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# THE COMMERCIAL PROSPECTS FOR FROZEN AUGUST LAMB

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DEPARTMENT OF AGRICULTURAL MARKETING

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# THE COMMERCIAL PROSPECTS FOR FROZEN AUGUST LAMB

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## INTRODUCTION

From time to time it has been suggested that rather than selling large numbers of milk fed lambs in July, August and September for immediate consumption at low prices, or retaining them for sale as hoggets, it would be beneficial to farmers and to the meat trade if a proportion of lambs slaughtered then were to be deep-frozen, placed in cold storage and sold during the following January, February and March. Prime home-bred lamb, frozen and handled in this way, would have to sell in direct competition with New Zealand lamb, and with fresh hogget mutton from late finished stores. It would no longer enjoy any premium over New Zealand lamb on account of freshness. Differences, however, in carcass conformation, in the eating quality of the meat, or in less easily determined factors affecting consumer preference, might influence the relative acceptability of frozen home-bred and frozen New Zealand lamb to the consumer. If Frozen August lamb is sufficiently more acceptable to consumers it might command a premium over imported lamb.

To be successful, the production and sale of Frozen August lamb must not only be profitable to the farmer, but also to meat wholesalers and retailers. It would not be worthwhile for them to purchase lambs for freezing in summer unless they could eventually be sold at least as profitably, after covering freezing and storage costs, as fresh spring Hogget or New Zealand lamb. Moreover, if lambs are diverted from the fresh market for freezing, higher market prices might obtain during the summer, and distributors would expect to share in any increased profitability during this period to an extent which at least compensates for the reduction in fresh sales volume.

A previous report showed that if August frozen lamb is regarded as exactly comparable in quality and in consumer acceptability and sold at the same price as New Zealand lamb, it would be of considerably less value than the fresh product and unprofitable for the wholesale and retail butcher\*. This report, therefore, describes a small scale shop test in which Frozen August lamb was sold in competition with fresh English Hogget and New Zealand lamb at varying price differentials in an attempt to obtain some indication as to whether enough Frozen English could be sold at a sufficiently high price to be profitable.

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\* "An Investigation of the Carcass Quality of Lambs and Hoggets with particular reference to the Cold-Storage of Home-bred Lamb". J. H. D. Prescott and C. E. Hinks, University of Newcastle upon Tyne, Department of Agricultural Marketing. Report No. 7, 1967. 15s. Table 34.

## CHAPTER I

# THE INFLUENCE OF DIFFERENT METHODS OF HANDLING HOME-BRED LAMBS ON MARKETING RETURNS AND CARCASS CHARACTERISTICS

This chapter summarises the results of the first report and the measurements made on lamb used in the shop test. It firstly tabulates the comparative Gross Margins for different types of lamb which will be used in subsequent analysis. Secondly, it describes the carcass characteristics of the three competing types of lamb to assess whether frozen August lamb has any distinctive market advantages which might influence its acceptability.

### Market Returns

The information contained in the tables in this section is based on data obtained from the production and marketing of eighty lambs, comprising equal numbers of Clun Forest and Suffolk  $\times$  Greyface, born in the spring of 1965. They were allocated to four treatment groups as follows: —

- Group I Slaughtered August, retailed fresh in August.
- Group II Slaughtered August, retailed frozen in February.
- Group III Slaughtered as hoggets in November, retailed fresh in November.
- Group IV Slaughtered as hoggets in February, retailed fresh in February.

The aim of the wholesale and retail meat trade, as of any other commercial activity, is to make as large a profit as possible. Other things being equal this means maximising their Gross Margins, or the difference between their selling and buying prices. Table 1 shows the Gross Margin the wholesaler obtained on the fresh August lambs, on the November hoggets, and on the February hoggets. In contrast he lost £1 9s. 8½d. on each of the Frozen August lambs, when these were priced similarly to New Zealand lamb.

Table 2, however, shows that the retailer obtained a substantial Gross Margin on the Frozen August lambs, which in the 1965 experiment were bought and sold at the prices prevailing for New Zealand lamb. This table somewhat over-estimates the Gross Margins which would actually be obtained as no allowance is made for wastage. It is usual, however, to sell lamb on the bone, and only to trim surplus fat from chops, not from legs and shoulders, so that the figures in Table 2 are unlikely to be much biased.

TABLE 1. Wholesalers Gross Margin (per carcass)

Group	1 Fresh August Lamb	2 Frozen August Lamb	3 Fresh November Hogget	4 Fresh February Hogget
Carcass weight at time of purchase (lbs)	41	41	52	46
(Purchase price per lb.)	£ s. d. (3 2)	£ s. d. (3 2)	£ s. d. (3 1)	£ s. d. (3 5)
Total cost to wholesaler	6 9 10	6 9 10	8 0 4	7 17 2
Cost of freezing and storing	— — —	8 0	— — —	— — —
<b>Total Cost</b>	<b>6 9 10</b>	<b>6 17 10</b>	<b>8 0 4</b>	<b>7 17 2</b>
Pelt Value	11 0	11 0	1 8 0	1 6 0
Red Offals (estimated)	3 10	3 10	4 10	4 3
White Offals (estimated)	1 6	1 6	1 11	1 8
Guarantee payment	5 1½	5 1½	19 6	7 10
(Selling price per lb.)	(2 11)	(2 2)	(2 4)	(2 8)
Carcass selling price	5 19 7	4 6 8*	6 1 4	6 2 8
<b>Total Return to Wholesaler</b>	<b>7 1 0½</b>	<b>5 8 1½</b>	<b>8 15 7</b>	<b>8 2 5</b>
Gross Margin	11 2½	1 9 8½loss	15 3	5 3
Gross Margin per lb. of carcass weight	3.28d.	8.69d.loss	3.52d.	1.37d.

\* Allowing for 1 lb. weight loss in storage.

The combined retail and wholesale Gross Margin on Frozen August lamb, sold at prevailing New Zealand lamb prices, would be only 10s. 3½d. or just under eight per cent and clearly quite inadequate when compared with other types of lamb, to cover wholesale and retail marketing costs. If, therefore, August Frozen lamb is regarded as exactly comparable in quality and consumer acceptability with New Zealand lamb it is of considerably less value than if sold fresh, even in August, and unprofitable to the meat trade as compared with either fresh English hogget or imported New Zealand lamb.

TABLE 2. Retailer's Gross Margin (per carcass)

Group	1 Fresh August Lamb	2 Frozen August Lamb	3 Fresh November Hogget	4 Fresh February Hogget	5 Frozen New Zealand
Carcass weight at time of purchase (lbs.)	41	40	52	46	34
Cost to Retailer	£ s. d. 5 19 7	£ s. d. 4 6 8	£ s. d. 6 1 4	£ s. d. 6 2 8	£ s. d. 3 13 8
(Retail selling price per lb.)	(3 10)	(3 2)	(3 10)	(3 8)	(3 2)
<b>Total Return to Retailer</b>	<b>7 17 2</b>	<b>6 6 8</b>	<b>9 19 4</b>	<b>8 8 8</b>	<b>5 7 8</b>
Gross Margin	1 17 7	2 0 0	3 18 0	2 6 0	1 14 0
Gross Margin per lb.	11.00d.	12.00d.	18.00d.	12.00d.	12.00d.



In the introduction, however, it was suggested that Frozen August lamb may not be regarded as exactly comparable in quality with New Zealand and that it may be sufficiently more acceptable to command a premium which would enable it to be sold profitably. The next section discusses the important carcass characteristics of the three products competing for sales in the spring period to assess whether the Frozen August product has any advantages which might lead to a premium.

### Differences in Carcass Characteristics

There was found to be virtually no difference in the proportions of various joints in the New Zealand and Frozen August lambs and hence in the cut-out values if priced similarly. There were, however, differences in the average weights of particular cuts, and in the percentage of fat, lean meat and bone. The latter were assessed by dissecting the best neck cuts of each carcass, as a suitable sample joint for this purpose. Resulting differences are shown for both kinds of frozen lamb and for fresh February hoggets in Tables 3 and 4.

