

THE SCHEDULE PRICE SYSTEM

AND THE

EXPORT LAMB PRODUCER

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Discussion Paper No. 55

Agricultural Economics Research Unit

Lincoln College

I.S.S.N. 0110-7720

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## THE AGRICULTURAL ECONOMICS RESEARCH UNIT

Lincoln College, Canterbury, N.Z.

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## ACKNOWLEDGEMENTS

The author would like to thank Professor Barry Dent (A.E.R.U.), Tony Beck (A.E.R.U.), Alan Frazer (N.Z.M.P.B.) and Don Harwood (Waitaki N.Z.R. Ltd) for useful discussion and criticism during the development stages of this paper.



## 1. INTRODUCTION

Over the last three seasons there has been a gradual increase in average carcass weight of export lambs slaughtered (Table 1).

Favourable environmental and, to a certain extent, economic conditions have enabled and encouraged producers to keep lambs on to heavier weights. Unfortunately, there has been a gradual increase in overfat lambs (the F grade) as weights have risen. Cullwick (1980) states that there is a global need for lean well-muscled carcasses of good conformation and urges re-assessment of lamb production practices to achieve such types.

Producers should benefit from the sales of increased quantities of lean heavier lamb. As most costs of handling lamb from the farm gate to point of load out from a meat processing plant are directly related to the number of carcasses handled and not to the weight of meat produced, then it follows that the heavier the carcass the lower the cost per kilogram of processing (Frazer, 1972). In theory, this should improve the producers' portion of the export lamb price.

Export companies too, should receive financial gain from an increase in average carcass weights as long as they can establish the market demand for the larger joints. An increase in the production of heavier weight carcasses would tend to spread the seasonal

Table 1  
Export Lamb Percentages

Weight Range (kg)	Grades	% Lambs per Grade per Slaughter Season			Average of the Three Seasons (%)
		1977/78	1978/79	1979/80	
8.0-12.5	PL	14.66	15.69	8.92	13.09
	YL	<u>27.22</u>	<u>22.26</u>	<u>23.45</u>	<u>24.31</u>
	Total	41.88	37.95	32.37	37.40
13.0-16.0	PM	29.03	35.23	33.47	32.58
	YM	<u>8.80</u>	<u>8.71</u>	<u>15.54</u>	<u>11.02</u>
	Total	37.83	43.94	49.01	43.60
16.5-25.5	PH or YH or PX, PH, PHH Total	5.05	7.82	9.84	7.57
All weights	F	0.48	1.11	1.25	0.95
Average carcass wt for season		12.9	13.3	13.6	13.27

Source: NZMPB (1979, 1980).

pattern of kill by reducing the numbers slaughtered in the peak period (Frazer, 1972), as farmers delayed the off-take time of their lambs. The spread of kill could therefore both lower killing charges and ease the labour problems specific to extreme seasonal work. There would also be a higher yield of saleable offals obtained (Frazer, 1972). However, the greatest benefit to the exporters is in the area of further processing. This is seen by many as the panacea to reducing overseas freight charges. Such charges are an increasing proportion of marketing costs (Chudleigh, 1980). By exporting a variety of cuts of meat specific to certain markets the quantity of saleable meat per container load is increased. Further processing will also provide employment within New Zealand so is viewed nationally as a worthwhile venture (Hilgendorf, 1981).

However, the efficiency of a further processing plant cannot be maximized if the majority of carcasses are less than 15 kg (Harwood, pers. comm., 1981). Small carcasses are not only inefficient in terms of costs per kilogram of processing but they are unable to provide a variety of marketable cuts, e.g. leg steaks, because of their size. Overfat carcasses are costly to process further so are not required.

The production of heavy, lean lambs therefore would appear to benefit farmers, exporters and the New

Zealand economy. However, the Meat Exporters' Schedule system for buying lambs can be and has been criticized for a number of years because of its inability to provide financial incentive to producers to increase their average lamb weights (Herlihy, 1970; Kirton, 1979; Cullwick, 1980). Although a number of alterations in both the calculation of costs and the carcass grades has occurred (NZMPB, 1979) the basic 'saw-tooth' structure of the system remains.

This paper aims to discuss the effect of the present system on producer returns from both individual animals and from drafts of animals of different carcass weights. The measurement of the extent to which the 'saw-tooth' structure affects producer returns and, therefore, provides disincentive to increase carcass weights can then be used as a basis on which to judge the system.

Alternative schedule systems should be aimed at removing some of the anomalies of the present system without introducing any greater amount of complexity into it. They should also aim to provide an effective guideline of market desires in the long term and hence enable producers to plan accordingly; for example, by selecting for heavier, leaner types of sheep.

Although alternative systems might reduce distortions in per head prices of lambs and aim to give a more concise indication of market demand, there are other aspects of the lamb production system that

will still limit the increase of carcass weights. Along with technical barriers to certain producers, there is the risk and uncertainty inherent in the system that is a result of the variation present in both drafting and grading techniques.

It is hoped that this paper will help create a better understanding of the present system by producers and others in the industry and will promote some further discussion on alternatives that might be better employed in the system.



## 2. THE SCHEDULE SYSTEM

The schedule system as presented to the producers each week is intended to be indicative of market trends as foreseen by the exporters and also, through its elaborate grading system, should allow financial incentive to producers to supply the type of carcass the market requires.

This discussion paper intends to examine exactly how a producer of lamb carcasses is affected by the present system, to suggest optimum strategies for such a producer in the face of risk and uncertainty and to propose alternative systems by which schedule prices might be obtained.

The part that both the export companies and the New Zealand Meat Producers' Board play in determining returns to the farmer is important and must be appreciated before alternative systems are suggested or the present system criticized.

### 2.1 The Export Companies

The New Zealand Freezing Companies Association (Inc.)'s submission to the Meat Industry Meeting on the 8th March 1979 at the Legislative Chamber outlined the following aspects of the livestock buying schedule system that is currently in operation.

"Although there are alternative methods of selling livestock for export, the schedule system is

that one most often preferred as:

1. Payment is immediate.
2. Price per kilogram of dressed weight is known before stock leave the farm.
3. All types of lamb, from unfinished to overfats, are catered for in the schedule pricing system.

Operation of the system involves meetings at weekly intervals throughout the year by the major exporting companies to review the schedule prices to be offered to the producer. The procedure by which this is achieved entails independent calculation of schedule values by each exporter, these values are then compared and an operating schedule based on the majority view is proposed for the coming week's schedule. The calculation of schedule values involves:

1. Forecasting future market prices by taking into account yields and expected volume of saleable product as well as possible demand.
2. Estimating the costs incurred in the period between slaughter and sale. Both costs and sale price are assessed on an average carcass weight for each grade. The costs are both:

- (a) Statutory Meat Board Levy -
  - Centralization Levy
  - Insurance
  - Meat Inspection fees (if applicable)
  - Freight Charges
- and (b) Specific -
  - Killing and Processing Charges
  - Buying and Administration Costs
  - Marketing and Advertising Costs
  - Interest
  - Freight Charges (inland)

The market demand for a particular grade or type of carcass is reflected directly through the price structure thereby providing financial incentive to the producer to produce the most desirable type of lamb.

While it is quite permissible for individual companies to increase their buying schedules to compete for or to attempt to obtain additional quantities of stock, any reduction in the operating schedule cannot be obtained without a general concensus from the other major exporters.

The lamb skin schedule which values wool and pelt separately is calculated in a similar manner using the expected future realizations and allowing for costs incurred.

Once the operating schedule has been agreed upon it is submitted to the New Zealand Meat Producers' Board as a general indication of the current schedule."

There are a number of factors that tend to complicate the setting of schedule prices. Firstly, not all exporters are selling on the same markets, their demands will therefore differ as will the prices they forecast for a particular grade of lamb. Their joint estimate of the price each grade will fetch on overseas markets is complicated by the fact that the majority of sales of lamb to the United Kingdom are on a consignment basis while sales to other markets are on an f.o.b. or c.i.f. basis (Frazer, 1981).

Secondly, those exporters wishing to further process the carcasses might desire a price structure that gives far more incentive to heavier lambs as it is uneconomic to cut light carcasses.

