

AGRICULTURAL
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Lincoln College

DISTRIBUTION COSTS AND
EFFICIENCY FOR FRESH
FRUIT AND VEGETABLES

by

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Publication No. 66

1971

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Agricultural Economics Research Unit Research Report No. 66

P R E F A C E

In this report, retail distribution costs for fresh fruit and vegetables in Christchurch are examined from both welfare and efficiency viewpoints. Retail prices and margins on these products will interest both the consumer and the grower while the efficiency analyses will be of major concern to all the retailers involved.

The report is an abbreviated version of Mr Kitson's Master of Horticultural Science thesis submitted to the University of Canterbury in December 1970. The research project, from which these results were derived, was generously supported by the New Zealand Vegetable and Produce Growers Federation and the New Zealand Fruit-growers Federation.

C O N T E N T S

	Page
1. INTRODUCTION	1
1.1 Outline of Research Programme	2
2. RESULTS OF SURVEYS OF RETAIL PRICES AND MARGINS	6
2.1 Introduction	6
2.2 Special Features of Analysis	7
2.3 Average Price Levels Between Retailers	8
2.4 Retail Margins	11
2.5 Procurement Cost Analysis	15
2.6 Quality Ratings	20
3. COST AND EFFICIENCY STUDIES	22
3.1 Total Store Operations	22
3.2 Cost Analysis	24
3.3 Fruit and Vegetable Operations Only	35
4. COMPARATIVE DISTRIBUTION COSTS FROM GROWER TO RETAILER DIRECT AND THROUGH NORMAL WHOLESALE CHANNELS	49
4.1 Price Arrival in Direct Trading	52
5. SUMMARY	55
5.1 Major Results in Brief	59
5.2 Conclusions	60

DISTRIBUTION COSTS AND EFFICIENCY FOR FRESH
FRUIT AND VEGETABLES

1. INTRODUCTION

This study concerns the economics of a particular section of the food distribution industry in New Zealand, namely that part responsible for distributing fresh fruit and vegetables. Distribution costs are measured as the difference between auction prices and retail prices for produce except where direct buying from growers is practised. Components of distribution costs include transport, handling, storage, selling and wastage. Efficiency of distribution is measured in terms of cost per unit of produce sold, sales per labour unit and sales per unit of floor space. Distribution costs and efficiency ratios are investigated and compared for supermarkets, superfruiterers, fruiterers and grocers in the Christchurch areas.

The importance of the economics of distribution has already been recognised in the United States where large sums of money have been committed to research by the National Commission on Food Marketing. Fast growth rates for the distribution sector have been noted both in the United States and New Zealand. In New Zealand gross output of the Trade, or Distribution sector has grown, in current value terms, at a rate of about 11 per cent per year between 1960 and 1965.

It has also been noted that in the United States labour productivity growth rates for distribution industries are among the lowest of all sectors. Thus a disturbing situation has arisen that a low productivity sector is becoming a more dominant sector in the United

States. For this reason efficiency studies in distribution are bound to assume greater significance.

Interest in fruit and vegetable distribution in New Zealand arises out of the unique role of the auction system in handling the bulk of fruit and vegetable output. Under this system, supplies of imported fruit are allocated to retail firms in proportion to the value of other produce they buy through auction firms, thus ensuring the dominant place of the auctions in the distribution system.

This system of distribution is defended by auction firms and decried by a number of retail firms, especially supermarkets who find that it induces a conflict between their desire to have supplies of overseas fruit and their desire to achieve economies of mass distribution by trading direct with growers. This study is thus an attempt to provide a rational base on which decisions about the future of fruit and vegetable distribution in New Zealand can be made. In particular, the objective is to indicate which sorts of retail outlets will provide the lowest cost distribution channels. Special attention is given to supermarkets because changes in the distribution system are likely to work in this direction.

1. Outline of Research

The studies in distribution costs and efficiency were based on a number of surveys of Christchurch fruit and vegetable retailers of the following four groups.

- (1) Supermarkets. This group consisted of stores selling groceries, meat and fruit and vegetables which had four checkouts or more. It also included variety stores and department stores which had, as one department, a supermarket.
- (2) Fruiterers. This group was classified according to the same criteria as used by the New Zealand Statistics Department. The requirement for this classification is simply that the retailer himself decides whether or not he belongs to this group.
- (3) Super fruiterers. This group was separated arbitrarily largely according to their size of operation and trading characteristics. Their average fruit and vegetable sales are about three times that of conventional fruiterers and a high proportion of their sales are in case lots. Because the group is small their results need careful interpretation and the implications for policy are limited.
- (4) Grocer/dairies. This group consisted of remaining food retailers who sold fruit and vegetable items. They are the major fruit and vegetable outlet in Christchurch with their 1967 wholesale purchases amounting to 47 per cent of Christchurch's total wholesale purchases.

The study included two surveys of retail prices, retail margins and procurement costs. These surveys, each conducted over a number of consecutive days, were at two different times of the year, February and August. The repetition of the survey

during August was to establish whether price and margin patterns between retail types were similar between seasons.

While these prices and margins studies were being conducted a sub sample were asked to record wastage losses of produce. This cost was regarded by many retailers as very significant. Because no factual data on loss rates was available, measures of this cost required a survey.

Surveys were also conducted in order to ascertain levels of costs and efficiency for retail distribution as a whole. These were designed to provide information not only on fruit and vegetable distribution costs but also on total store distribution costs where products other than fruit and vegetables were also sold. The main reason for noting overall costs was that a number of these had to be allocated to individual product groups. In order to adopt a rational approach to the problem of cost allocation and to provide an insight to the detailed day to day functioning of a typical supermarket two, one week detailed studies were made of the functioning of a Christchurch supermarket.

Finally, a comparative study was made of distribution costs where the retailer's wholesale source was the auction firm on the one hand and the grower himself on the other. This was in order not only to establish relative levels of these costs but also to establish how growers fared under each type of distribution.

Thus the project provides factual data on relative retail distribution costs internal to retail firms and distribution costs between retail firms and the two wholesale sources of major interest,

auction firms and growers. The following sections will present the principal results of the study.