TABLE 3. Percentages of Fat, Lean Meat and Bone in the Best Neck Cuts of Sample Carcasses

Prescott and Hinks 1966						
		Frozen August Lambs	New Zealand Number Two's	Fresh February Hoggets	Standard Error of Differences	
		I	II	III	I v II	I v III
		Lean Meat %	45.35	38.55	47.13	3.53*
Fat %	34.62	43.10	34.69	5.13	5.47	
Bone %	19.32	18.70	18.72	2.38	2.45	
Lean/Fat ratio	1.43	0.95	1.47	0.28*	0.35	

Shop Test 1967						
		Frozen August Lambs	New Zealand Number Two's	Fresh February Hoggets	Standard Error of Differences	
		I	II	III	I v II	I v III
		Lean Meat %	41.37	39.25	42.72	1.73
Fat %	34.95	40.94	39.87	2.41**	2.27**	
Bone %	23.68	19.81	17.41	3.03	3.34	
Lean/Fat ratio	1.15	1.00	1.09	0.10	0.13	

\* Significant at the 5% level of probability.

\*\* Significant at the 1% level of probability.

Although the Frozen August lambs had a heavier proportion of bone this was not apparent from visual appraisal. Moreover, they had a higher proportion of lean meat. The New Zealand carcasses, however, contained considerably more fat and this difference could be noticed by a discerning customer. This was true of the lambs measured both in 1966\* and 1967. Considerable within-type variation for both English and New Zealand lamb reduced the significance of these differences in the 1966 test and in the shop test.

\* Prescott and Hinks *Op. Cit.* Page 22.

The average weight of separate cuts also differed. The shoulder is least divisible for retail sale and with the leg affords a useful indication of this difference. Being smaller, New Zealand shoulders and legs had an average sale price of 9s. 11½d. and 12s. 7d. respectively compared with 11s. 9½d. and 14s. 11d. for the larger cuts of Frozen August lamb. This could give some competitive advantages to the New Zealand product if more customers attach greater importance to the total price of a joint than to the price per pound.

TABLE 4. Complete Shoulder and Leg Weights and Average Retail Prices

	Frozen August Lamb	New Zealand Number Two's	Fresh February Hoggets
Carcass weight (lb.)	40	34	46
<b>SHOULDER</b>			
% of carcass	19.66	19.51	19.06
weight (lbs.)	3.93	3.32	4.38
Price per lb. (s. d.)	3—0	3—0	3—6
Price of Joint (s. d.)	11—9½	9—11½	15—4
<b>LEG</b>			
% of carcass (adjusted for part sold as loin)	15.46	15.34	14.95
weight (lbs.)	3.09	2.61	3.44
Price per lb. (s. d.)	4—10	4—10	5—9
Price of Joint (s. d.)	14—11	12—7	19—9

Larger joints may, however, be cut into more suitable sizes, and Table 5 shows the mean weekly average size of cut offered during the 1967 shop test and the corresponding joint prices when valued at the outset of the experiment. These differences in joint price are probably not large enough to invalidate the test.

TABLE 5. Average Size and Price of Joints used in Shop Test based on Marketing Prices

	Frozen August Lamb	New Zealand Number Two's	Fresh February Hoggets
<b>SHOULDER</b>			
Joint weight (lbs.)	2.65	2.19	2.19
Retail Price per lb. (s. d.)	3—0	3—0	3—6
Average Price of Joint (s. d.)	7—11½	6—7	7—8
<b>LEG</b>			
Joint weight (lbs.)	2.40	1.92	2.32
Retail Price per lb. (s. d.)	4—10	4—10	5—4
Average Price of Joint (s. d.)	11—7¼	8—3¼	12—4½

A tasting panel was also used in 1966 to assess the tenderness, flavour and juiciness of the different kinds of lamb. This was not repeated for the carcasses used in the 1967 test but there is no reason to suspect that these differed in such characteristics. The results, as presented by Prescott and Hinks\*, show that there

\* *Op. Cit.* Page 30.

were no significant differences in the ranking of the three types of meat for degree of, or preference for flavour, nor in preference for juiciness. There were significant differences for degree of tenderness and juiciness, and in preference for tenderness. In the case of tenderness Frozen August ranks highest, followed in order by New Zealand and then Fresh February Hogget. Frozen August lamb is juicier than New Zealand yet not as juicy as the fresh product, but this does not appear to affect the panellists preference for juiciness.

TABLE 6. Panel ranking of 'Frozen August Lamb', 'Fresh February Hogget' and 'New Zealand Lamb' for degree of flavour, tenderness and juiciness and preference for these characteristics

Group Treatment	II Frozen August Lamb	IV Fresh February Hogget	V New Zealand Number Two's	Significance of Ranking*
DEGREE OF FLAVOUR				
Overall Rank	1st	=2nd	=2nd	NS
PREFERENCE FOR FLAVOUR				
Overall Rank	2nd	3rd	1st	NS
DEGREE OF TENDERNESS				
Overall Rank	1st	3rd	2nd	†††
PREFERENCE FOR TENDERNESS				
Overall Rank	1st	3rd	2nd	†††
DEGREE OF JUICINESS				
Overall Rank	2nd	1st	3rd	††
PREFERENCE FOR JUICINESS				
Overall Rank	=1st	=1st	2nd	NS

\* From Kendall's Coefficient of Concordance Test (Kendall, 1948).

†; ††; †††; indicate significance of ranking at 5%; 1%; and 0.1% level of probability.

Overall it would seem that the Frozen August lamb has an advantage in preference for tenderness, but in other respects is not greatly different from either New Zealand or fresh February Hogget.

The first part of this chapter has presented a summary of the data obtained from the 1966 tests, which showed the Frozen August product to be unprofitable to the trade when sold retail at the same price as New Zealand lamb. It also provides estimates of the Gross Margin obtained by retailers and wholesalers at that time on the other types of lamb. These margins are also typical of those achieved in 1966/67. They will be used in the later parts of the Report.

In addition, the carcass characteristics which might enable Frozen August lamb to be sold at a premium have been considered. Frozen August lamb has the main advantage of preferred tenderness. In addition it has less fat than either of the other types and more lean than New Zealand which may attract the customer to the product. There was, however, considerable variability in the amount of lean, fat and bone in each type of carcass.

These advantages are offset by shoulder and leg joints which tend to be slightly larger than those from New Zealand lamb and more similar to those from fresh

February Hogget. The retail price of these joints, therefore, tends to be higher than for similar New Zealand lamb, which may discourage customers who choose their purchase by joint price. Nevertheless, these joints may be cut and, as Table 5 shows, this was done by the retailer co-operating in the shop test so that the Frozen joints were little larger than the New Zealand cuts. The Frozen August lamb also had more bone than either fresh February Hogget or New Zealand lamb but since this is not apparent to shoppers, and replaces fat rather than lean meat, it is not likely to be disadvantageous.

Frozen English lamb does not appear to have an absolute advantage over competing types of lamb but it does have some advantages. Therefore, it might sell at a sufficient premium to be profitable to the meat trade. The results of a shop test designed to give some indication of the relative acceptability of Frozen English lamb are presented next.

## CHAPTER II

### THE SHOP TEST

The objectives of the shop test were, to determine the relative acceptabilities of New Zealand and Frozen August lamb to customers, to obtain some idea whether they would pay extra for Frozen August, and for what quantity, when sold in direct competition with joints from New Zealand Number Two carcasses. The test was carried out over a nine week period, commencing in the middle of January, 1967. It took place in a supermarket, the meat being sold entirely by self-service, in order to eliminate any bias which might have arisen if customers had been able to seek a butcher's advice.

New Zealand lamb is nationally known and advertised. It was, therefore, labelled as such and displayed without any in-store advertising. The fresh English Hogget was, in conformity with store practice, treated similarly and labelled simply as English Lamb. The Frozen August lamb was labelled similarly to the English Hogget, but because it was a new product, it was also promoted as 'Special English August Lamb' using a single 20" × 30" poster standing on top of the chill cabinet.

Each cut of Frozen August and New Zealand lamb was displayed throughout the experiment in the same location and area, and this was kept as fully stocked as possible. The display of fresh Hogget was considerably larger than for the frozen products in accordance with its predominance of sales. It also varied a little more in size principally at times of special offer on shoulders.