Lastly, there is the complicated relationship between supply and demand in a changing market. Heavyweight lambs, which make up approximately 7 percent of the total kill, are desired by further processors who are establishing a market for various cuts of meat overseas. As the development costs of a new market are high they cannot offer premium prices for such lambs. Instead, they must attempt to establish demand with the small supply of lambs available. To avoid an oversupply of heavyweight carcasses prices can only be increased for farmers as demand is established.

## 2.2 The Meat Producers' Board

Although the Meat Producers' Board is not able to control the setting of schedule prices, it can, through monitoring the system, endeavour to persuade companies to alter the schedule and, in the event of no response, advise producers of the position and note alternatives open to them. Monitoring the system involves setting the quality grades to which the schedule price relates and ensuring that grade specifications are maintained at a similar level in every export slaughterhouse in New Zealand (Frazer, 1981). There are two main avenues by which the Producers' Board can indirectly affect producer returns.

### (a) Control and supervision of the grading of carcasses

In September 1979 (NZMPB, 1979), for example, discussion with the exporters on the mechanics of lamb schedule calculations resulted in an agreement by the companies to use a formula that more accurately determines the schedule value of each grade. Up until this time the per head buying, processing and administration costs were converted to per kilogram costs by using the average weight of all lambs thereby overvaluing the lighter lambs and undervaluing the heavier lambs. More accurate calculation of farm costs for each grade and weight range was

achieved by using the average weight for each particular grade when converting per head costs (Table 2).

The Meat Producers' Board hoped that this method of calculation would go some way towards reducing distortions in per head values at certain weights and thereby remove the disincentive to produce heavier lambs, increase the quantity of lamb available for export and reduce the per kilogram charge for processing. The disadvantage, however, of heavier lambs is that they are more likely to exceed the permissible fat cover, (GR measurement), imposed by the NZMPB. In the past the Board has progressively decreased the GR measurement to ensure the export of lean carcasses. In 1979 however it was decided that while farmers should be encouraged to produce lean, well-muscled, heavier lambs it would be unfortunate if those lambs with a slightly deeper fat cover were discounted as overfats. Three new grades were therefore introduced involving two within the 16.5-19.6 kg range, the leaner carcass receiving a premium price, and one for the 20.0-25.5 kg carcasses. These three grades replaced the previous heavy-weight grades of prime (PH) and the secondary (YH) carcasses in the weight range of 16.5-25.5 kg (Table 3). By this method, it was hoped that farmers would be given the incentive to adapt their management practices to produce heavy-weight lean lambs.

Table 2  
Determination of Schedule Prices

Grade	Market Value	Incurred Costs Ex Farm to FOB	Average Weight per Grade	New System Schedule Price	Old System Schedule Price when Av.Wt = 13.0 kg and Av. Cost/hd =\$6.35 NZc/ kg
	NZc/kg FOB	\$/head	kg	NZc/kg	
PL	135.8	6.24	11.8	82.9	86.8
PM	133.8	6.48	14.3	88.5	84.9
PH	118.2	6.76	17.6	79.8	69.6
YL	133.8	6.17	11.2	78.7	84.9
YM	131.9	6.43	13.8	85.3	83.0
YH	116.2	6.70	17.0	76.8	67.7

Source: Compiled from NZMPB (1979).

Table 3  
Export Lamb Grades

Grade Symbol	Weight Range kg	GR Criteria mm
PL	8.0 - 12.5	<15
YL	8.0 - 12.5	<15
PM	13.0 - 16.0	<15
YM	13.0 - 16.0	<15
PX	16.5 - 19.5	<15
PH	16.5 - 19.5	15-17
PHH	20.0 - 25.5	<17

Source: NZMPB (1979).

(b) Price smoothing scheme for export meat

In 1976 the Meat Producers' Board brought a scheme into operation aimed at providing producers with protection against price fluctuations. As outlined by the Board in NZMPB (1979b) the scheme consists of:

- (i) A Meat Export Prices Committee that fixes minimum and trigger prices to the producer for representative "benchmark" grades of export meat.
- (ii) Supplementary payments to producers from the buffer account, or intervention in the

market itself by the Board to ensure that producers receive at least the minimum price if the meat exporters schedule prices are lower than the minimum.

- (iii) Deductions from producers' returns for payment into the buffer account whenever the schedule exceeds the trigger price for a benchmark grade.

Because the PM grade (13-16 kg) forms the biggest proportion of lamb exported it is used as the benchmark grade. The minimum price is set by:

- (a) Calculating a three-year average market price from:
  - (i) The actual average for the previous season.
  - (ii) The estimated average for the current season.
  - (iii) The forecast average for the coming season for which the minimum price is to apply.
- (b) Considering:
  - (i) Market trends and prospects for meat and farm products.
  - (ii) The state of the buffer accounts.
  - (iii) The desirability of expanding the production of meat in New Zealand.

- (c) Setting the price within a band 10 percent above or below the three-year average market price.

If the schedule price falls below the minimum price for the "benchmark grade" then the Meat Producers' Board is responsible for setting minimum prices for the non-benchmark grades. The price relationships between benchmark and non-benchmark grades reflect market preference, trends and prospects.

Setting of the trigger prices at the start of the season involves consideration of:

- (a) Market trends and prospects for meat and other farm products.
- (b) The state of the buffer accounts.
- (c) The desirability of keeping a sufficient margin above the minimum prices to allow normal commercial marketing to proceed.

The buffer or meat income stabilization account held at the Reserve Bank is used therefore to support prices when the schedule falls below the minimum price and is replenished by deductions from producers' returns when the schedule rises above the trigger price.

### 3. THE EFFECT OF THE SCHEDULE SYSTEM ON PRODUCERS

To enable an economic assessment of the system it was decided to impose various prices on both individual lambs and drafts of lambs.

The schedule prices used are a range selected from the 1980/81 season as indicative of the variation that can be expected within a season (Table 5). The prices of November 25-29th, excluding pelt prices, persisted through December, January and February.

#### 3.1 The 'Saw-Tooth' Effect

##### 3.1.1 Per head price

The relativity between prices per kilogram for the respective grades has a large influence on the extent to which distortions in per head prices occur. The 'saw-tooth' effect, as it is commonly called, is the result of pricing increasing weight ranges at a decreasing amount (Fig. 1). Such distortions in per head prices are less apparent now than when noted by Herlihy (1970) and recent alterations in the calculation of schedule prices by the export companies have enabled them to be decreased further. However, the 'saw-tooth' effect is still an

Table 4

Schedule Prices (c/kg) During the 1980/81 Season

Week	Grades							Woolly Skin (kg)		
	PL	PM	PH	PHH	YL	YM	PX	0.5	0.8	1.0
Nov. 10-15th	118	114	96	95	113	113	101	72	126	162
Nov. 17-22nd	110	113	88	87	108	109	93	37	91	117
Nov. 24-29th	108	113	94	90	106	111	100	22	70	102
Mar. 2-7th	107	114	101	95	107	112	112	22	64	92