2. RESULTS OF SURVEYS OF RETAIL PRICES AND MARGINS

2.1 Introduction

The objective of these surveys was to measure the levels of retail prices for each type of retail outlet and since retail margins can be regarded as the cost of performing the retail distribution function, by relating retail prices to procurement costs further data on distribution costs can be determined, i.e. margins can be calculated.

The dimensions of the surveys of retail prices and margins carried out in February and August 1969 are described by the table below.

	<u>February</u>	<u>August</u>
No. retailers of all groups	82	42
No. days recording	14	3
No. items recorded	15	12

Samples of outlets were selected statistically using data on overall percentage margins collected during the 1967 study as a base.

The following table shows the numbers of retailers of different types in each survey.

	<u>February</u>	<u>August</u>
Supermarkets	14	7
Fruiterers	29	16
Grocer/dairies	35	17
Super fruiterers	4	2

Where possible information on the same items was recorded in

both the February and the August survey periods. This was possible for the following nine items:

Carrots	Lettuce
Celery	Onions
Cabbage	Potatoes
Tomatoes	Apples
Grapefruit	

Apricots, peaches, plums and nectarines of the February survey were replaced by kiwifruit, tamarillos, mandarins and lemons in August. In addition during February a number of substitutions were made within the survey period. In this way information was recorded on 15 items. Two further items, case apricots and case peaches were also included for short periods, the results being analysed by hand rather than by computer like all other items.

2.2 Special Features of Analysis

Two features of this analysis warrant special mention.

These are:

- (1) That allowance was made for differences in quality of different items. A numerical scale awarding points for ripeness, colour, defects and evenness of size was developed, and points for quality were awarded to each item every time its price was recorded. Items whose quality was high had their retail prices lowered and items whose quality was low had this price increased. As a result some allowance was made for quality differences although

there is no suggestion that this is a full allowance.

(2) Margins were calculated by matching the retail price recorded, with the wholesale price for exactly the same items. This procedure was more difficult for larger retailers although these retailers, by indicating when produce had been bought made it possible to still match retail prices with actual invoice prices.

2.3 Average Price Levels Between Retailers

Retail prices adjusted for quality are presented in detail in A.E.R.U. Technical Paper No. 12.

For easy comparison between retail groups results have been aggregated in Table 1 into a shopping basket cost. This required weighting items for each period by their relative importance in the shopping basket. For February this was done using as a basis the supermarket case study, which calculated sales of all items in physical terms. Dividing these sales by the total fruit and vegetable customer count during this period gave a figure which indicated the average physical sales per customer, for each item. Multiplying this figure by the quality weighted average retail prices charged by each retail outlet, gave figures in cents of the average expenditure on each item per fruit and vegetable customer. The aggregated expenditure figures for each retail group are shown for each survey period in Table 1.

With one exception the results show the same pattern for each survey period. Ignoring the super fruiterer group initially,

Table 1 Value of Average Fruit and Vegetable Sale per Fruit and Vegetable
Department Customer and Relative Cost of Market Basket

A. February

Item	Sales per Customer in Normal Sales		Grocer/ Dairies	Fruiterers	Supermarkets	Super fruiterers
	Units	Units	Cents	Cents	Cents	Cents
Carrots	0.29	lb	3.37	3.36	2.87	3.71
Celery	0.05	stk	1.18	1.27	1.35	1.35
Cabbage	0.08	ea	1.05	1.07	0.95	0.97
Tomatoes	0.26	lb	5.95	5.72	5.16	5.27
Lettuce	0.06	ea	0.8	0.79	0.70	0.70
Onions	0.38	lb	3.82	3.73	3.37	2.85
Apricots	0.08	lb	1.95	2.12	1.89	1.99
Peaches	0.04	lb	0.81	0.85	0.76	0.79
Nectarines	0.01	lb	0.23	0.24	0.21	0.23
Plums	0.02	lb	0.41	0.50	0.43	0.47
Strawberries	0.02	pun	0.81	0.79	0.73	0.74
Grapefruit	0.05	lb	1.03	1.05	0.99	0.96
Potatoes	1.46	lb	6.36	7.36	5.93	6.42
Apples	0.05	lb	0.95	0.96	0.94	0.86
Total Basket			28.00	29.81	26.28	27.31

B. August

Carrots	0.30	lb	1.91	1.98	1.80	1.20
Celery	0.02	stk	0.41	0.50	0.48	0.59
Cabbage	0.17	ea	2.99	3.24	2.75	2.62
Tomatoes	0.02	lb	1.29	1.35	1.18	1.21
Lettuce	0.03	ea	1.07	1.07	0.89	0.99
Onions	0.26	lb	1.56	1.48	1.30	0.81
Potatoes	2.12	lb	9.22	8.65	8.45	5.57
Kiwifruit	0.03	lb	0.82	1.00	0.84	0.65
Tamarillos	0.03	lb	0.81	0.83	0.75	0.73
Mandarins	0.01	lb	0.29	0.37	0.34	0.31
Lemons	0.02	lb	0.51	0.49	0.44	0.33
Grapefruit	0.03	lb	0.68	0.76	0.72	0.45
Apples	0.45	lb	6.67	6.96	6.86	6.30
Total Basket			28.23	28.68	26.80	21.76

supermarkets show the lowest level of retail prices (adjusted for quality), the grocer/dairy group is next, and the fruiterer group highest, in each survey period. This result is also consistent among individual fruit and vegetable items. Once again ignoring the super fruiterer group, supermarkets had the lowest prices for twelve of the fifteen items.

The distinction between the grocer/dairy group and the fruiterer group is less clear cut. If anything the quality adjustment scale erred on the side of taking insufficient recognition of quality. Complete adjustment for quality, if it were possible, may have evened the basket costs in the two periods for these groups. The costs for these two groups do not differ greatly in the August period, although they are 1.81 cents higher for fruiterers in the February period.

The inconsistency in the super fruiterer group results between survey periods is a result of a sampling error.