The lamb was kept chilled in the display cabinet (32°F.) but it was found that the frozen lamb had to be re-packed after 24 – 36 hours because of considerable drip losses associated with thawing. English Hogget, however, did not need re-packing.

The cuts that were sold, and their prices throughout the period of the experiment are given in Appendix I. The supermarket retained control over the prices charged for fresh English Hogget, and they found it commercially desirable to sell shoulders at a particularly low price between the second and fifth weeks of the experiment. New Zealand and Frozen August prices for shoulders were, therefore, reduced by the same amount during this time since we were interested in differential rather than absolute prices. Similarly, after six weeks the supermarket raised its prices for loin chops by sixpence a pound, and the prices of the New Zealand and Frozen August loin chops were altered by a similar amount. Apart from these changes the prices of fresh Hogget and New Zealand lamb were kept constant. Similarly, it was the policy of this supermarket to keep beef and pork prices as near constant as possible. The Frozen August lamb was sold at the same price as the New Zealand lamb for an initial period of four weeks so that customers might become accustomed to the product. In each successive week the Frozen August cuts were raised in price by threepence a pound until in the ninth week they were being offered for sale at one shilling and threepence a pound more than the New Zealand joints.

The supermarket in which the test was carried out had a good butchery department, but at that time of year normally sold fresh English Hogget and did not stock New Zealand lamb. In one way this was an advantage as the New Zealand and the Frozen August lamb were both new products to their regular customers. On the other hand, a large proportion of customers continued to buy fresh hogget throughout the period. Sales of both the New Zealand and of Frozen August lamb were consequently lower than might be expected in stores of similar size but whose merchandising policies emphasise New Zealand lamb. Combined frozen lamb sales reached a maximum of 23.7% of all lamb sales by weight and averaged 20.8% over the nine week period. Because of this, sales of individual frozen cuts were in some cases very low. For example, in the third week only 54 lbs. of Frozen August shoulder was sold compared to 534 lbs. of fresh. For this reason more emphasis is placed on total sales of each kind of lamb than on sales of individual cuts. It was also argued that a price premium could only be charged on the better joints. Indeed, the poorer cuts were not sold as joints in this shop. The six cuts used in the shop test accounted for eighty per cent of the Frozen August lamb carcass by weight.

The shop test, in which prices of Frozen August lamb were progressively raised, permits the establishment of a relationship between quantity sold and its price. The quantity of Frozen August lamb sold depends on the price charged for it, the price of competing products such as New Zealand lamb or beef, and many other factors influencing consumer behaviour such as climate, etc. In this experiment we concentrated on the relationship between the quantity of Frozen August lamb sold and its price, the price of New Zealand, and the price of fresh English lamb. This may be conveniently expressed as an equation (1) below.

$$Q_{FA} = a + b_1 P_{FA} + b_2 P_{NZ} + b_3 P_{FH} \quad (1)$$

where the letters are interpreted as

$Q_{FA}$  = quantity of Frozen August premium cuts sold in any week

$P_{FA}$  = average price of Frozen August premium cuts sold in that week

$P_{NZ}$  = average price of New Zealand sold in that week

$P_{FH}$  = average price of Fresh Hogget sold in that week

Unfortunately the weighted average prices of New Zealand and of Fresh Hogget lamb are highly correlated with each other and with the price of Frozen August. This prevents estimation of their separate influence on the quantity of Frozen August lamb sold. Because of this the simplified equation (2) was fitted\*.

$$Q_{FA} = a + b_1 P_{FA} \quad (2)$$

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\*If the test could have been extended to obtain a greater number of observations it should have been possible to fit an equation of type (2) to each cut of Frozen August lamb. Because of its short duration and the small quantities involved, however, there is considerable variation in the amounts of each cut sold, so that trial attempts at fitting this equation to each individual cut were not very satisfactory. If, however, these separate equations are regarded as at least best estimates of the true relationships and are summed together, it is of some satisfaction to find that the resultant total demand curve is very similar to the one presented below which is derived from aggregate figures.

In the first four weeks of the test when prices were both constant and Frozen August and New Zealand prices were at the same level, sales of the two frozen products rose at first but levelled out during the third and fourth weeks. This agrees with the anticipated reaction of customers, who were expected to take some time to become accustomed to the new products. For this reason the equation was fitted to the last seven weeks only of the experimental data and resulted in the following relationship.

$$Q_{FA} = 268.03 - 3.40 P_{FA} \quad (2a)**$$

It is possible that during the test period there was a shift in demand away from lamb, particularly in the last three weeks when sales of all lamb fell. In an attempt to remove this influence an index of total weekly sales of lamb in the store was constructed using the mean sales of the first four weeks as a base (=100). This index was then used to adjust the actual quantities of Frozen August sold. For example, in week six the index of total sales was 85.63. Applying this to actual sales of Frozen August lamb of 81.1 lbs. raises this to 94.8 lbs.\*\*\*. Equation (2) was fitted to these adjusted quantities and price, giving the following result.

$$Q_{FA \text{ (adjusted)}} = 210.50 - 2.20 P_{FA} \quad (2b)†$$

Of the several forms of equation (2) which were tried, (2a) and (2b) best fitted the data. A choice between them is difficult. Their respective price elasticities at mean price of 57.2d. and sales of 73.5 lbs. are -2.64 and -1.71. The latter is closer to previously derived estimates for "all lamb" while the first at -2.64 is more elastic and perhaps more satisfying for this product which is so similar to its competitors. For this reason, in the long run, it might well provide the more reliable predictions. Moreover, the introduction of a new product into a store naturally stimulates interest and the "competition" is likely to have raised sales at the outset. This would have had the effect of raising the base of the index used to calculate adjusted weekly sales and hence such adjusted sales may have been too high in the latter weeks and so have caused the lower elasticity of equation (2b). For this study, therefore, most emphasis is laid on equation (2a) although equation (2b) is worked through to give an indication of the results which would follow from its acceptance.

Before they can be used to evaluate the prospects for Frozen August lamb these equations require a little manipulation to put them in a more convenient form and to take account of those parts of the carcass which could not be sold for a premium (scrag, kidney, fat, etc.).

Firstly it is more convenient to change the equations so that the Price is on the left-hand side. The two equations change so that, after rounding:

(2a) becomes

$$P_{FA} = 78.79 - 0.29 Q_{FA} \quad (2c)$$

and (2b) becomes

$$P_{FA} = 95.68 - 0.45 Q_{FA} \quad (2d)$$

\*\* ( $r^2=0.93$ ; significant at 1% level)

\*\*\* Appendix I, Table 3.

† ( $r^2=0.74$ ; significant at 5% level)

Next the adjustment must be made for the 20% of every Frozen August carcass which could not be sold at a premium. Butchers generally sell a considerable quantity of scrag, breast and lap for rendering, some for sausage manufacture, and a very small amount to the customer over the counter for stewing. The price for this part of the carcass is, therefore, very variable and in this study a figure of 6d. per lb. was used. After adjusting for non-premium cuts the equations are again slightly altered\* so that now:

(2a) becomes

$$p_{FA} = 64.23 - 0.19 q_{FA} \quad (2e)$$

and (2b) becomes

$$p_{FA} = 77.74 - 0.29 q_{FA} \quad (2f)$$

where  $p_{FA}$  = Average price of Frozen August lamb sold *including* non-premium cuts.

and  $q_{FA}$  = Quantity of Frozen August lamb sold *including* non-premium cuts.

At the outset it was hypothesised that the Frozen August lamb would compete principally with New Zealand. Since it was branded as English, of similar size, and sold alongside fresh English Hogget as well as New Zealand it is pertinent to question the type with which it did compete in the test. Diagram 1, Appendix V, shows the percentage share of the total sales by weight, of each type of lamb, plotted against each week of the experiment and the results of fitting to the data for each type of lamb an equation as below (3)

$$S = a + b_1 T \quad (3)$$

where  $S$  = % share of total sales

$T$  = week of experiment

The equations were fitted to data from only the last seven weeks for the reasons explained earlier. From these equations it would seem that Frozen August lamb in fact competed just as strongly with fresh English Hogget. As Frozen August price was raised steadily over the experiment, for every 2% fall in quantity sold there was roughly a 1% increase in fresh Hogget sales for every 1% increase on New Zealand sales\*\*. If the Frozen August lamb had competed more strongly with New Zealand we would have expected a larger percentage increase in New Zealand sales. It is, of course, probable that Frozen August lamb would compete marginally with other meats such as beef and pork, but this was not considered here.