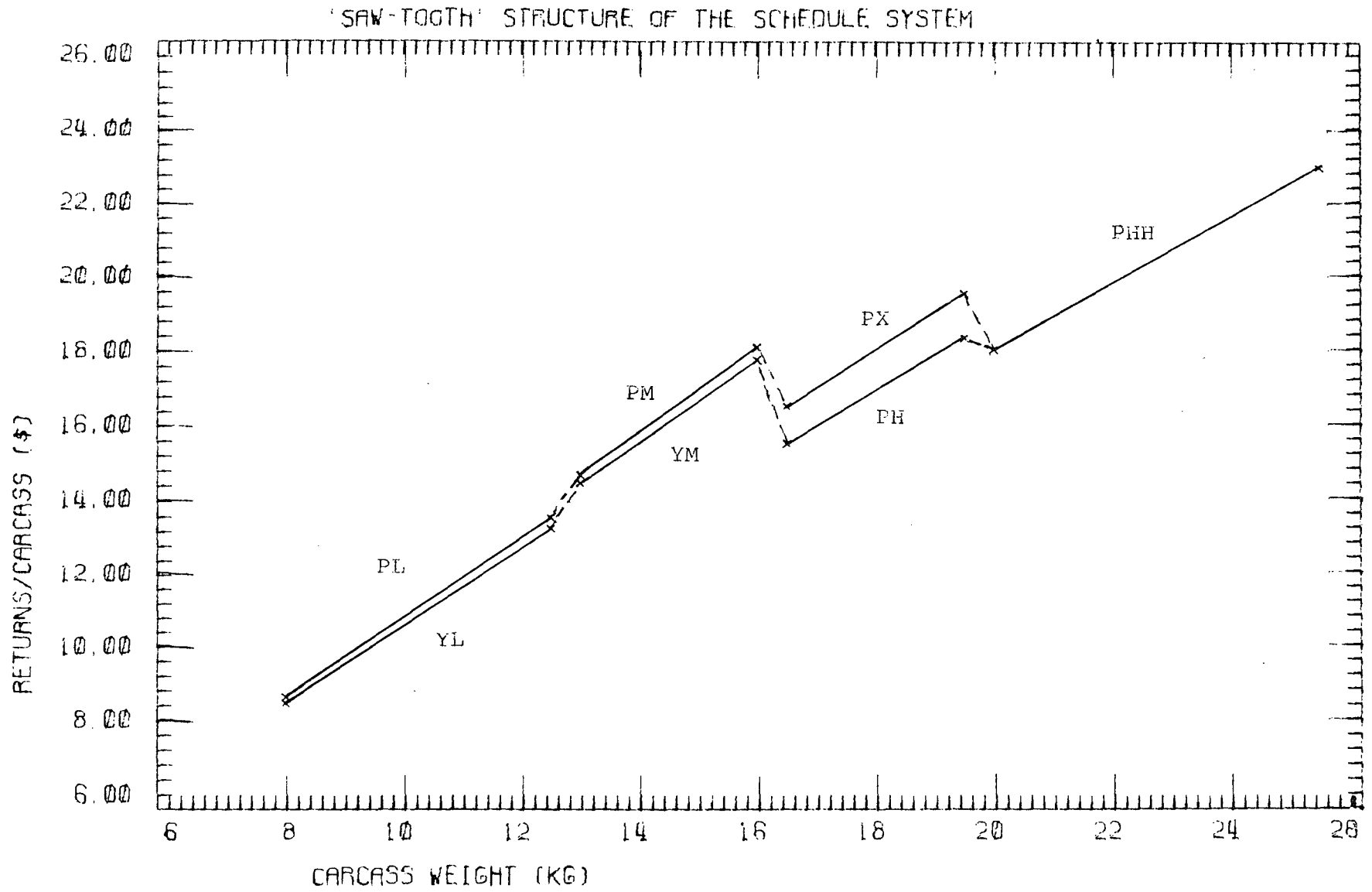


Figure 1 : Schedule prices of November 24th-29th.

important aspect of the schedule system and its magnitude is a direct result of price relativity between grades.

A closer understanding of the structure of the schedule price system, as illustrated in Figure 1, plus an interpretation of the 'saw-tooth' effect on lamb carcass prices (Table 5) enable an assessment of its influence on producers' management decisions.

Table 5  
Comparison of Heavy Lamb Prices  
(Nov. 24th-29th, 1980)

Grades	PM	PX	PH	PHH
Price (¢/kg) on Nov. 24th	113	100	94	90
	16.0	18.08	19.23	
	14.6	16.5		
Carcass Wts (kg) of respective grades at which their price per carcass is equal.	13.7		16.5	
		19.5		21.67
		18.0		20.0
			19.5	20.37
			19.15	20.0

For most of the 1980/81 season producers would have improved their returns by increasing individual lamb weights to 1.6 kg. To profit from heavier weights however producers had to risk the chance of receiving the price of YM and PM lambs 2-3 kg lighter. For example a PX lamb was not worth as much as a 16 kg PM until it reached 18.08 kg in weight. Similarly a PH lamb had to weigh 19.23 kg before it equalled the 16 kg PM price. A 16.5 kg PH lamb had the same value as a 13.7 kg PM. To avoid heavier lamb carcasses being undervalued it was imperative that they were at least 18 kg and lean. The incentive to increase lamb weights was decreased, not only by the risk of producing lambs in the 16.5 to 18 or 19 kg weight range but also by the risk of producing lambs over 19.5 kg. The second 'saw-tooth' region illustrates that PHH lambs did not equal 19.5 kg PX lambs until they weighed 21.67 kg and equalled 19.5 kg PH lambs at 20.37 kg. A 20.0 kg PHH lamb had the same value as an 18.0 kg PX or a 19.15 kg PH.

Producers were therefore discouraged from increasing lamb weights by per head price distortions at heavier weights. Feed required for extra kilograms of weight could have been put to more profitable use if such lambs had been drafted off as PMs. On a per lamb basis, even if the producer had the type of lamb

and management skills to achieve lean heavy-weight lambs he could only sell a narrow weight range of lambs to ensure increased returns.

The distortions in per head values are directly affected by the price per kilogram relativity between grades. An extreme example of this was seen in the schedule prices of the week from November 17th, 1980. An analysis of the 'saw-tooth' effect of November 17th on relative lamb carcass prices (Table 6) reveals large distortions in the heavy-weight lamb prices as illustrated in Figure 2. In that week a producer would not have profited from heavy-weight lambs unless they were over 21 kg carcass weight as the PH, PX (except for the 19.5 kg carcass) and the PHH lambs under 21 kg were all worth less per head than PMs.

Table 6

Comparison of Heavy Lamb Prices(Nov. 17th-22nd, 1980)

Grades	PM	PX	PH	PHH
Price (¢/kg) on Nov. 17th	113	93	88	87
Carcass Wts (kg) of respective grades at which their price per carcass is equal.	16	19.44 19.5	20.55 19.5	20.77 20.85 19.72

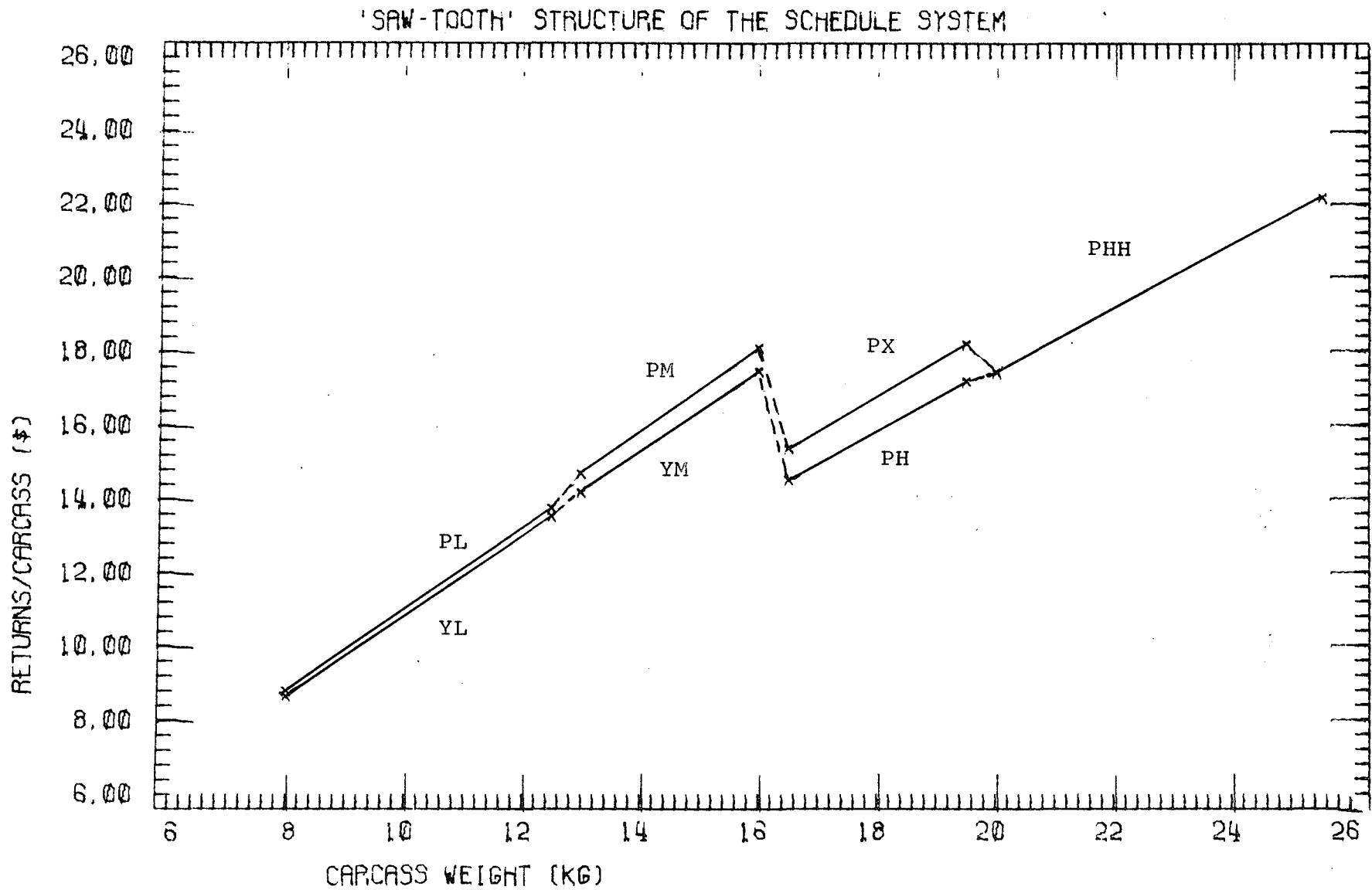


Figure 2 : Schedule prices of November 17th-22nd.