In the February survey a 100 per cent sample was taken of this group. Because of limitations in sampling size (there are only four retailers in the group), the same sized sample should have been taken in August. However because of the geographical distribution of the group it was decided that the additional cost of surveying all four rather than two of these outlets in August was too great.

When only two of this group were surveyed in August, the market basket cost was very markedly cheaper than that of supermarkets, over 5 cents cheaper in fact. This group was also

cheapest for 9 out of 13 items.

In summary, supermarkets charged lowest prices in general. The grocer/dairy group and the fruiterer group both charged higher prices. Fruiterers' prices, after some adjustment has been made for quality, were slightly higher than those of grocer/dairies. Some elements of the super fruiterer group charge notably lower prices than all other groups (this was probably so even for February).

2.4 Retail Margin Analysis

Retail margins calculated are shown in detail in A.E.R.U. Technical Paper No. 12. These tables show margins between the non quality adjusted retail price and wholesale price.

In addition to auction margins, these tables show landed margins (the margin between retail price and the price at the shop door when the retailer did not do his own buying). Only the grocer/dairy group and some fruiterers bought fruit and vegetables in this way.

The margins have also been presented in the form of percentages markups in Table 2.

This table shows that in both survey periods the super fruiterer group had more of the survey items whose average auction margin was lowest. The supermarket group had most items in second lowest position while the fruiterer group most often had the highest or second highest auction margin. The grocer/dairy group's rankings of margins were widely spread, with a slight majority being in the second

Table 2

Average Percentage Markups for Different
Retailers (not adjusted for quality)

A. February

Item	Unit	<u>Grocer/Dairies</u>		<u>Fruiterers</u>		<u>Supermarkets</u>		<u>S/fruiterers</u>		<u>Overall</u>	
		<u>Auction</u>	<u>Landed</u>	<u>Auction</u>	<u>Landed</u>	<u>Auction</u>	<u>Landed</u>	<u>Auction</u>	<u>Landed</u>	<u>Auction</u>	<u>Landed</u>
Carrots	lb	154.7	105.1	230.0	262.4	102.1		157.5		168.9	115.2
Celery	stk	64.4	24.4	64.1	46.6	68.1		48.2		63.8	39.5
Cabbage	ea	111.1	68.5	167.7	105.9	137.7		233.9		147.6	72.2
Tomatoes	lb	73.4	54.0	79.7	55.3	62.1		63.5		73.7	54.2
Lettuce	ea	109.6	80.8	146.6	73.1	118.6		128.1		130.6	80.3
Onions	lb	135.6	100.0	152.9	106.4	57.5		150.8		123.9	100.4
Apricots	lb	71.4	55.2	88.4	88.6	75.9		77.8		81.3	58.5
Peaches	lb	85.3	70.0	99.7	83.7	73.7		72.2		88.8	71.6
Plums	lb	78.4	73.4	83.0	54.6	61.1		63.3		75.6	68.9
Apples	lb	45.9	33.4	50.6	27.6	55.4		31.5		49.6	32.7
Strawb.	pun	45.3	25.8	42.3	17.7	37.1		39.3		41.5	22.6
G/fruit	lb	66.2	54.1	66.2	75.2	60.5		51.7		64.1	57.0
Carrots	bnch	60.4	49.4	96.0	57.2	77.1		71.2		80.7	49.9
Potatoes	lb	113.1	84.1	113.9	138.0	41.3		53.8		92.5	87.8
Nectarines	lb	96.2	64.7	88.4	89.1	78.4		65.9		85.9	67.3

B. August

Carrots	lb	184.5	104.2	323.7	235.4	75.4		405.1		210.1	125.7
Celery	stk	37.5	25.5	61.6	93.0	60.7		24.6		53.2	39.2
Cabbage	ea	63.6	68.2	69.6	32.5	73.7		66.6		68.4	57.6
Tomatoes	lb	35.5	21.1	44.7	33.3	30.7		29.0		39.3	24.9
Lettuce	ea	25.6	24.8	45.2	41.6	41.1		34.2		39.8	31.8
Onions	lb	235.7	188.3	221.3	149.3	104.1		146.9		196.1	178.1
Kiwifruit	lb	71.9	51.5	46.1	31.5	40.7		22.6		47.4	46.1
Tamarillos	lb	58.5	69.1	60.9	36.6	39.1		35.1		54.1	60.2
Mandarins	lb	48.4	38.0	51.1	45.9	49.4		28.0		48.6	40.6
Apples	lb	60.7	51.6	60.3	47.1	63.5		71.9		61.5	50.6
Lemons	lb	86.7	71.8	96.7	123.4	61.9		53.3		85.0	79.5
G/fruit	lb	36.3	28.1	48.0	44.1	72.7		40.7		49.4	39.1
Potatoes	lb	145.3	138.9	138.4	113.1	62.7		31.5		118.6	132.0

highest position.

Items with lower wholesale prices (for normal sales units) showed higher average markups. The overall average auction prices for carrots, cabbage, lettuce, onions and potatoes were all less than 10 cents per normal retail sales unit in February. These items all show markups of greater than 100 per cent. However differences do exist among them between different types of retail outlet. For potatoes, in the case of supermarkets and super fruiterers, the average markup was 41.3 per cent and 53.8 per cent respectively, while for onions these markups were 57.5 per cent and 150.8 per cent. For onions then, the super fruiterer group markup was in the same range as the grocer/dairy and fruiterer group.

A similar pattern was exhibited during August. At this time of the year only carrot, potato and onion wholesale prices were low for normal retail sales units. Only these items had average markups of greater than 100 per cent. Exceptions among retail outlets were apparent for super fruiterers for potatoes, and supermarkets for carrots.

Table 1 also shows that carrots, onions and potatoes were among the major volume sellers at both times of the year. It would appear from this evidence that supermarkets especially, and super fruiterers, recognised their volume sellers and tailored their merchandising policies to suit this, for despite the fact that wholesale prices were low, the percentage markups were very significantly lower than those of the other groups.

The pattern among other fruits and vegetables is less evident but it could be said in general that these margins for grocer/dairies and fruiterers appear to be at a slightly higher level than those of supermarkets and super fruiterers.