\* See Appendix II for details of calculation.

\*\*The values for  $b_1$  in the equations were Frozen August  $-1.24$ ; fresh Hogget  $+0.66$ ; New Zealand  $0.58$ , which are roughly in the ratio of 2; 1; and 1. The actual equations are presented in Diagram 1, Appendix V.



## CHAPTER III

### IMPLICATIONS OF SHOP TEST RESULTS

The results are analysed in two ways; on the assumption, first that the meat trade would try to sell the quantity which would maximise its profits, and secondly that it would not be prepared to market Frozen August lamb unless it was at least as profitable as existing methods of sale.

The analysis is complicated by the fact that there are two links in the marketing chain, wholesaler and retailer; the former of whom would have to tie up capital in storage for this sort of operation. Moreover, if each tries to maximise his own profits it is exceedingly difficult for a stable solution to evolve unless it is imposed on the trade\*. For this last reason the results are analysed with the simplifying assumption that there is only one link in the meat trade, a wholesaler with his own retail outlets. In this way we can firstly seek to maximise *the industry* profits and secondly to achieve at least as much profit as *the industry* does with other types of lamb.

#### Maximum 'Industry' Profits

The wholesaler-retailer, to maximise his Gross Margin will buy and sell Frozen August lamb until the revenue obtained for the increment of sale, the Marginal Revenue\*\*, has fallen to the level of extra cost incurred in purchasing the lamb, the Marginal Cost\*\*\*. Any quantity sold over and above this would have an extra cost greater than the extra revenue for which it could be sold and hence sell at a loss. The optimum quantity has been derived mathematically for demand curve (2e) as an example in Appendix III. The same result can also be derived quite simply from diagrams 2 and 3, as explained below.

Marginal Cost of Frozen August lamb is equal to the sum of the cost of its purchase in August, its refrigeration and storage charges, and an interest charge on money tied up in storage, *plus* the loss of margin on the type of lamb which Frozen August replaces.

The rate of return a wholesaler-retailer will want on money tied up in the stored August lamb is set arbitrarily at two levels, a minimum acceptable of 10%; and a more likely 20% if he considers the risk involved. Similarly, three possible substitution effects are considered; where Frozen August replaces only New Zealand; where it replaces only fresh Hogget; and, as suggested on page 15, where it replaces 1 lb. of New Zealand for very 1 lb. of fresh Hogget. Table 7 sets out the calculation of MC under all these different assumptions. Any of these figures can be altered if a wholesaler believes his costs to be different from those used below, and this will merely change the total Marginal Cost.

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\* W. Fellner. *Competition Among the Few*. New York: Knopf. (1949). Ch. 9.

\*\* MR in diagrams 2 and 3, Appendix V.

\*\*\* MC in diagrams 2 and 3.

For the example, in Diagrams 2 and 3 (and Appendix III) the Marginal Cost used is 55.87d./lb. (Table 7, Section A. Column iii) and is constant regardless of the total quantity bought and sold.

TABLE 7. Calculation of Marginal Cost of Frozen August Lamb to the Wholesaler-Retailer

A. REQUIRED CAPITAL RETURN OF 10% ON STORED LAMB			
	(i) All NZ d/lb.	(ii) All FH d/lb.	(iii) 1NZ:1FH d/lb.
Lamb replaced by Frozen August			
Purchase Price of Carcass (£6 9 10)	38.00	38.00	38.00
Cost of Storage (8 0)	2.40	2.40	2.40
Interest over 7 months (Aug.-Feb.) (8 0½)	2.41	2.41	2.41
Loss* of Gross Margin on Lamb Replaced	12.75	13.37	13.06
<b>Total Marginal Cost</b>	<b>55.56</b>	<b>56.18</b>	<b>55.87</b>
B. REQUIRED CAPITAL RETURN OF 20% ON STORED LAMB			
	(i) All NZ d/lb.	(ii) All FH d/lb.	(iii) 1NZ:2FH d/lb.
Lamb Replaced by Frozen August			
Purchase Price of Carcass (£6 9 10)	38.00	38.00	38.00
Cost of Storage (8 0)	2.40	2.40	2.40
Interest over 7 months (Aug.-Feb.) (16 1)	4.83	4.83	4.83
Loss* of Gross Margin on Lamb Replaced	12.75	13.37	13.06
<b>Total Marginal Cost</b>	<b>57.98</b>	<b>58.60</b>	<b>58.29</b>

\* Sum of wholesale and retail Gross Margins per lb. as given in Tables 1 and 2. The Wholesale Margin on New Zealand lamb is taken to be 3%.

In the case of the combined wholesaler-retailer the demand curve derived on page 15 has again to be slightly adjusted because it must include a return for fleece, offal and guarantee. This adds 7.31 pence revenue per pound sold\*\*. Hence demand curve (2e), page 15, now becomes:

$$p_{FA} = 64.23 + 7.31 - 0.19q_{FA}$$

$$= 71.54 - 0.19q_{FA} \quad (2g)$$

and (2f), page 15, becomes

$$p_{FA} = 85.05 - 0.29q_{FA} \quad (2h)$$

These are the curves marked  $AR_I$  in diagrams 2 and 3. The Marginal Revenue curve falls twice as fast as this and is marked  $MR_I$ . The intersection at Q of the MC and MR lines indicates the quantity at which the wholesaler-retailer will make his maximum Gross Margin. The average price at which he will sell this quantity is given by the  $AR_I$  curve at P, and the shaded area represents the amount of the extra margin.

\*\* Calculated from figures in Table 1.

Table 8 indicates the maximum extra Gross Margin which could be expected under the two assumptions of needed Capital return using demand curve (2g), and assuming that the Frozen August lamb replaces 1 lb. of New Zealand for every 1 lb. of fresh Hogget. The associated quantity and price of premium cuts and their share of total in-store lamb sales are also shown. The results for replacement of part New Zealand and part fresh Hogget are chosen for presentation here because they are representative of what actually happened in the test and because the calculated Marginal Cost lies between that for the other two possibilities. Because Marginal Costs are similar, only small changes in the results occur for different substitution effects. Complete results for demand curve (2g) are, however, given in Appendix IV, together with those based on demand curve (2h).

**TABLE 8. Quantity and Price of Frozen August Lamb Maximising Weekly Gross Margin in Test Store**

	(iii) 1NZ:1FH
<b>A. 10% RETURN ON CAPITAL REQUIRED</b>	
Maximum Weekly Addition to Store Gross Margin on Lamb (£ s. d.)	£1 7 6½
Total Quantity of Lamb including non-premium cuts (lbs.)	41.24
Quantity of premium cuts (lbs.)	32.99
Average Price of premium cuts (d/lb.)	69.22
Frozen August as % of Store's Total Lamb Sales	6.42
<b>B. 20% RETURN ON CAPITAL REQUIRED</b>	
Maximum Weekly Addition to Store Gross Margin on Lamb (£ s. d.)	£0 19 8
Total Quantity of Lamb including non-premium cuts (lbs.)	34.87
Quantity of premium cuts (lbs.)	27.89
Average Price of premium cuts (d/lb.)	70.70
Frozen August as % of Store's Total Lamb Sales	5.95

### Minimum Acceptable 'Industry' Profits

Alternatively, it is possible to argue that the wholesaler-retailer would be prepared to sell Frozen August lamb provided that he achieved at least the same Gross Margin as for the product it replaces. He would require at least to recover the cost of buying and storing the lamb, plus the margin he would have made on the substituted product. In other words, he would need to sell at a price equal to the Marginal Cost derived in Table 7. The intersection at R of the MC and AR curves in Diagrams 2 and 3, therefore, indicates the quantity which would be sold. There is no extra margin, but an additional quantity of Frozen August lamb is sold, Table 9 gives the quantities of premium lamb which could be sold, the corresponding price and percentage share of total sales, again using demand equation (2g) and assuming that the Frozen August lamb replaces 1 lb. of New Zealand for every 1 lb. of fresh Hogget. Results based on other substitution effects and demand curve (2h) are again shown in Appendix IV.