### 3.1.2 Average price/head per draft

As it is rather unrealistic to consider only individual lamb prices, the 'saw-tooth' effect on producer returns might better be illustrated by comparing the average price/head of various drafts of lambs as they increase in weight. The five drafts given in Table 7 can be used to represent the spread of grades attained as average draft weight increases, and for the sake of simplicity exclude any lambs that do not fall into export grades. As the average weight per draft increases the proportion of lambs in the heavier weight grades increases. The majority of lambs in each draft are graded as prime thereby assuming that they are drafted as finished stock and not as a result of feed shortages. It is also assumed that the lambs are of a breed able to achieve heavier weights without becoming overfat.

Using the five representative drafts it is possible to assess the marginal returns of increases in average carcass weight using specified schedule prices (Table 8).

Although there is an increase in average price/head as carcass weight increases, the marginal return of each kilogram weight increase is lowest when the

Table 7

Five Lamb Drafts Excluding Non-export Grades

Grades	No. of Lambs	Av. Wt (kg)	No. of Lambs	Av. Wt (kg)	No. of Lambs	Av Wt (kg)	No. of Lambs	Av. Wt (kg)	No. of Lambs	Av. Wt (kg)
PL	87	11.6	37	11.7	14	11.8	5	11.9		
PM	53	14.1	124	14.2	82	14.3	78	14.4	59	14.5
PH					15	17.2	22	17.6	33	18.0
PHH							13	20.0	25	21.0
YL	26	11.0	13	11.10	11	11.2				
YM	34	13.6	23	13.70	45	13.8	44	13.9	39	14.0
PX			3	16.6	33	17.0	38	17.4	44	17.8
Total No.	200		200		200		200		200	
Av. Wt (kg)	12.5		13.5		14.5		15.5		16.5	
Av. Wool Wt (kg)	0.5		0.8		0.8		1.0		1.2	

Table 8  
Calculation of Producer Returns

Draft	Av. Wt/ Draft  kg	Schedule Prices of					
		Nov. 17th-22nd, 1980			Nov. 24th-29th, 1980		
		Total Returns \$	Av. Price /Carcass \$	Marginal Returns \$/carcass	Total Returns \$	Av. Price /Carcass \$	Marginal Returns \$/carcass
1	12.5	2 767.47	13.84	1.22	2 750.81	13.75	1.3
2	13.5	3 011.51	15.06	0.27	3 009.76	15.05	0.58
3	14.5	3 065.47	15.33	0.59	3 126.87	15.63	0.73
4	15.5	3 183.16	15.92	0.43	3 271.52	16.36	0.59
5	16.5	3 269.70	16.35		3 389.8	16.95	

average draft weight increases from approximately 13.5 kg to 14.5 kg. That is to say that although the average price per head increases as weight increases, the producer receives less for that extra kilogram gain than for the other weight gains described.

The greatest return from increasing carcass weight occurs when the average draft weight increases from 12.5 kg to 13.5 kg and this is in agreement with the structure of the schedule system. It is only when lambs fall into the PX and PH grades that distortions occur in prices/head and it would appear that this is reflected in the average price/head of a draft well before the average draft weight reaches 16 kg. According to economic theory, profit is maximized when marginal returns equal marginal cost. The marginal cost of increasing lamb weights is farm specific as it relates to feed availability. However, if it involves the introduction of fodder crops or supplements, it might be difficult to equate them to the 58 or 27¢/head return achieved by Draft 3.

The price relationships between grades can magnify the extent to which individual price/head distortions affect the marginal returns from increasing carcass weight. On November 17th, 1980, for example, the relatively low prices of the non-benchmark PH, PX and PHH grades produced a situation in which it was,

quite possibly, uneconomic to increase average weights above 13.5 kg. By November 24th, 1980, the prices for the heavy-weight grades had improved but the returns/head from an extra kilogram in weight above 13.5 kg were still low. Although the changes made by the Meat Producers Board were distinctly aimed at reducing the previous disincentive to produce lambs above the PM grade weight by improving returns to farmers for lean, well-muscled, heavier lambs, such disincentives have not been altogether removed. While the 'saw-tooth' structure of the pricing system exists and while price fluctuations of non-benchmark grades persist, the risk to the producer of having lambs undervalued will continue to be a major reason for not increasing lamb weights.

### 3.2 Price Relativity Between Grades

When the schedule price falls below the minimum for the benchmark grade the Meat Producers' Board operate their price smoothing scheme to ensure the minimum price for the benchmark grade and offer prices for the other grades that reflect potential market demand. At all other times the exporters are responsible for the price relationships between benchmark and non-benchmark grades.

The effect such price relativities have on producer returns has been discussed in view of the per head and per draft returns. The magnitude of the 'saw-tooth' effect will determine the weights at which it is most profitable to sell. However, when a producer makes the decision to sell his lambs he has to take into account not only the current returns but also future returns for heavier lambs. He can only base his decision on current price relativities which, due to the price fluctuations that can occur, are not an accurate guide. In the face of such uncertainty he might sell his lambs at lighter weights regardless of their possible increased value at heavier weights. It is proposed therefore that as long as wide fluctuations in price relativities between grades occur, any attempt to stabilize the system and encourage production of more desirable carcasses for the market, will be of little effect.

It must be remembered that schedule prices are a result of the estimated future market, incurred costs and expected supply of lambs. It is not, therefore, the world situation alone that dictates the price offered to the producer. An example of the effect of both incurred costs and expected supply on producer prices was seen in November 1980. As it is often the policy of the freezing companies to offer premiums for light-weight lambs early in the season

to encourage supply, PL and YL lambs up until November 17th were favourably priced for producers. On November 17th substantial increases in killing and freezing charges were announced and all prices were reduced. As the companies now convert such charges to per kilogram costs by using the average weight for each grade, any increase in costs would affect the price relativities between grades by decreasing light-weight lamb prices more than heavier lambs. The prices announced for November 17th-22nd reflected a change in relativity between grades with a notable reduction in the prices of both light-weight and heavy-weight grades. The medium weight grades were least affected by price fluctuations with the benchmark (PM) price falling by only 1 ¢/kg. If it had fallen below the 133 ¢/kg, the minimum price set by the Meat Producers' Board, the price smoothing scheme would have had to be put into operation and the Board might have seen fit to intervene in the market. Since, in some areas of the country, a substantial proportion of lambs drafted in November fall into the light-weight grades (Table 9), it is reasonable to suppose that the increase in the supply of light lambs prompted a transfer of the premium from the light to the medium-weight lambs. The disproportionate change in heavy-weight grade prices cannot be clearly explained.

Table 9

The November Lamb Slaughter at Canterbury Frozen Meat Co. (CFM)  
and Kaiti Refrigeration Co. (Gisborne)

Grades	Slaughter Seasons % lamb slaughtered in each carcass grade					
	1977/78		1978/79		1979/80	
	CFM	Kaiti	CFM	Kaiti	CFM	Kaiti
PL	24.8	17.28	24.6	34.0	23.2	13.7
PM	47.7	29.0	47.7	29.3	52.9	25.6
					2.5	0.2
PH)PX )PH	5.3	2.6	5.2	1.9	2.4	0.03
YH)PHH	10.0	0.06	10.3		0.1	0.03
YL	2.6	29.5	2.6	24.8	9.8	35.4
YM	-	9.1	-	2.5	3.2	10.9

Notes: CFM = Canterbury Frozen Meat Co.      Kaiti = Kaiti Refrigeration Co. (Gisborne).