A look at margins in absolute terms enables further comment about the relative levels between items, since they should in a way, be construed as reflecting relative costs of marketing. The auction margins relate to the cost of buying, transporting to store, selling, and recording a profit for any particular item.

In February, the most striking result is the level of stone fruit margins. The average cost as defined above for apricots, peaches, plums and nectarines was in the range of 10c/lb where these fruits were sold loose. This makes an interesting comparison with margins per case recorded for case lot sales of peaches and apricots over the same period. These margins, in cents per half case, are shown in the following table.

<u>Case Fruit Margins (cents/half case)</u>			
<u>Item</u>	<u>Fruiterers</u>	<u>Supermarkets</u>	<u>Super fruiterers</u>
Peaches	45.44	43.25	26.25
Apricots	40.00	48.42	30.83

Two points arise from this table. The first is a comparison between case lot margins and per pound margins. Given an overall margin figure of about 40 cents per half case the margin per pound would be only slightly greater than 2 cents, a very significant reduction in marketing cost from the 10c/lb noted earlier for loose fruit. This

is a reflection partly of the effect of volume selling, and the reduction in risk of wastage which has been partly passed on to the buyer.

The other point is that the margins for the super fruiterer group are very much lower than for the other two outlets. Once again this is partly a reflection of the volume of this business done by this group. A very large proportion of their business is also in case lots.

The average level of margins for kiwifruit, tamarillos and mandarins, like the stone fruit, is around the 10c/lb mark, but presumably without the same deterioration risk.

For items present in both surveys the margins for celery, cabbage, onions, grapefruit and potatoes were about the same in either period. The margins for tomatoes and lettuce were very much higher in August. The margin for carrots was significantly lower in August, while the margin for apples was slightly down.

The following table summarises average overall margins between retail price and auction price in cents per normal retail unit for each survey period. (Table on p.16).

2.5 Procurement Cost Analysis

The auction prices paid and/or the prices paid for survey items at the shop door were observed in the retail price surveys. From these auction prices, Table 3 has been produced showing the relative wholesale expenditures, for a parcel of goods made up in

Overall Auction Margins (cents/unit)

<u>Item</u>	<u>February</u>	<u>August</u>
Carrots/lb	6.08	3.74
Celery	9.71	8.36
Cabbage	7.13	7.04
Tomatoes	8.59	18.21
Lettuce	6.75	9.46
Onions	4.62	3.47
Apricots	10.63	-
Peaches	9.17	-
Plums	9.21	-
Strawberries	11.17	-
Grapefruit	7.77	7.80
Carrots/bunch	6.13	-
Potatoes	2.33	2.36
Nectarines	10.25	-
Kiwifruit	-	9.75
Tamarillos	-	9.59
Mandarins	-	11.11
Lemons	-	10.79
Apples	6.18	5.73

the proportions indicated, by each retail outlet.

The relative proportions of items are by weight. This table shows proportions only among the survey items listed, not for all fruit and vegetable items sold. The most notable feature of these proportions, is the dominance of potatoes as the major product item in both survey periods.

The purpose of the analysis of procurement costs was to investigate whether any particular retail group paid lower prices at auction for their produce. In particular, do larger buyers buy at any advantage through the auction system? Both February and August results suggest that this is so. The weighted expenditure of the super fruiterer retailers was 12.5 per cent less than the next highest group in February (439 versus 502) and 5.6 per cent less during August (435 versus 467).

Before further comment on this advantage which the super fruiter group have through their large volume of purchases (they are larger buyers than supermarkets, with average weekly retail sales in 1967 being \$820 versus \$515 for supermarkets)¹, it would be wise to see with which items their advantages lie. A glance at potatoes shows that in February 38 units of their total 63 units advantage over supermarkets lies with this item, and 26 of their 32 unit advantage over supermarkets in August lies with this item.

1. This result came from the 1967 study, Fresh Vegetable Retailing in New Zealand - An Economic Survey. A.E.R.U. Research Report No. 50.

Table 3

Relative Expenditures at Auction by Different Retail
Outlets (Weighted by Proportion of Purchases)

A. February

Item	Unit	Percentage of Total purchases of Listed Items	Grocer/ Dairies	Fruiterers	Supermarkets	Super fruiterers
Carrots	lb	10.2	40.1	30.7	32.4	26.3
Celery	stk	1.8	26.1	27.0	28.0	28.3
Cabbage	ea	2.8	15.5	13.3	13.1	8.5
Tomatoes	lb	9.1	110.8	105.5	101.8	104.4
Lettuce	ea	2.1	11.8	10.7	10.7	9.2
Onions	lb	13.3	52.1	44.2	45.2	30.8
Apricots	lb	2.8	36.8	37.4	35.2	34.1
Peaches	lb	1.4	14.1	14.5	14.9	14.4
Plums	lb	0.7	7.3	8.8	8.9	9.5
Apples	lb	1.8	22.4	22.7	21.9	22.0
Strawberries	pun	0.7	19.4	19.0	18.5	17.4
Grapefruit	lb	1.8	21.2	22.1	21.6	22.1
Potatoes	lb	51.2	129.0	143.3	145.4	107.5
Nectarines	lb	0.4	4.4	4.9	4.6	4.9
Total		<u>100.0</u>	511.0	504.2	502.2	439.4

B. August

Carrots	lb	9.9	14.7	12.6	12.8	7.8
Celery	stk	0.5	7.1	8.1	6.9	11.8
Cabbage	ea	11.5	114.9	127.1	105.5	107.6
Tomatoes	lb	0.5	23.9	23.4	21.2	23.2
Lettuce	ea	0.8	20.8	19.5	16.2	19.7
Onions	lb	6.8	11.4	11.5	8.8	7.5
Kiwifruit	lb	0.8	12.4	19.3	15.1	15.5
Tamarillos	lb	0.8	13.9	14.3	14.1	14.8
Mandarins	lb	0.3	6.1	7.3	6.6	7.4
Apples	lb	11.7	107.3	112.8	106.9	95.2
Lemons	lb	0.5	6.6	6.3	6.4	5.5
Grapefruit	lb	0.8	12.9	13.7	10.7	8.4
Potatoes	lb	55.2	121.4	103.2	136.3	110.4
Total		<u>100.0</u>	473.4	479.1	467.5	434.8

Their major advantage lies then, in a commodity which is not auctioned at all but sold by treaty. Of the remaining thirteem items in February this group had a buying advantage over supermarkets for seven. The advantage was significant for carrots, cabbage and onions. Of the twelve items, other than potatoes in August, the super fruiterer group had a buying advantage over supermarkets for only five. This advantage was significant for carrots again, onions, less so than February, and apples for which they had no advantage during February.