TABLE 9. Quantities and Premium Price of Frozen August Lamb When Sold at Minimum Acceptable Level of Margin

	(iii) 1NZ:1FH
A. 10% RETURN ON CAPITAL REQUIRED	
Total Quantity of Lamb including non-premium cuts (lbs.)	82.47
Quantity of premium cuts (lbs.)	65.98
Average Price of premium cuts (d/lb.)	59.66
Frozen August as % of Total Sales	9.50
B. 20% RETURN ON CAPITAL REQUIRED	
Total Quantity of Lamb including non-premium cuts (lbs.)	69.74
Quantity of premium cuts (lbs.)	55.79
Average Price of premium cuts (d/lb.)	62.61
Frozen August as % of Total Sales	8.55

Analysis of the results of the shop test indicate that it would have been possible at that time to sell Frozen August lamb at a price sufficient to cover costs of procurement, storage, and consequent losses on alternative types of lamb. Indeed, an increase in Gross Margin could be possible if the wholesaler-retailer had set out to achieve this. Taking the view that a 20% return on invested capital is likely to be required and that the un-adjusted demand curve (2g), page 17, is most suitable, then an increase in the store's Gross Margin of 19s. 8d. per week would have been possible. If the most favourable situation is acceptable, then this extra amount might be as much as £3 1s. 7½d. per week\*. This increase would, of course, have to be shared between wholesale and retail operations and, if these were separate enterprises, an equitable division of this gain would have to be established.

The most likely increase in Gross Margin is small and even if the most favourable is chosen the predicted gain is not large in relation to total supermarket profits. Moreover, to achieve this only very small sales of Frozen August lamb would be involved; about 6% of total. Any shop selling the Frozen August lamb would still have to sell both New Zealand and fresh English so that the small quantity sold might prove troublesome to many, particularly the smaller butchers. In a supermarket such as the one used in the test, only about one carcass a week would be used if sold to maximise the Gross Margin. Even if the product were sold for no increase in margin, only about 1½ carcasses per week would be sold. This low volume of sales might well mean that extra staff, time and inconvenience would raise the Marginal Cost of Frozen August lamb and thereby reduce its apparent profitability. This would be aggravated by pre-packing, when problems of drip necessitate frequent re-wrapping.

The shop experiment, by starting with similar prices for New Zealand and Frozen August lamb provided a stiff test for the English product yet sufficient customers continued to buy at higher prices to make it profitable. Nevertheless,

\* Appendix IV.

even if sold to achieve no increase in margin an average price of 62.61d./lb. for premium cuts is required (or a premium of 14.12d./lb. compared to the average for New Zealand lamb). Over a longer period of time this high price might well dissuade customers from making repeat purchases. It would be optimistic, therefore, to expect Frozen August to amount to as much as 5% of total lamb sales; and this would be mainly through larger stores or butchers shops.

Returns to producers would be expected to increase if a significant proportion of lambs now slaughtered in July, August and September were demanded for freezing and resale early in the following year. It is not, however, possible to estimate with any accuracy what these additional returns might be if different proportions were diverted from the fresh meat market, nor was this the purpose of the test.

Since this is, however, an important question some guidelines should be given. About 18% of butchers sell enough meat to use 1 frozen carcass per week\*. They account for 45% of total meat sales. Allowing for this, 5% of retail lamb sales in January, February and March\*\*, would, if we assume a constant level of sales throughout the year, represent about 3,000 tons of lamb. If this quantity had been removed from the fresh market in the July, August and September\*\* period, sales as fresh mutton and lamb in that period would have fallen by approximately 4%. It must be realised that this estimate is a very rough approximation based on a large number of assumptions. No attempt will be made here to estimate how much this would influence the farm price, since many other considerations would be involved. For example, the New Zealand Meat Board might well adjust their merchandising policy to make greater supplies available during the summer period. Moreover, the estimate of lamb removed from the market is based on the results of only one shop test, in one year, and only one area. Any resulting increase in the price realised by farmers for their lambs would lead to a similar rise in costs to buyers for both the fresh and frozen trade. This rise in price of lambs purchased for freezing would, of course, lead to a smaller demand for this purpose so that the expected increase in July-September sales would not be as large as predicted by the simple computation above.

There is, moreover, the possibility of at least one other change taking place. To the producer fresh August lamb and lamb frozen in August are the same product, and would result in precisely the same returns for the same costs of production. In contrast, the lambs which in the earlier experiment were sold fresh as hoggets in November, could have been sold in August. They realised an additional £1 10s. 6d.† each to the producer, compared with lambs slaughtered in August, but their additional feed costs alone amounted to £1 2s. 0d.† per lamb. From this it appears, allowing for minor expenses and the occasional casualty, that November Hoggets

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\* Census of Distribution and other services. HMSO 1961: Butchers with meat sales as large as, larger than the test store.

\*\* Averaged over three years 1965—1967.

† Prescott and Hinks *Op. Cit.* Page 37, Table 34.

were marginally the most profitable to produce in this experiment and in this year. Many farmers are well aware that this is sometimes the case and plan sales accordingly. If, however, the demand for August lamb for freezing raised returns to producers by only a few shillings many farmers who sell in the autumn might decide to fatten more of their lambs off in summer. This would tend to counteract the price rise resulting from freezing lambs.

One final consideration arises from the fact that, in the first experiment hoggets which would not have graded in August and were kept until February incurred a cost of £3 4s. 0d. per lamb for feed alone and only obtained an additional return compared with August slaughter of £1 7s. 4d. These were, therefore, clearly less profitable than either the August or November slaughtered test lambs. In the shop test the Frozen August lamb competed just as strongly with its fresh counterpart as with New Zealand lamb. Hence a gain in profitability from selling Frozen August lamb passed back to the farmers in higher prices is likely to be offset by price reductions in the following spring. This would further reduce the profitability of spring Hoggets and any overall annual gain to the sheep industry.

## SUMMARY AND CONCLUSIONS

The first part of this research, previously reported, indicated that English lamb frozen in August had some advantage over New Zealand and fresh spring Hogget in most carcass characteristics. The meat was leaner and tasting panels recorded a preference with regard to tenderness. Joints were, however, a little larger than those from New Zealand carcasses. The advantages, however, would only make the product a commercial success if customers were prepared to pay a sufficient premium for them. This report, therefore, deals with a shop test which attempted to assess the commercial prospects for English lamb slaughtered and frozen in August.

The test took place in a large northern supermarket in which meat was sold by self-service. The Frozen August lamb was displayed alongside New Zealand and fresh Hogget. Initially the price per lb. of the Frozen August lamb was set at the same level as New Zealand. After four weeks its price was increased progressively until the ninth week of the test, when each cut of Frozen August lamb was selling at a premium of 1s. 3d. per lb. over New Zealand cuts. As the price of Frozen August was increased the quantity sold fell, and a measure of this relationship between price and quantity has been established.

From this it can be shown that the meat trade, as represented by a combined wholesaler-retailer with weekly sales of about 700 lbs. of lamb, might have made 19s. 8d. extra per week from selling Frozen August lamb at an optimum price, representing a premium of 1s. 10½d. per lb. over New Zealand. Under less restrictive assumptions this additional profit might be about £3 a week, at a premium of 2s. 5d. At the price needed to achieve such gains, however, only very small quantities of the product would be sold, amounting to only about 6 per cent of total retail lamb sales. Even if the product was sold at a price just sufficient to cover costs, so that the trade would make the same profit, sales would only amount to about 9 per cent and a premium of 1s. 2d. per lb. over New Zealand lamb would have to be charged. Thus, only the larger butchers would be able to sell a whole carcass of Frozen August lamb. There are also problems associated with drip losses from the frozen product. Moreover, Frozen August was found to compete just as strongly with fresh spring Hogget as with New Zealand lamb.