Similarly, price changes on March 2nd, 1981, might be explained as being an example of the effect of both the forecast market value and expected supply on schedule prices. A drought in some areas of the country together with schedule prices that gave no incentive to produce heavier lambs in January and February might have resulted in a poor supply of such lambs to the works. To ensure the fulfilment of present and possible future contracts for heavy carcasses, premium prices were imposed on the heavy-weight grades.

Variations in both supply and demand patterns through the 1980/81 season resulted in wide fluctuations in price relativities between grades. How producer returns were affected by such variations is outlined in Table 10 in which the returns/draft for light, medium and heavy-weight drafts (average weights of 12.5, 13.5 and 15.5 kg respectively) were calculated from the schedule prices of November 10th-15th, 17th-22nd, 24th-29th and March 2nd-7th. By considering the average price/carcass alone, then price change can be analysed independently from sheepskin price fluctuations. Light-weight draft returns decreased as the season progressed following the sharp 60¢ drop on November 17th. The medium weight draft was least affected by price changes through the season as it contains proportionately more benchmark grade lambs.

Table 10

Returns/draft to the Producer

Dates in 1980/81 Slaughter Season	Av. Price \$/Carcass			Av. Price \$/Lamb (including sheepskin payment)		
	Light Weight	Medium Weight	Heavy Weight	Light Weight	Medium Weight	Heavy Weight
Nov. 10th-15th	14.44	15.44	16.64	14.8	16.5	17.74
Nov. 17th-22nd	13.84	15.06	15.92	14.02	15.79	17.09
Nov. 24th-29th	13.75	15.05	16.36	13.86	15.61	17.38
Mar. 2nd-7th	13.78	15.17	17.04	13.89	15.58	17.96

The heavy-weight lambs, however, fluctuated greatly in price, a 72¢ drop in average price on November 17th was followed by an increase of 44¢ and finally an increase of 68¢ on March 2nd.

For the producer selling his lighter lambs early in the season, his heavier ones at the end of the season and his medium-weight lambs throughout the season it would have been a profitable year. It could have been as likely that such a producer might have sold his light lambs a week or so too late and decided not to increase weights above a medium grade because of the 'saw-tooth' effect on prices for heavy-weight grades. The difference between returns from the two strategies could be calculated simply as outlined below:

<u>Strategy 1</u>	<u>Strategy 2</u>
100 lambs @ \$14.44 = 1 444.0	200 lambs @ \$13.75 = 2 750.0
200 lambs @ \$15.05 = 3 010.0	200 lambs @ \$15.05 = 3 010.0
100 lambs @ \$17.04 = 1 704.0	
Total returns (\$)	
6 158.0	5 760.0
Av.Price \$/carcass	
15.40	14.40

If analysed in terms of returns from the ewe and hectare (Table 11), still disregarding sheepskin payments, the drop in average price would result in a gross margin decrease of \$1.20/ewe or, assuming 15 ewes/ha, \$18.00/ha.

Table 11

Gross Margin Analysis


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Assumptions: 2 yr ewe flock lambing at 120 percent  
with 4 percent ewe death rate.

<u>Income</u>	<u>Strategy 1</u>	<u>Strategy 2</u>
Wool (4.5 kg @ \$2.4) x .96	10.36	10.36
Lamb Sales 1.2 lambs	18.48	17.28
Cull ewes (.92 x \$11) x .5	5.06	5.06
	<hr/>	<hr/>
	33.90	32.70
 <u>Costs</u>		
Health, shearing, freight and rams	3.03	3.03
Replacements (0.54 @ \$16)	8.64	8.64
	<hr/>	<hr/>
GROSS MARGIN/EWE	22.23	21.03
GROSS MARGIN/HA (assuming 15 ewes/ha)	333.45	315.45

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In conclusion, the fluctuations in price relationships between grades, although generally a result of market conditions, provide the basis of great variation to producer incomes and must therefore affect his confidence in the system. Short term fluctuations in price overrule any long term objective of increasing lamb carcass weights.



#### 4. ALTERNATIVE SCHEDULE SYSTEMS

Although there are advantages to the producer in the present schedule system, as outlined in Section 2, its saw-tooth structure does create distortions in per head values that are a disincentive to potential producers of heavy-weight lambs. The Meat Producers' Board's price smoothing scheme does not control the variation in relativity between prices of benchmark and non-benchmark grades thereby reducing the security of such a scheme.

##### 4.1 Curvilinear Pricing Schedule

It is proposed that, to prevent disparities in per head values and to remove disincentives to increase lamb weights, a curvilinear pricing system should replace the current saw-tooth structure of pricing. The choice of an equation for a curve should reflect forecast market conditions as well as expected supply and incurred costs, thereby providing financial incentive to producers to supply the more desirable carcass type. In Figure 3, four versions of one function create a range of curves that describe differing market conditions. The plateau shape of curve A would provide little incentive to produce lambs greater than 13 kg while the continuous line of curve D would encourage an overall weight increase.

# ARCTAN CURVES FOR PRICING LAMB CARCASSES

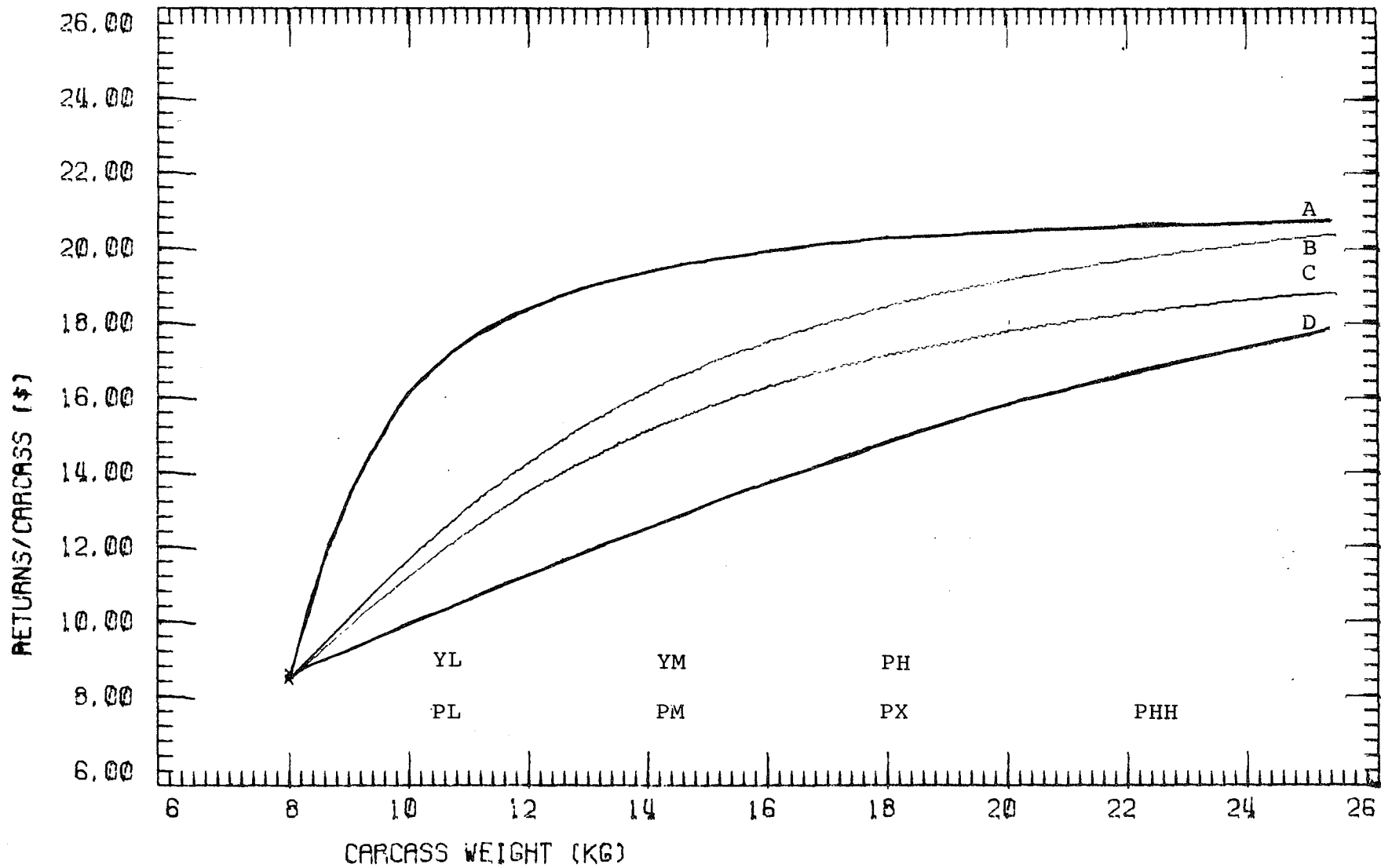


Figure 3 : Four different curves.