From this summary it would appear that the auction system price forming process gives no discount to the large buyer, but that large buyers do get an advantage on hard lines of fruits and vegetables which commonly are sold on treaty rather than under the hammer.

The buying advantage, which the super fruiterer group has, was passed on in the case of potatoes in both survey periods where their markups were relatively low. However for carrots in both periods, cabbage in February, onions in both periods, and apples in August, markups were high, indicating that this group formed prices in relation to ruling retail prices rather than in relation to wholesale prices.

The relative expenditures of the other three groups were in total fairly similar. However, they did bear the same relationship to each other, with the grocer/dairy group having the highest expenditure in February, next were fruiterers and slightly lower were supermarkets. In August the position of

grocer/dairies and fruiterers was reversed, while supermarkets were still the lowest.

Comparison of the average auction and landed prices gives some indication of the cost of having produce bought and delivered by agents who provide these services. Results of an analysis of this cost will be presented in the costs and efficiency studies later in this publication.

2.6 Quality Ratings

The following table shows the quality rating, averaged over all items for each group, and for each survey period.

Average Quality Ratings

<u>Survey Period</u>	<u>Grocer/Dairies</u>	<u>Fruiterers</u>	<u>Super-markets</u>	<u>Super fruiterers</u>
February	14.86	15.37	15.30	15.25
August	15.49	15.89	15.81	16.06

The average quality ratings during February showed little difference between fruiterers (highest), supermarkets, and super fruiterers (lowest). However these three groups had very noticeable higher quality items than the grocer/dairy group.

The pattern was roughly similar in August where again the grocer/dairy group had a significantly lower average. In August however, the reduced sample size of super fruiterers resulted in this group having the highest, rather than the lowest quality average of the three top groups.

The general level of quality averages was notably higher in August than in February. This was probably a function of:

- (a) The better storage conditions climatically at this time of the year.
- (b) The different composition of the survey items in either period. The highly perishable stone fruits and strawberries of February were replaced by kiwifruit, tamarillos and mandarins.

3. COSTS AND EFFICIENCY STUDIES

The survey results of the costs and efficiency studies were analysed in two parts. Results for all retail groups will also be presented in these two parts which were:

- (1) Total store operations
- (2) Fruit and vegetable operations only

The total sample size for each study was 35. This was constituted as follows:

Supermarkets	12
Fruiterers	10
Grocer/dairies	11
Super fruiterers	2

3.1 Total Store Operations

The results of this study are summarised for each retail group in Table 4. This table has three sections. Section A shows costs per dollar of sales in three categories. Only the third category includes costs whose values vary directly with the level of sales. The other two categories contain costs whose values are fixed, to varying degrees as the level of sales varies. Profitability ratios in Section B show that profits have been calculated as a return to the manager. For this reason charges against capital, rent, depreciation, interest and repairs and maintenance have been included in the costs listed

Table 4 Whole Store Expense Ratios Productivity Ratios and Profitability

A. Expenses as a Percentage of Sales

<u>Fixed</u>	<u>Super-</u> <u>markets</u>	<u>Fruiterers</u>	<u>Grocer/</u> <u>Dairies</u>	<u>Super</u> <u>Fruiterers</u>
Rates and Rent	1.50	1.91	1.49	1.24
Depreciation	0.68	0.56	0.39	0.26
Interest	0.66	0.86	0.76	0.21
Insurance	<u>0.14</u>	<u>0.17</u>	<u>0.14</u>	<u>0.24</u>
Sub Total	<u>2.98</u>	<u>3.51</u>	<u>2.80</u>	<u>1.97</u>
<u>Discretionary</u>				
Salaries	0.04	-	-	-
Telephone	0.05	0.18	0.16	0.21
Composite	0.51	0.57	0.41	0.97
Maintenance	0.26	0.70	0.30	0.12
Advertising	1.10	0.28	0.19	0.37
Electricity	0.49	0.60	0.48	0.19
Vehicle	0.06	0.67	0.39	1.30
Wages	<u>6.43</u>	<u>5.94</u>	<u>4.61</u>	<u>6.75</u>
Sub Total	<u>8.94</u>	<u>8.97</u>	<u>6.55</u>	<u>9.94</u>
<u>Variable</u>				
Packaging	1.35	0.17	0.02	0.08
Delivery into store	0.08	-	-	-
Buying charges	<u>-</u>	<u>-</u>	<u>0.08</u>	<u>-</u>
Sub Total	<u>1.43</u>	<u>0.17</u>	<u>0.10</u>	<u>0.08</u>
Total Expenses	<u>13.35</u>	<u>12.67</u>	<u>9.48</u>	<u>12.01</u>
Total Expenses after Adjustment for Managerial Inputs	13.91	19.12	13.35	17.16
<u>B. Profitability</u>				
Percentage Gross Profit	18.63	21.34	15.58	22.60
Management Surplus as % of sales	3.77 ¹	9.77	6.09	11.68
Manager's Earning Rate in Dollars per hour	8.881	1.260	0.933	3.855
<u>C. Productivity Ratios</u>				
Sales per ft ² selling area	\$117.83	\$115.21	\$87.80	\$161.26
Sales per ft ² total area	\$73.48	\$61.15	\$67.52	\$86.26
Sales per man hour (\$)	\$15.57	\$6.29	\$8.13	\$5.29

1. Supermarket costs include group service charges.

in Section A, often at standard rates.¹

3.2 Costs Analysis

3.2.1 Total Fixed Costs. The first sub total in Table 4 is a reflection of average fixed costs. These indicate that only fruiterers have higher levels of average fixed costs than supermarkets. Even though the difference between supermarkets and the outlets with lower average fixed costs may be discounted somewhat because of higher site rental figures and better site quality, these figures do nothing to indicate that supermarkets achieve economies because they are larger than other outlets or because they operate on a different production function. In fact because supermarkets operate on a different production function their average fixed cost load is likely to be greater because many fixed costs are associated with more intensive capital usage.