Outlets large enough to sell profitably a whole Frozen August carcass each week probably embrace about 18 per cent of all retail butchers, and these are likely to be widely scattered. It is improbable, therefore, that this product would be attractive to small or local wholesalers selling mainly to small, independent butchers.

A very approximate estimate suggests a maximum possible off-take of young lamb for freezing during the summer months amounting to 4 per cent. Even then consequential earlier sales of potential October and November Hoggets might well reduce this proportion. Moreover, sales of summer frozen lamb are likely to depress prices for spring Hoggets so that any gain made by farmers in the summer may well be off-set in the following spring.

The results of this test in one shop, over a short period, cannot be regarded as conclusive. Nevertheless, they suggest that the commercial prospects for Frozen August lamb are rather poor. Certainly one would not advocate commercial freezing of summer lamb without further research evidence to contradict the results of this investigation.



## APPENDIX I

**TABLE 1. Cuts Sold and Prices Charged throughout the Experiment**

	Fillets	Legs	Shoulders	Chump Chops	Loin Chops	Stewing Chops
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
<b>Fresh Hogget</b>						
Week 1	5 8	5 4	3 3	6 8	5 6	3 8
2	5 8	5 4	2 11	6 8	5 6	3 8
3	5 8	5 4	2 11	6 8	5 6	3 8
4	5 8	5 4	2 11	6 8	5 6	3 8
5	5 8	5 4	2 11	6 8	5 6	3 8
6	5 8	5 4	3 6	6 8	5 6	3 8
7	5 8	5 4	3 6	6 8	6 0	3 8
8	5 8	5 4	3 6	6 8	6 0	3 8
9	5 8	5 4	3 6	6 8	6 0	3 8
<b>New Zealand</b>						
Week 1	5 4	4 10	3 0	6 0	5 0	3 0
2	5 4	4 10	2 8	6 0	5 0	3 0
3	5 4	4 10	2 8	6 0	5 0	3 0
4	5 4	4 10	2 8	6 0	5 0	3 0
5	5 4	4 10	2 8	6 0	5 0	3 0
6	5 4	4 10	3 3	6 0	5 0	3 0
7	5 4	4 10	3 3	6 0	5 6	3 0
8	5 4	4 10	3 3	6 0	5 6	3 0
9	5 4	4 10	3 3	6 0	5 6	3 0
<b>Frozen August</b>						
Week 1	5 4	4 10	3 0	6 0	5 0	3 0
2	5 4	4 10	2 8	6 0	5 0	3 0
3	5 4	4 10	2 8	6 0	5 0	3 0
4	5 4	4 10	2 8	6 0	5 0	3 0
5	5 7	5 1	2 11	6 3	5 3	3 3
6	5 11	5 4	3 9	6 6	5 6	3 6
7	6 2	5 7	4 0	6 9	6 3	3 9
8	6 5	5 10	4 3	7 0	6 6	4 0
9	6 8	6 1	4 6	7 3	6 9	4 3

TABLE 2. Weighted Average Price a Pound for Six Cuts Named in Table 1.

Week	New Zealand	Frozen August	February
	Lamb s. d.	Lamb s. d.	Hogget s. d.
1	3 11 $\frac{3}{4}$	4 0	3 8 $\frac{1}{2}$
2	3 8 $\frac{3}{4}$	3 8 $\frac{3}{4}$	3 5
3	3 10 $\frac{1}{2}$	3 11	3 3 $\frac{1}{2}$
4	4 0 $\frac{1}{4}$	3 11	3 4
5	4 1 $\frac{1}{2}$	4 6 $\frac{1}{2}$	3 6 $\frac{1}{4}$
6	4 3	4 9 $\frac{1}{2}$	3 11 $\frac{3}{4}$
7	4 1 $\frac{3}{4}$	5 0 $\frac{1}{2}$	3 11 $\frac{3}{4}$
8	4 2	5 7 $\frac{3}{4}$	3 11 $\frac{3}{4}$
9	4 1 $\frac{1}{4}$	5 6	3 11 $\frac{3}{4}$

TABLE 3. Adjusted Sales of Frozen August Lamb

Week	Total Weekly	Index	Adjusted Sales of
	Sales (lbs.)	(wks. 1—4 = 100)	Frozen August Lamb (lbs.)
1	763.51	—	—
2	877.49	—	—
3	826.23	102.61	101.87
4	753.84	93.61	107.14
5	843.90	104.80	85.61
6	689.53	85.63	94.75
7	607.82	75.48	61.19
8	552.73	68.64	76.31
9	447.09	55.52	55.95

## APPENDIX II

### Adjustment of Demand Relationship for Sales of Non-Premium Meat

Using equation 2c:  $P_{FA} = 78.79 - 0.29 Q_{FA}$

Now Total Revenue  $= P_{FA} \times Q_{FA}$   
 $\therefore = 78.79 Q_{FA} - 0.29 Q_{FA}^2$  . . . . . (i)

To this must be added the revenue for non-premium meat. For each 40 lbs. carcass 20 per cent (or 8 lbs.) was non-premium, selling at 6d. per lb. Hence if  $Q$  lbs. of premium meat are sold,  $Q_{FA}/32$  carcasses are used and therefore  $Q_{FA}/32 \times 8 \times 6 = 1.50Q_{FA}$  pence extra revenue obtained from non-premium cuts. The equation becomes

Total Revenue  $= 78.79 Q_{FA} + 1.50Q_{FA} - 0.29Q_{FA}^2$   
 $TR = 80.29 Q_{FA} - 0.29Q_{FA}^2$  . . . . . (ii)

This is in terms of *premium* quantity " $Q_{FA}$ ". We wish to express total revenue in terms of *carcass* quantity " $q_{FA}$ ". Now each 40 lb. carcass has 32 lbs. of premium and 8 lbs. of non-premium meat.

$\therefore Q_{FA} = \frac{q}{40} \times 32 = \frac{4q_{FA}}{5}$

Substituting in (ii)

$TR = 80.29 \times \frac{4q_{FA}}{5} - 0.29 \left(\frac{4q_{FA}}{5}\right)^2$   
 $= 64.23q_{FA} - 0.19q_{FA}^2$

$\therefore P_{FA} = \frac{TR}{q_{FA}} = 64.23 - 0.19q_{FA}$

## APPENDIX III

### Example Derivation of Maximum Weekly Gross Margin Obtained by the Industry

If Frozen August lamb replaced 1 lb. of New Zealand for every 1 lb. of fresh Hogget lamb and a 10% return on Capital is required.

Gross Margin ( $\pi$ ) = Total Revenue (TR) — Total Cost (TC)

$$\begin{aligned} \text{Now TR} &= \text{Lamb Price} \times \text{Lamb Quantity} + \text{Revenue from offal} \\ &= P_{FA} \times q_{FA} + \text{Offal price} \times q \end{aligned}$$

Substituting for  $p_{FA}$  by equation 2g, page 17

$$= 71.54q_{FA} - 0.19q_{FA}^2$$

$$\text{Total Cost} = 55.87q_{FA}$$

$$\begin{aligned} \therefore \pi &= 71.54q_{FA} - 0.19q_{FA}^2 - 55.87q_{FA} \\ &= 15.67q_{FA} - 0.19q_{FA}^2 \end{aligned}$$

To Maximise

$$\frac{d\pi}{dq} = 15.67 - 0.38q_{FA}$$

$$= 0 \text{ when } q_{FA} = 41.24 \text{ lbs.}$$

$$\text{and } \pi = \text{£1 6s. 11d.* per week}$$

This is made up of  $\frac{41.24}{40} = 1.03$  carcasses

∴ Quantity of Premium Meat ( $Q_{FA}$ ) = 1.03 × 32	= 32.99 lb.
Using equation 2c the price of Premium Meat	= 69.22d./lb.
∴ Return on Premium Meat = 32.99 × 69.22	= 2283.57 pence
Return on Non-Premium Meat = 1.03 × 8 × 6	= 49.48 pence
Return on Offal, etc. = 1.03 × 292.5	= 301.54 pence
	= 2634.59 pence
Less Cost of Purchase and loss of NZ sales = 41.24 × 55.87	= 2303.90 pence
	= 330.69 pence
	= £1 7s. 6½d.