A  $P = 3.5 + (26/\pi) \times \text{Arctan} (\pi \times 0.3 \times (CW-8))$   
 B  $P = 8.5 + (30/\pi) \times \text{Arctan} (\pi \times 0.05 \times (CW-8))$   
 C  $P = 8.5 + (26/\pi) \times \text{Arctan} (\pi \times 0.05 \times (CW-8))$   
 D  $P = 8.5 + (30/\pi) \times \text{Arctan} (\pi \times 0.01 \times (CW-8))$

Where P = Price, and CW = Carcass Weight

It was illustrated in Table 8 how the present system did not encourage farmers to increase average draft weights above 13.5 kg because of low marginal rates of return. The aim therefore of the curvilinear system is to initiate a more gradual decrease in marginal returns per extra kilogram of average draft weight.

The curvilinear scheme could, for example, divide lambs into prime, lean carcasses (equivalent to PL, PM, PX and PHH grades) and non-prime carcasses (YL, YM and PH grades) and use one curve for each type. By this method a premium could be paid for prime lean lambs. The number of lambs within each type and their average weight and price could clearly indicate the type of lamb a producer is supplying to the market. The producer could also easily estimate potential returns per carcass weight from a graphic representation of each curve.

The current market structure would still require the division of lambs into specific grades. Therefore, while varying equations with respect to quality could be used to price a carcass, it would be allocated a specific grade with respect also to its weight. A small computer connected to weighing scales and possibly a GR measurement probe would easily calculate the price and allocate a grade to each carcass.

Two curvilinear schedules are presented here for illustrative purposes as alternatives to the Nov. 24th-29th 1980 schedule prices. They give some indication of the approaches that could be adopted with respect to differing market demand:

1. Curve I - the shape of this curve suggests a market in which premiums will be paid for light-medium weight lambs (Figure 4). The returns to the producer from the five example drafts are therefore high for the 12.5 kg draft and increase at a marginally decreasing rate as weights increase (Table 12). The marginal rates of return as carcass weights increase is shown in Figure 5 as a gradually declining line. This curve might be proposed as an alternative to the present schedule system with the current market situation.
2. Curve II - if the world demand was to create a situation in which the average carcass weight was encouraged to increase significantly then a schedule represented by Curve II might possibly be adopted (Figure 6). The marginal returns to the producer of increasing carcass weights above 12.5 kg are great (Table 13) and throughout the increases in average carcass weight the rate of return is greater than that recorded by either Curve I or the current schedule system (Figure 5).

# CURVILINEAR STRUCTURES FOR PRICING LAMB CARCASSES

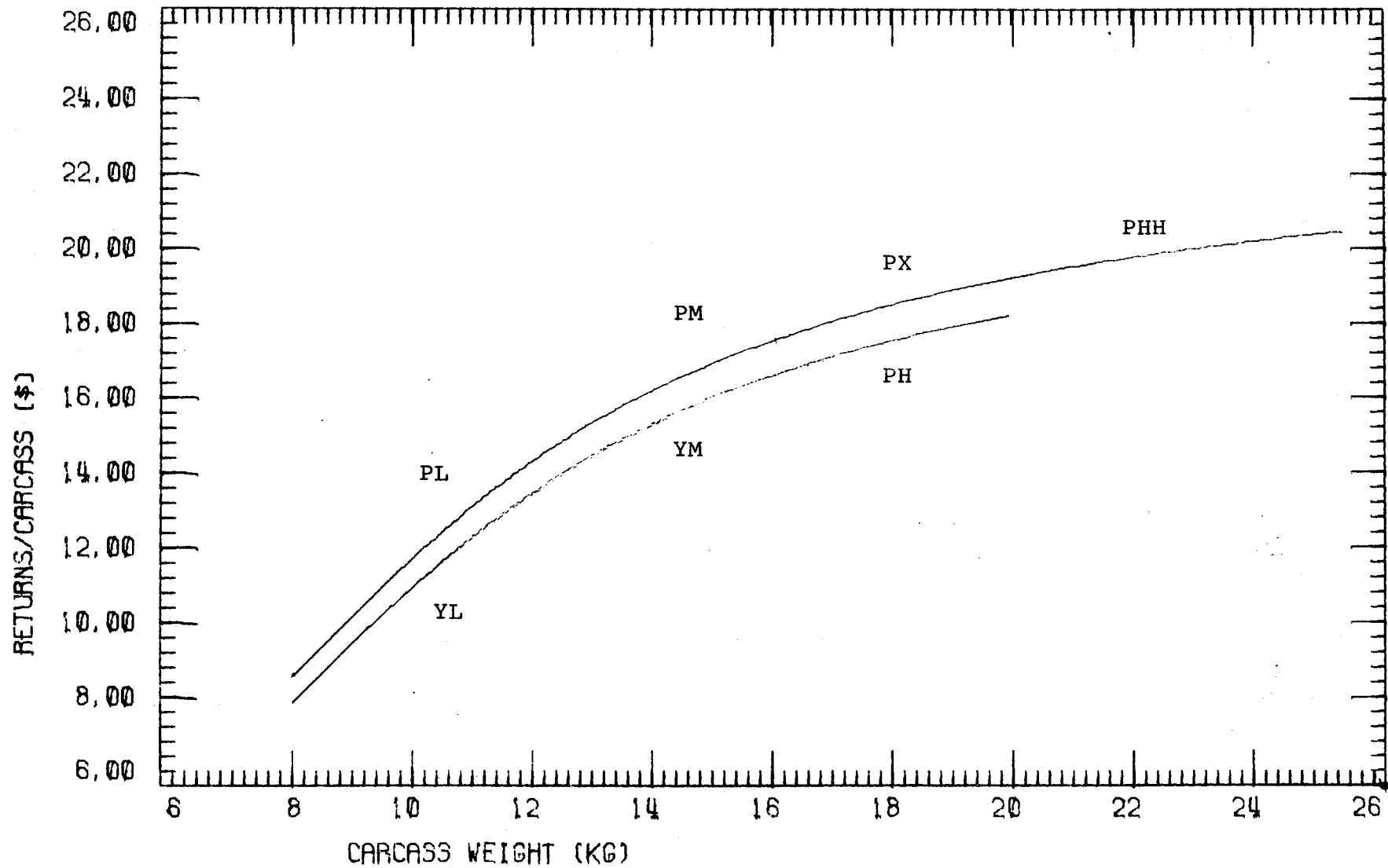


Figure 4 : Curve I pricing prime (A) and non-prime (B) lambs.

Equation A  $P = 8.5 + (30/\pi) \times \text{ARCTAN} (\pi \times 0.055 \times (cw - 8))$

Equation B  $P = 7.9 + (29/\pi) \times \text{ARCTAN} (\pi \times 0.055 \times (cw - 8))$

Where P = Price and CW = Carcass Weight

Table 12

Returns/Draft for the Five Example Drafts

	Drafts									
	1		2		3		4		5	
	P	NP	P	NP	P	NP	P	NP	P	NP
Av. Wt (kg)/ carcass type	12.55	12.47	13.68	12.76	14.72	14.12	15.70	15.13	16.9	15.83
No. carcasses/ carcass type	140	60	164	36	129	71	134	66	128	72
Av. Price (\$)/ carcass type	14.73	13.68	15.63	14.14	16.44	15.27	17.00	15.96	17.70	16.39
Total Returns	2893.8		3072.36		3204.93		3331.36		3445.68	
Av. Returns (\$)/ carcass	14.47		15.36		16.02		16.66		17.23	
Marginal Returns (\$)/kg av. carcass wt			0.89		0.66		0.64		0.57	

Note: Each draft is divided into prime (P) and non-prime (NP) carcasses and priced by arctan functions:

$$P = 8.5 + (30/\pi) * \text{ATAN} (\pi * 0.055 * (CW - 8)) \text{ for prime carcasses}$$

$$P = 7.9 + (29/\pi) * \text{ATAN} (\pi * 0.055 * (CW - 8)) \text{ for non-prime carcasses}$$

where P = returns/carcass (\$) and CW = carcass weight (kg).