The other major point of interest in discussing average fixed costs is the relatively low level of fixed costs recorded by super fruiterers. This is largely because of their lower levels of capital in terms of both buildings, and plant and equipment, and because of the relatively low levels of stocks required in a produce operation.

1. A full description of standardisation procedures is to be found in "The Economics of Fresh Fruit and Vegetable Retailing in New Zealand - an Economic Survey", A.E.R.U. Technical Paper No. 12.

3.2.2 Discretionary Fixed Costs. The second major group of costs for overall store operations are those costs which have been described as discretionary fixed costs, i.e. from salaries to wages in Table 4.

The salaries recorded for supermarkets are payments to office help only, and do not include payments to management.

The sub total for this group of costs shows average discretionary costs to be highest for super fruiterers (Table 4). Then come fruiterers followed closely by supermarkets, while grocer/dairies are substantially lower than all others.

The wages cost for super fruiterers and supermarkets is the main cause of their higher costs. Over all retailers the average wage cost as a percentage of discretionary fixed costs is 68.76 per cent and as a percentage of all costs is 49.94 per cent. With wages being of such a magnitude it is desirable to investigate more closely reasons for the differences between retail outlets.

3.2.2.1 Wages A major reason for the difference was found to lie in the average hourly wage rate. These rates were calculated as follows:

	<u>Super-</u> <u>markets</u>	<u>Fruiterers</u>	<u>Grocer/</u> <u>Dairies</u>	<u>Super</u> <u>Fruiterers</u>
Average hourly wage rate (\$)	1.00	0.78	0.69	0.64

If, instead of using actual and imputed wage payments to all staff apart from the manager, payments were imputed to all

hours worked, including the manager's hours, at a standard rate of seventy cents per hour, the wages percentages would change substantially to the following figures.

	<u>Super-</u> <u>markets</u>	<u>Fruiterers</u>	<u>Grocer/</u> <u>Dairies</u>	<u>Super</u> <u>Fruiterers</u>
Adjusted wages as a percentage of sales	4.57	11.11	8.61	13.23

This adjustment works to the advantage of supermarkets for two reasons. The first is a difference of thirty cents an hour in the wage rate. The second is that a large proportion of total hours worked, for fruiterers and grocer/dairies in particular, had been excluded in order to impute a management surplus. The inclusion of these hours meant that the labour costs for these two groups was increased substantially. If the adjustment allowed for only the inclusion of managerial hours at the average wage rate for the retail type (i.e. supermarket \$1.00 per hour, fruiterers 78c/hour etc.), discretionary costs would be as follows:

	<u>Super-</u> <u>markets</u>	<u>Fruiterers</u>	<u>Grocer/</u> <u>Dairies</u>	<u>Super</u> <u>Fruiterers</u>
Average discre- tionary fixed costs after adjust- ment for managerial wages (cents/dollar of sales)	9.57	15.42	10.42	15.09

This adjustment makes a very considerable difference to the result. Now supermarkets have the lowest average labour cost even at a wage rate of over twenty cents per hour higher than the next

highest retail group. The only other change of significance is that the average discretionary fixed costs of fruiterers is now marginally greater than super fruiterers. The average discretionary fixed cost for the grocer/dairy group has also increased substantially although it remains considerably below that for fruiterers and super fruiterers.

3.2.2.2 Other Discretionary Fixed Costs Other factors which are notable among discretionary fixed costs are:

- (1) Advertising. For supermarkets this is substantially higher than for any other outlet. Subsequent analysis of advertising costs for supermarkets showed that higher advertising costs were associated both with higher margins and lower levels of total costs. The interpretation put on this was that more advertising lowered average total costs by encouraging greater utilisation of facilities by customers but that the benefits of these lower costs accrued largely to retailers in the form of higher margins.
- (2) The low ratio for supermarkets of telephone costs by comparison with other outlets. This is noteworthy because it indicates how overhead costs can be spread by producing large outputs.
- (3) The electricity cost ratio for super fruiterers is substantially below that of other retail groups. This is very likely an indication of the non capital intensive nature of their production process.

(4) The super fruiterer group has a substantially higher vehicle expense ratio than other groups. The explanation lies largely in the scale of their buying of fruit and vegetables.

3.2.3 Variable Costs The important information available from Table 4 about this cost category is that variable costs, notwithstanding the fact that they are likely to be understated, are a relatively minor part of total costs as is shown below.

	<u>Super-</u> <u>markets</u>	<u>Fruiterers</u>	<u>Grocer/</u> <u>Dairies</u>	<u>Super</u> <u>Fruiterers</u>
Variable costs as a percentage of total costs	9.56	1.34	1.05	0.66

The average over all groups for this percentage was 3.44 per cent. The supermarket percentage is substantially higher than that of other groups. The reason is partly that only supermarkets were able to provide data on all packaging costs which were largely included in the cost of stocks for sale by other outlets. The figure for supermarkets is therefore a better indicator of variable cost levels than figures for other groups.

3.2.4 Total Expense Ratios as Indicators of Efficiency The total expense figures shown in Table 4 indicate that supermarket costs as a percentage of sales are greater than for all other retail groups. Like the sub totals for discretionary fixed

costs, this figure is misleading for it ignores the input of managerial labour which is extremely significant for smaller retail outlets. When managerial labour inputs are included at the average wage rate for the relevant group, total costs as a percentage of sales are as follows:

	<u>Super-</u> <u>markets</u>	<u>Fruiterers</u>	<u>Grocer/</u> <u>Dairies</u>	<u>Super</u> <u>Fruiterers</u>
Total costs as a percentage of sales after adjustment for managerial wages	13.91	19.12	13.35	17.16

As with discretionary fixed costs, the adjustment for managerial labour substantially changes the ranking of this variable between different types of retail outlet. Now fruiterers show higher costs as a percentage of sales than other groups while the grocer/dairy group has the lowest total expense ratio, with supermarkets being only slightly higher. These total expense ratios could be regarded as indicators of relative efficiency only under the following conditions:

- (1) where similar prices are paid for inputs of the same quality by different retail types;
- (2) where each retail type produces a similar quality and mix of products;
- (3) where each retail type produces a similar quality and mix of services.