\* A small discrepancy in these two figures results from rounding error following manipulation of the demand equations. In each case the larger is used.

APPENDIX IV

TABLE 1. Quantity and Price of Frozen August Lamb Maximising Weekly Gross Margin in Test Store

a. Using Demand Curve 2g			
	(i) All NZ	(ii) All FH	(iii) INZ:1FH
A. 10% RETURN ON CAPITAL REQUIRED			
Maximum Weekly Addition to Store Gross Margin on Lamb (£ s. d.)	£1 8 8	£1 6 6	£1 7 6½
Total Quantity of Lamb including non-premium cuts (lbs.)	42.05	40.42	41.24
Quantity of premium cuts (lbs.)	33.64	32.34	32.99
Average Price of premium cuts (d/lb.)	69.03	69.41	69.22
Frozen August as % of Store's Total Lamb Sales	6.49	6.36	6.42
B. 20% RETURN ON CAPITAL REQUIRED			
Maximum Weekly Addition to Store Gross Margin on Lamb (£ s. d.)	£1 0 7¼	£0 18 9½	£0 19 8
Total Quantity of Lamb including non-premium cuts (lbs.)	35.68	34.05	34.87
Quantity of premium cuts (lbs.)	28.54	27.24	27.89
Average Price of premium cuts (d/lb.)	70.51	70.89	70.70
Frozen August as % of Store's Total Lamb Sales	6.01	5.89	5.95
b. Using Demand Curve 2h			
A. 10% RETURN ON CAPITAL REQUIRED			
Maximum Weekly Addition to Store Gross Margin on Lamb (£ s. d.)	£3 3 0	£3 0 3½	£3 1 7½
Total Quantity of Lamb including non-premium cuts (lbs.)	50.84	49.78	50.31
Quantity of premium cuts (lbs.)	40.68	39.82	40.25
Average Price of premium cuts (d/lb.)	77.38	77.76	77.57
Frozen August as % of Store's Total Lamb Sales	5.05	4.95	5.00
B. 20% RETURN ON CAPITAL REQUIRED			
Maximum Weekly Addition to Store Gross Margin on Lamb (£ s. d.)	£2 13 0¾	£2 10 7½	£2 11 9¾
Total Quantity of Lamb including non-premium cuts (lbs.)	46.67	45.60	46.14
Quantity of premium cuts (lbs.)	37.34	36.48	36.91
Average Price of premium cuts (d/lb.)	78.88	79.26	79.07
Frozen August as % of Store's Total Lamb Sales	4.64	4.53	4.58

**TABLE 2. Quantities and Premium Price of Frozen August Lamb When Sold at Minimum Acceptable Level of Margin**

a. Using Demand Curve (2g)			
	(i) All NZ	(ii) All FH	(iii) 1NZ:1FH
A. 10% RETURN ON CAPITAL REQUIRED			
Total Quantity of Lamb including non-premium cuts (lbs.)	84.11	80.84	82.47
Quantity of premium cuts (lbs.)	67.28	64.67	65.98
Average Price of premium cuts (d/lb.)	59.28	60.04	59.66
Frozen August as % of Total Sales	9.63	9.38	9.50
B. 20% RETURN ON CAPITAL REQUIRED			
Total Quantity of Lamb including non-premium cuts (lbs.)	71.37	68.11	69.74
Quantity of premium cuts (lbs.)	57.10	54.48	55.79
Average Price of premium cuts (d/lb.)	62.23	62.99	62.61
Frozen August as % of Total Sales	8.68	8.43	8.55
b. Using Demand Curve (2h)			
A. 10% RETURN ON CAPITAL REQUIRED			
Total Quantity of Lamb including non-premium cuts (lbs.)	101.69	99.55	100.62
Quantity of premium cuts (lbs.)	81.35	79.64	80.50
Average Price of premium cuts (d/lb.)	59.07	59.84	59.46
Frozen August as % of Total Sales	10.10	9.89	10.00
B. 20% RETURN ON CAPITAL REQUIRED			
Total Quantity of Lamb including non-premium cuts (lbs.)	93.35	91.20	92.28
Quantity of premium cuts (lbs.)	74.68	72.97	73.82
Average Price of premium cuts (d/lb.)	62.08	62.85	62.46
Frozen August as % of Total Sales	9.27	9.06	9.17

APPENDIX V

DIAGRAM 1

WEEKLY SHARE OF TOTAL LAMB SALES

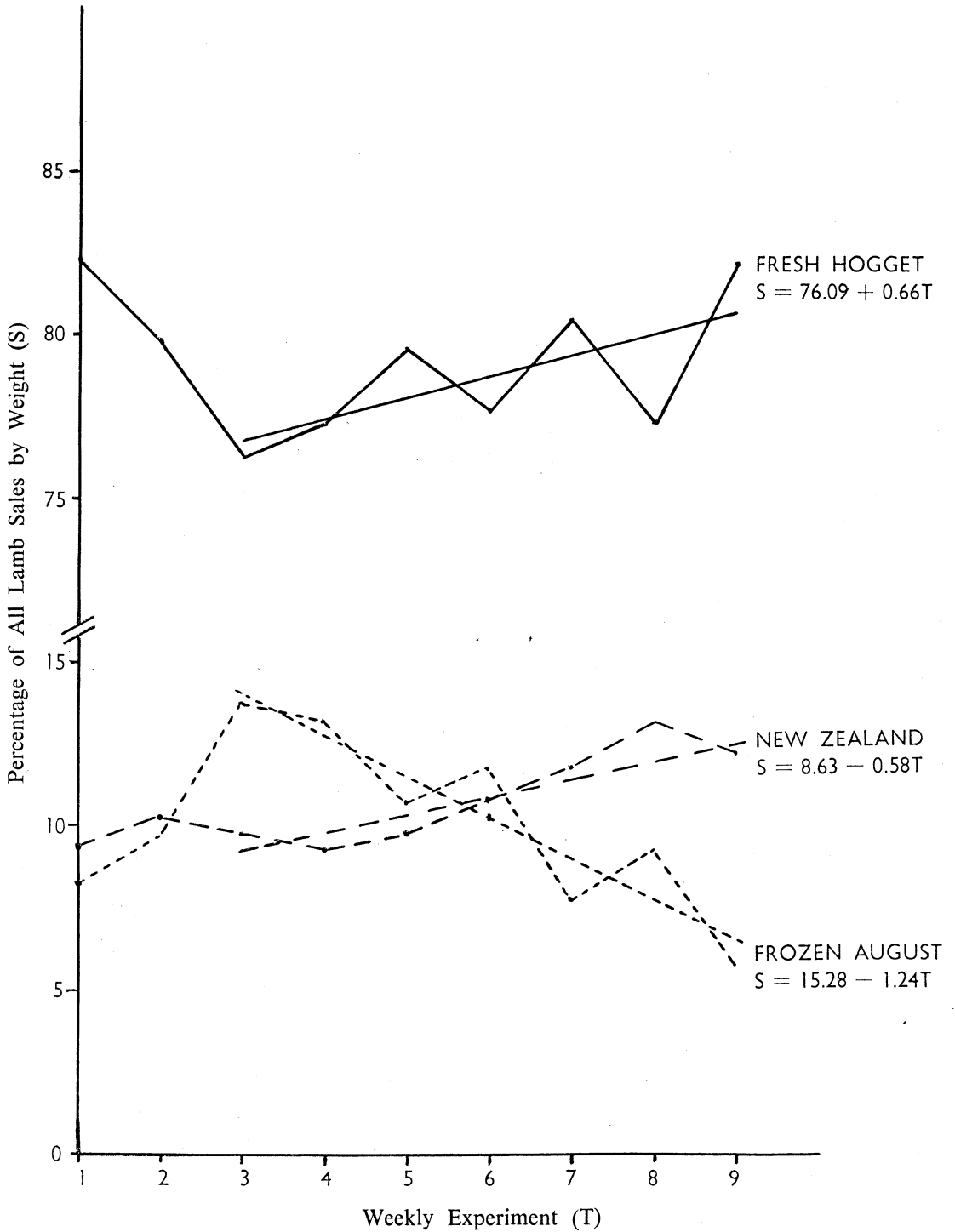


DIAGRAM 2

DEMAND EQUATION 2g (Page 17)

