leanest carcass should be paid the highest price. As the carcass weight declines so does the equilibrium price, and as carcass fatness increases so the

TABLE 4. CALCULATION OF THE EQUILIBRIUM PRICE FOR A MUTTON CARCASS WEIGHING 23 KG'S WITH A GR MEASUREMENT OF 8 MM

	Predicted kg	Price (¢/kg)	Returns	Create Costs (¢/kg) except those with*	
Bone in leg	: 6.92	¢150.0	$10.38	Depreciation	¢ 1
Backstraps	: 1.47	¢350.0	$ 5.15	Administration	¢ 1
Fillet (Short)	: 0.15	¢400.0	$ 0.60	Production	¢ 2
Trunk 50%	: 1.20	¢ 50.0	$ 0.60	Variable Costs	
Trunk 80%	: 5.96	¢ 80.0	$ 4.77	Levy*	¢ 30
Total Bone	: 4.53	¢ 10.0	$ 0.45	Droving	¢ 2
Fat	: 2.49	¢ 10.0	$ 0.25	Killing*	¢400
Offal	: 0.00	¢ 0.0	$ 0.00	Chilling	¢ 2
				Boning(Score 1,2,3)*	¢ 350
				Boning(Score 4,5)*	¢ 0
				Boning(Special)*	¢ 0
				Packing	¢ 2
				Freezing	¢ 2
				Delivery	¢ 1
Total	22.73 kg		$22.20		$0.47 (per kg)
Carcass shrinkage (%) : 2.0					
Profit Margin (%) : 5.0			Equilibrium price : 47.3 ¢/kg		

equilibrium price declines. This is also found for mutton within MUTONPRO. These shifts are a reflection of changes in yield and costs of processing. To utilize these relationships a user of the program must consider the suitability of each carcass. In Australia very lean lamb carcasses (score 1; GR − 0.5 mm) are not suitable for the clients of the retail butcher or for export as cuts overseas. Consequently the price paid for a score 1 carcass would be reduced to a level sufficient to discourage it's sale for those markets as shown in table 2 where the price has been made equivalent to that of a score 5 carcass. This method of setting prices is designed to reflect consumer preferences and if adopted indicates that in fact within Australia the highest price should be paid for a score 2 carcass. This directly correlates to the type of carcass preferred by our customers (Hopkins and Congram, 1985) and many of our overseas markets that purchase cuts such as the US.

In a sense the program is most applicable to adoption by exporters and it is these that have actually sought to introduce the concept.

Mutton in contrast to lamb has received little attention from a marketing perspective despite the fact that in Australia it has a level of production only marginally less than lamb. As for lamb it has been shown that carcass weight and GR are good predictors of the composition of sheep carcasses (Kirton et al., 1986) so a similar approach was used for developing the models in MUTONPRO as for LAMPRO. MUTONPRO is also likely to be of particular benefit to exporters allowing them to realistically discount unwanted carcasses.

Currently a large percentage of sheep and lambs are sold through saleyards in Australia with the consequential problems for meat quality and transmission of market signals. The systems outlined here will not replace this method of selling livestock. However as the push to increase objectivity continues this concept will be extended and those producers who can deliver the correct animals will be rewarded financially.

To facilitate use in Australia by industry both programs and associated manuals have been lodged with the Authority for Uniform Specification Meat and Livestock (AUSMEAT) for dissemination and further information is available from this organization.

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