3.2.4.1 Input Prices and Quality The point has already been

made that supermarkets pay considerably more for labour inputs than other retail types. It is also notable that the quality of labour used may be higher for supermarkets, but not as high as the differential in wage rates would suggest. In this respect supermarket efficiency would have been understated.

A further feature of input costs noted in Table 4 is that packaging costs have been included largely for supermarkets only, other retail types including these in the cost of goods for sale. If a figure of 0.1 per cent (similar to other retail groups) of sales only were included for supermarkets then a total cost ratio of 12.80 would have been recorded for supermarkets, a figure lower than other groups (grocer/dairies are next highest at 13.35).

3.2.4.2 Product Quality and Mix The quality of grocery products can be regarded as being similar for all types of retail outlets. A can of beans is the same wherever it is bought. Differentials in fruit and vegetable quality have been noted, the main point of note being that the grocer/dairy group stocked fruit and vegetables substantially lower in quality rating than the other three groups.

As only supermarkets have butchery departments no quality comparisons are possible for meat. However this represents a significant difference between retail groups in product mix. This invites the question; "in which direction would total costs be biased because of the inclusion of costs associated with meat handling?" An indication of this is available from data used for

the case study. This shows direct wage costs as a percentage of sales for each of the four departments within the supermarket as:

	<u>Grocery</u>	<u>Meat</u>	<u>Produce</u>	<u>Delicatessen</u>
Direct wages as a percentage of sales	5.4	10.7	15.1	5.7

This would indicate that the addition of meat to groceries in the product mix would strongly bias distribution costs in an upwards direction if only wage costs were considered, and this firm were representative.

At the same time if the order of the wage ratios stated above is consistent between stores, then because of the very high wage percentage figure quoted for produce, it is likely that total cost ratios for retailers more specialised in fruit and vegetable retailing are biased upwards considerably compared to an enterprise which handles only grocery goods.

The ultimate effect of differences in quality and product mix then, if cost ratios are used as a measure of efficiency, would be to reduce the ratios of super fruiterers, fruiterers and supermarkets relative to grocers. After allowing for this variable supermarkets would have been proven more efficient than other retail outlets.

3.2.4.3 Service Quality and Mix The question of quality and mix of services provided by different retail types is a vexed one, involving complicated non quantifiable welfare issues. Each type

of retail outlet provides services unique in some way which help to differentiate its product from that of other retailers.

It is not possible to say that costs, as indicators of efficiency, should be weighted in any particular direction because of differences in consumer services because in only a few cases is it possible to put values on these services. The services provided by different retailers are largely non quantifiable aspects of a retailer's offer and should be assumed to have a neutral effect on the use of relative costs as a measure of efficiency.

3.2.5 Productivity Ratios as Indicators of Efficiency If in using relative cost levels as a measure of efficiency allowances are made for differences in input prices, if data is standardised, if allowances are made for differences in quality and mix of products and services, then supermarkets would appear to be more efficient than other retail outlets in the overall food retailing function.

A more meaningful measure of the efficiency of retailers of different types is a measure of physical output as a ratio of physical inputs, usually labour and capital. A measure of physical output for retailing is clearly not possible because of the multiplicity of products which form the output.

In the present case output is measured as dollars of sales. The best proxy available for physical capital is the floor area of the retail unit. Both sales per square foot selling area and per

square foot total area are shown in Table 4.

A physical measure of labour is less difficult. Total man hours of input is the common measure. This measure was used in this analysis also.

Table 4 indicates that the super fruiterer group is the most efficient user of capital, measured in both selling area and total area, with the supermarket group being next most efficient. It also indicates that fruiterers are more efficient than grocer/dairies in using capital measured in selling area but that the position is reversed when capital is measured as total area.

In efficiency of labour use, supermarkets proved to be substantially ahead of any other retail outlet, followed by grocer/dairies, fruiterers, and super fruiterers in that order.

These results lend support to the results indicated when total costs were used to indicate the relative efficiency of different types of retail outlet. Supermarkets, when efficiency is measured by the productivity ratios above, also appear to be more efficient in resource use than other retail outlets. Grocer/dairies, when efficiency is measured on both scales would appear to be next most efficient followed by the fruiterer group. The status of the super-fruiterer group is less clear. This group is substantially more efficient in capital usage than other retailers but least efficient in labour usage. The average total cost of this group is lower than fruiterers but substantially higher than the other two groups. But as the case study results indicate that produce operations are substantially higher labour users than other operations, a correction

for differences in product mix would improve the efficiency rating of this group relative to the fruiterer group.

3.2.6 Profitability Ratios Table 4 also presents results of an analysis of profitability ratios. The percentage gross profit ratios show the grocer/dairy group to have the lowest figure and the super fruiterer group the highest. Supermarkets have second lowest gross profit ratios. These results are as would have been expected on the basis of differences in output. The gross profit ratios noted for different departments in the case study supermarket were as follows:

	<u>Grocery</u>	<u>Meat</u>	<u>Produce</u>	<u>Delicatessen</u>	<u>Total</u>
Gross profit as a percentage of sales	15.9	25.2	33.3	18.8	19.6

From these figures it would be expected that outlets whose output is biased towards hard grocery lines would have lower margins and those biased towards produce items would have higher margins.

These figures are also in line with the major single cost in retailing, labour. The greater the diversification from pure grocery operations to produce operations the greater is the average labour cost and the greater is the gross margin.

When management surplus is imputed as a residual it is its absolute size which is significant rather than its ratio to sales. The average absolute management surplus figure was greatest for supermarkets. Then came super fruiterers, fruiterers and grocer/

dairies in that order.