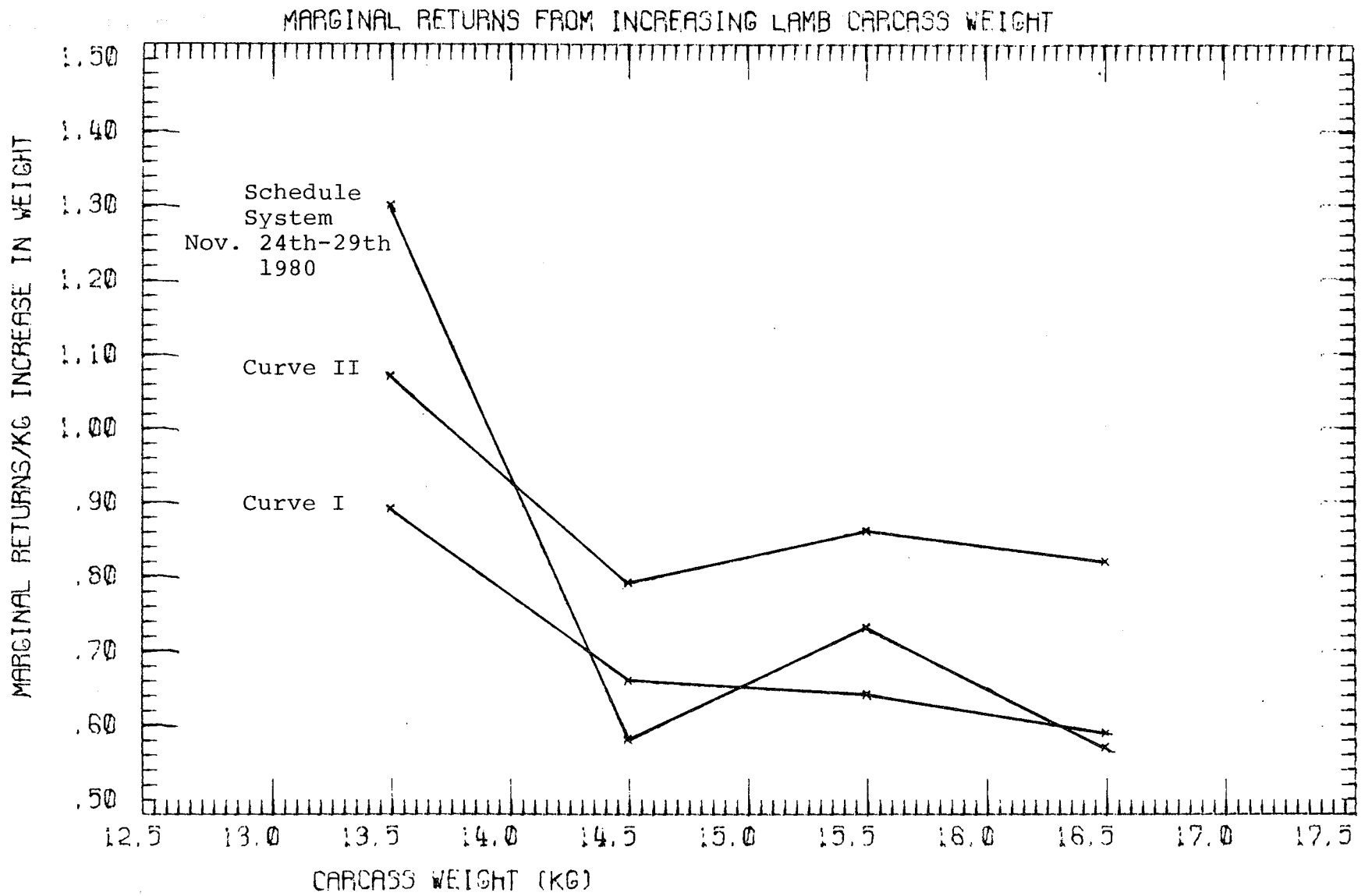


Figure 5 : Marginal returns from increasing average draft weights.

CURVILINEAR STRUCTURES FOR PRICING LAMB CARCASSES

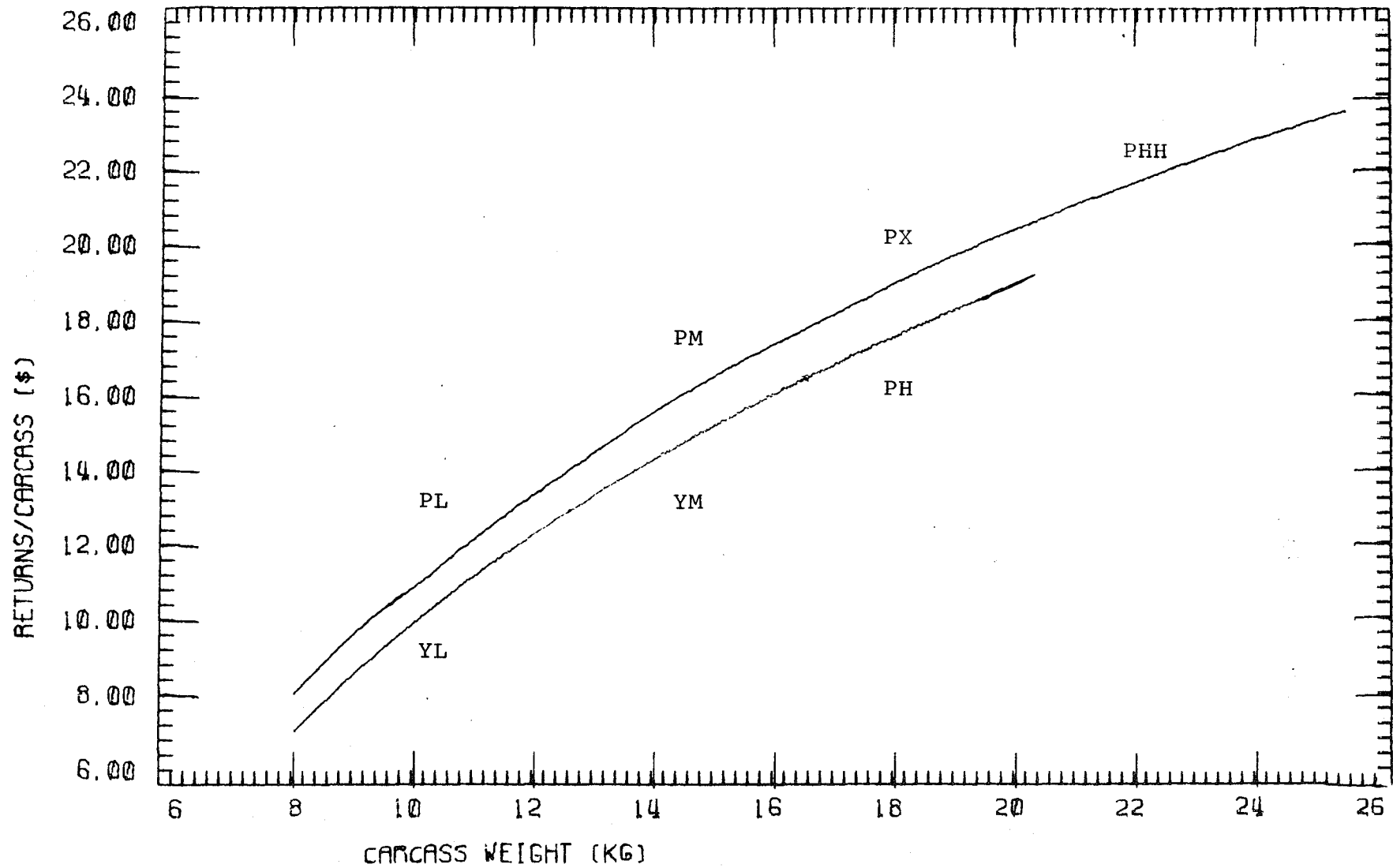


Figure 6 : Curve II pricing prime (A) and non-prime (B) lambs.