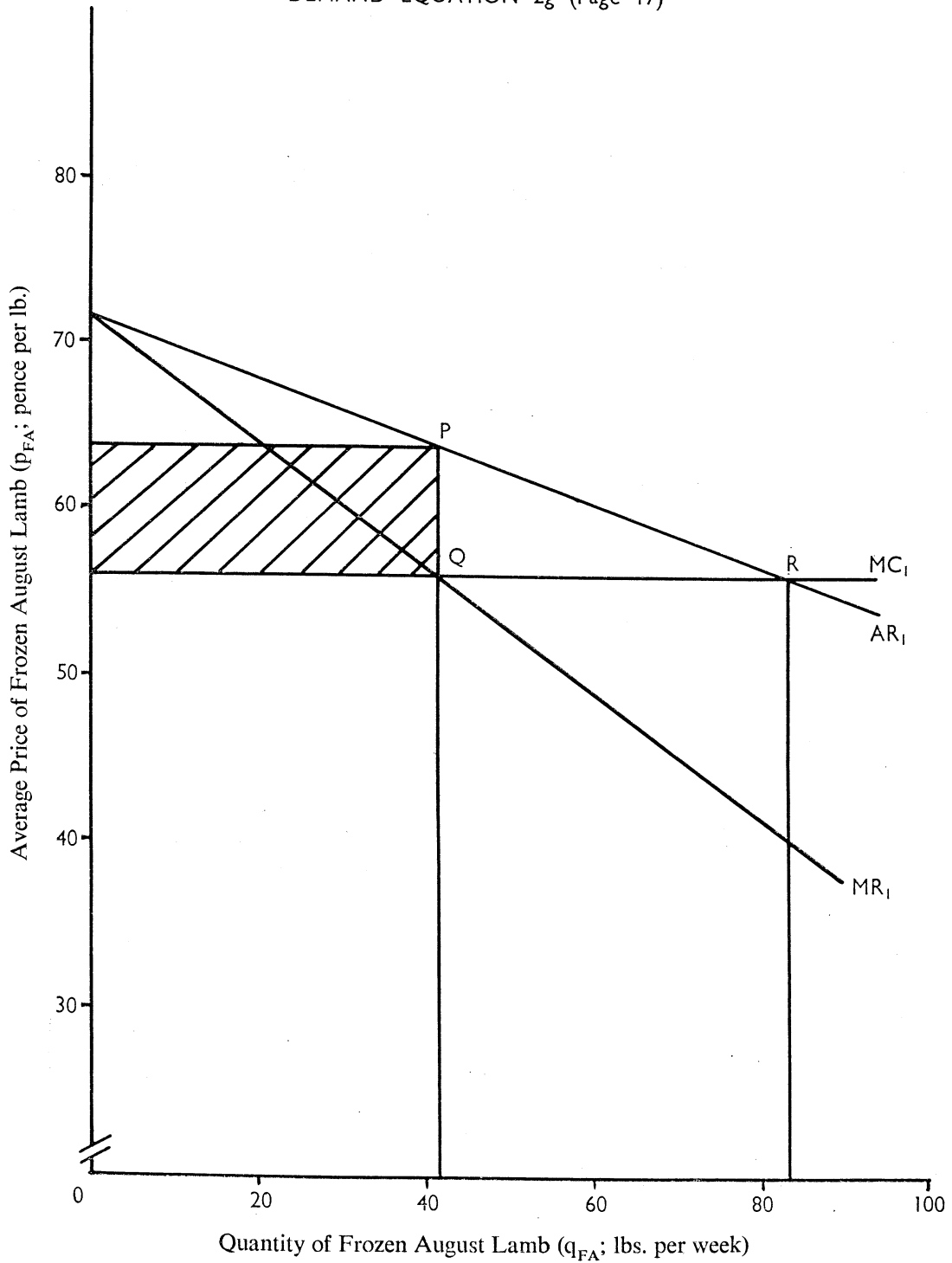
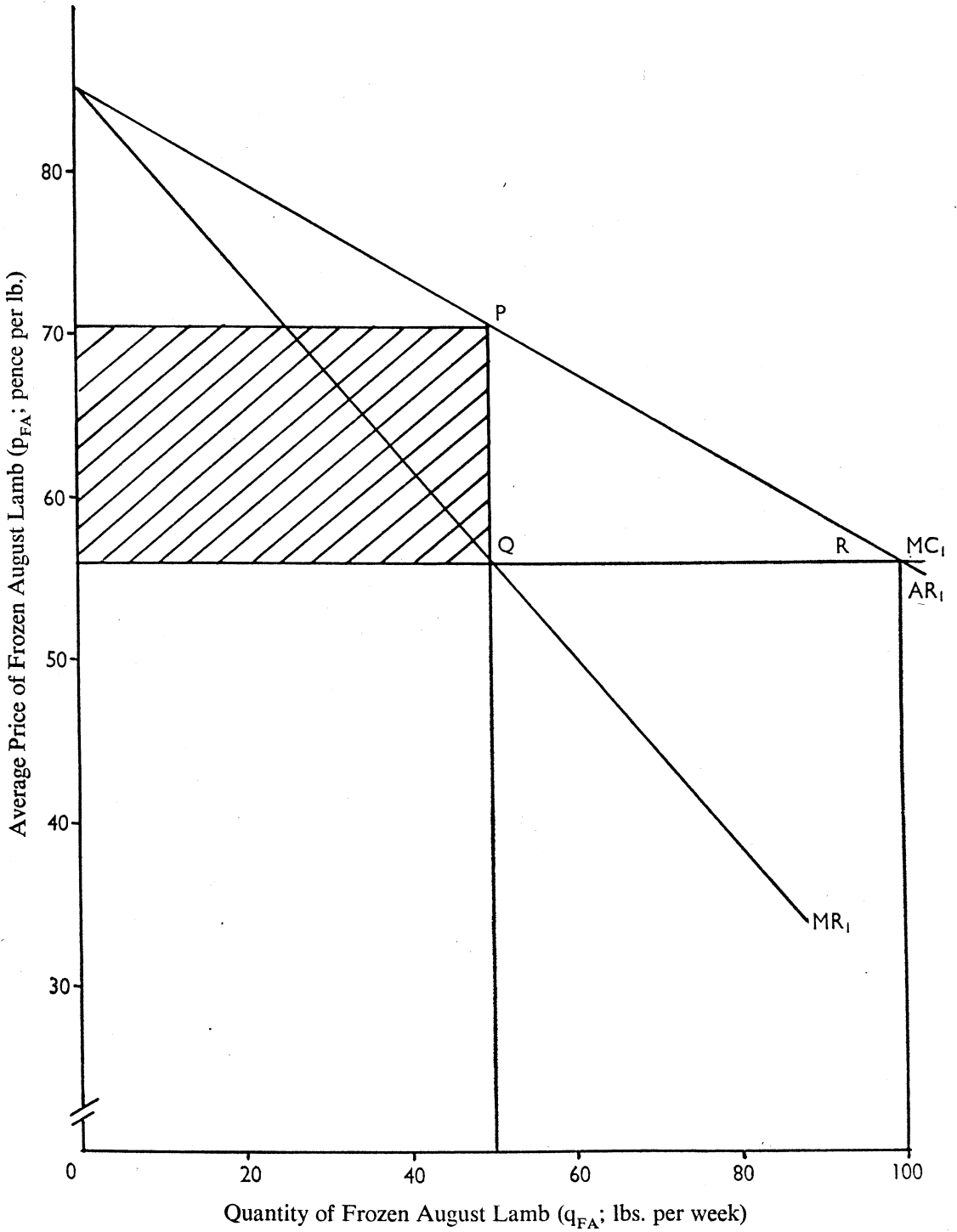




DIAGRAM 3

DEMAND EQUATION 2h (Page 17)



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