Equation A  $P = (13.5 \times \text{Ln CW}) - 20$

Equation B  $P = (13.0 \times \text{Ln CW}) - 20$

Where P = Price and CW = Carcass Weight.

Table 13

Returns/Draft for the Five Example Drafts

	Drafts									
	1		2		3		4		5	
	P	NP	P	NP	P	NP	P	NP	P	NP
Av. Wt (kg)/ carcass type	12.55	12.47	13.68	12.76	14.72	14.12	15.70	15.13	16.9	15.83
No. carcasses/ carcass type	140	60	164	36	129	71	134	66	128	72
Av. Price (\$)/ carcass type	14.08	12.74	15.12	13.04	16.18	14.37	16.99	15.2	18.03	15.77
Total Returns	2735.6		2949.12		3107.49		3279.86		3443.28	
Av. Price/ carcass	13.68		14.75		15.54		16.4		17.22	
Marginal Returns/ kg av. carcass wt			1.07		0.79		0.86		0.82	

Note: Each draft is divided into prime (P) and non-prime (NP) carcasses and priced by natural logarithm functions:

$$P = 13.5 * \text{LN}(CW) - 20 \text{ for prime carcasses}$$

$$P = 13.0 * \text{LN}(CW) - 20 \text{ for non-prime carcasses}$$

where P = returns/carcass (\$) and CW = carcass weight (kg).

The marginal return from increasing average weight from 13.5 kg to 14.5 kg is 72¢. This would encourage farmers to increase lamb weights possibly with the adoption of high cost intensive systems of producing lamb but only until the marginal cost of such increases equals the marginal return.

For this example carcasses were divided into two types. It could well be that exporters prefer to group the carcass types differently, for example, into prime with a less than 15 mm GR fat measurement (equivalent to PL, PM and PX), non-prime (YL and YM) and heavy lambs with greater than 15 mm and less than 17 mm GR measurement (PH and PHH) which possibly is a more exact division of types. However, it should be stressed that if division occurs as weights increase, the present 'saw-tooth' structure is more likely to return. A more radical approach to the pricing system must be used if the curvilinear structure is to be adopted and simplicity of design is probably the key to the acceptance and understanding of such an approach by the producer.

#### 4.2 Defined Relativity Between Grades

With the 'saw-tooth' pricing structure the relativity between prices of different weight ranges has a large effect on producer returns. While such

price fluctuations may reflect changing world demand they do not always encourage the producer to increase his lamb weights.

There would appear to be two alternatives with which to tackle this anomaly of the system.

1. Use a defined relativity between grade prices throughout the season. The relationship between grade prices would be set by the exporters at the beginning of the season and should be based on expected market demand for the various grades of lamb. This concept would also easily adapt to the curvilinear pricing system as the shape of the curve would remain constant throughout the season, the only change would be the position of the intercept on the y axis, i.e. from an overall price increase or decrease. This method however would be inflexible to world market demand and local supply through the season.
2. Have minimum prices set for each grade. This method would still allow fluctuations in grade prices but would provide the security of a price smoothing scheme which would help to reduce the producer's risk. A graph of either the traditional 'saw-tooth' structure or the curvilinear equation for the minimum prices

would serve as a guide to the most profitable type of lamb to produce. There would still be enough flexibility in the system to reflect market demand and allow for some degree of risk for those producers willing and able to take it. The same rules would apply as for the present price smoothing scheme that the Meat Producers' Board would set the minimum prices below which they would supplement prices or intervene in the market to ensure producer returns. There would also be target prices for each grade above which levies would be collected and returned to the buffer account. While this scheme would seem to involve greater administration and organization it is necessary if only to ensure that the price smoothing scheme does, in fact, provide a secure, minimum base on which producers can plan for the season.

An alternative favoured by many, of whom few are producers, is that the minimum price system should be abolished. The schedule system would then reflect market demand more exactly. It can be argued that, when minimum and target prices are set too high, the price smoothing systems become unbalanced, income is seldom collected from high returns and therefore is not available to finance low producer returns. When,

as for example in the 1980/81 season, the benchmark grade price was equivalent to the minimum price exporters were prepared to pay in the face of forecast market conditions. It is also possible that some exporters may be prepared to take a slight loss from the sale of the benchmark grade in order to avoid Meat Board intervention. In such cases the minimum price system is seen to distort prices from the true market situation. Because of this, minimum prices should act only as a support against unforeseen circumstances rather than the bases upon which schedules are determined.

The system must have the flexibility to cope with market demand but at the same time inform producers of the long term trends and provide incentives to him for adapting to them. This is especially important where such adaptation might involve breed or policy changes.



5. SUMMARY AND CONCLUSIONS

In the 1980/81 slaughter season the schedule price system, in conjunction with the minimum price schemes, was unable to provide farmers with an adequate representation of market conditions. Although it did encourage the production of the benchmark grade of lamb (PM), these usually represent only one third of all lambs slaughtered for export. Due to their environment, not all producers provide PM lambs and, also, the current practice of both drafting and grading mainly by eye and touch creates a source of variation in the returns to the producer that he is not able to control. The risk of lambs being picked that are either unfinished or over-finished and graded as either too lean or fat is a relatively unmeasured but extremely important factor. While such variation exists, producers cannot avoid being affected by distortions in non-benchmark grade prices. For those producers with the technical ability to increase lamb weights, the presence of such risks provides a disincentive to do so.

As this discussion has noted, the financial disincentive to produce lambs weighing more than an average of 13.5 kg exists because the 'saw-tooth' structure of the schedule system continues to permit the undervaluing of those lambs graded as PX, PH and PHH. The risk of not being paid for those extra

kilograms of weight is a factor not popular with producers already faced with risk and uncertainty inherent in the production system. The only alternative strategy for a producer wishing to increase weights is to take lambs above the 'saw-tooth' region. Because of the breeds of sheep currently used in New Zealand, the risk of producing overfat lambs would tend to discourage this option.

The 'saw-tooth' structure of the schedule system is the direct result of the prices per kilogram offered for respective carcass grades. The degree of distortion in per head price in the current schedule is therefore dictated by the price relativity between grades. No distortions would occur if prices/kg were constant or increasing as carcass weights increased.

The price of the benchmark grade (PM) changed little during the 1980/81 slaughter season but its relativity with non-benchmark grade prices created distinct saw-tooth regions in the schedule's structure. The effect of a 'guaranteed' PM price on the prices of the non-benchmark grades and therefore the structure of the schedule is an important issue with respect to the benefit of minimum price schemes. If export companies market PM lambs at a loss to avoid intervention by the Meat Producers' Board it would appear logical that they must recoup such losses by gaining on the sales of other grades. Such actions would both exacerbate the 'saw-tooth' effect of the schedule and fail to reflect the market situation in

producer returns.

The alternative schedule systems proposed are suggested as indications of how the efficiency of the schedule could be improved by the use of a curvilinear schedule. The shape of the curve can reflect market demand and give some guide as to the more desirable carcass types and therefore the weight to which it is profitable to produce. The price smoothing scheme could also be improved to minimize risk to the producer and either a minimum price curve or minimum prices for each grade are a recommendation in the light of this discussion. The levels set for minimum prices must be realistic with respect to the market situation so as not to induce distortions between grade prices and therefore an unrealistic representation of demands.

Long term market trends must be represented by the price structure of the schedule system well in advance of the slaughter season. If exporters cannot agree to include such information in the schedule prices then those companies requiring specific consignments could establish forward contracts with producers for a particular type of lamb either at an absolute price or one related to the benchmark grade. There must be a strong indication from the exporters

of the type of lamb they are prepared to pay for before producers begin to change their management practices.

At present the only strategy for the producer aiming to avoid the distortions in per head value that result from the schedule system is that of adopting alternative marketing options. These include cooperative and pooling systems and owner account schemes in which the producer does not receive all or some of the payment for his lambs until they are sold overseas in the hope that schedule price distortions will be removed on the world market. Not all producers are either willing or financially able to adopt such a strategy. If their lambs were more accurately priced within New Zealand, there would be no need for them to add international market uncertainty to their already uncertain horizons.

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