Table 4 also shows that the substantial manager's surpluses for supermarkets and super fruiterers are maintained on an hourly basis but hourly returns for fruiterers and grocer/dairies were substantially lower.

3.2.7 Summary of Analysis of Whole Store Operations The major conclusion from this section of the study is that, when appropriate allowances are made for differences in types of operation, super-marketing performs well in terms of criteria of performance used. These criteria indicate that supermarkets are the most efficient users of most resources and have higher levels of profit than other groups of retailers. On the same criteria of performance, grocer/dairies and super fruiterers would rank next and fruiterers would be ranked lowest.

3.3 Fruit and Vegetable Operations Only

For stores which stocked items other than fruit and vegetables the calculation of fruit and vegetable costs required allocation of some costs shared by the whole store. The techniques used to allocate costs are described in greater detail elsewhere.¹ These techniques were based partly on a detailed study conducted in the case study supermarket and each cost was allocated in a way which seemed to best

1. "The Economics of Retailing Fresh Fruit and Vegetables with Special Reference to Supermarkets," A.E.R.U. Technical Paper No. 12.

reflect relative resource usage. For example rental charges were allocated in proportion to floor area used, depreciation in proportion to plant and fittings value, and advertising in proportion to newspaper space used. A very small proportion of costs was allocated using proportion of sales as a base. The major cost, wages, was in most cases calculated directly for fruit and vegetable operations.

Where estimation or allocation of costs is required, resultant costs will be less than perfect indicators of resource usage by fruit and vegetable operations. However, the background of the case study and the skill of managers in assessing resource usage would assist in minimising errors. Nevertheless the results of the study of fruit and vegetable operating costs cannot be viewed with the same confidence as results of total store cost analysis.

3.3.1 Results for Fruit and Vegetable Operations Only These results

presented in Table 5, are almost analagous to those presented in Table 4 for whole store operations. Major points of differences are:

- (1) The management surplus for all but supermarkets and super fruiterers is not a meaningful concept for fruit and vegetable operations alone, because with other groups some estimates of labour costs were needed and to be realistic these estimates required the inclusion of managerial labour. Hence calculation of a managerial surplus is not possible. For this reason profitability ratios also list estimated net profit as a percentage of sales. For this calculation estimates of the store manager's contribution to fruit and vegetable operations were included in wages for supermarkets and

super fruiterers.

- (2) Included in productivity ratios in Table 5 are estimated buying and delivery costs for produce. These were analysed in a standard form separate from expense ratios and include actual payments to resources employed outside the firm to perform these functions, and times and mileages calculated out at standard rates where these resources were internal to the firm.
- (3) Estimated packaging costs included under productivity ratios, represent physical usage of packaging materials calculated out at standard rates.

3.3.2 Fixed Costs For fruit and vegetable operations alone supermarkets exhibit the second highest level of fixed costs (Table 5). Only fruiterers have higher average fixed costs. The fixed cost level of supermarkets reflects largely the greater capital intensity of supermarket fruit and vegetable operations. This is a result of expensive cool storage facilities, sophisticated produce display stands and packaging equipment, as well as machines for waste disposal.

The average fixed cost noted for super fruiterers is almost half that of supermarkets despite the fact that they have more plant and equipment than the average supermarket. This is because their fruit and vegetable sales levels are substantially higher than the average supermarket.

Both fruiterers and grocer/dairies have higher average fixed cost levels for fruit and vegetable operations than super fruiterers.

Table 5 Fruit and Vegetable Expense Ratios Productivity
Ratios and Profitability

A. Fruit and Vegetable Expenses as a Percentage of Fruit and
Vegetable Sales

<u>Fixed</u>	<u>Super-</u> <u>markets</u>	<u>Fruiterers</u>	<u>Grocer/</u> <u>Dairies</u>	<u>Super</u> <u>fruiterers</u>
Rates and Rent	1.97	2.56	1.69	1.24
Depreciation	0.61	0.64	0.48	0.26
Interest	0.62	0.51	0.39	0.21
Insurance	0.22	0.15	0.06	0.24
Sub total	<u>3.42</u>	<u>3.86</u>	<u>2.62</u>	<u>1.97</u>
<u>Discretionary</u>				
Telephone	0.06	0.18	0.16	0.21
Maintenance	0.21	0.80	0.37	0.12
Advertising	0.75	0.28	0.19	0.37
Electricity	0.53	0.60	0.59	0.19
Wages	9.15	8.78	10.71	6.75
Composite	0.64	0.57	0.41	0.97
Allocated Wages	1.92	-	-	-
Vehicle Expenses	-	0.65	0.98	1.30
Sub total	<u>13.26</u>	<u>11.68</u>	<u>13.41</u>	<u>9.94</u>
<u>Variable</u>				
Packaging ¹	2.57	0.28	0.16	0.08
Delivery into Store	1.13		0.72	
Sub total	<u>3.70</u>	<u>0.28</u>	<u>0.88</u>	<u>0.08</u>
Total Costs	20.38	16.00	16.91	12.01

1. This is only packaging charges not included in purchases.

Table 5 (cont'd)

B. Profitability of Fruit and Vegetable Operations

	<u>Super-</u> <u>markets</u>	<u>Fruiterers</u>	<u>Grocer/</u> <u>Dairies</u>	<u>Super</u> <u>fruiterers</u>
Percentage Gross Profit	24.69	29.94	27.10	23.7
Management Surplus as % of Sales	2.01 ¹	-	-	11.68
Estimated Net Profit as % of Sales	1.46 ²	13.88	10.50	9.50

C. Productivity as a Percentage of Sales

Produce Sales/ft ² Selling Area	\$112.09	\$133.18	\$97.97	\$161.27
Produce Sales/ft ² Total Area	\$57.68	\$45.62	\$65.40	\$86.24
Produce Sales per man hour (in-store hrs only)	\$10.84	\$11.81	\$7.64	\$10.85
Estimated Buying and Delivery Cost as % of Sales (Produce)	2.62	2.89	6.58	2.09
Estimated Packaging Costs as % of sales (Produce)	2.51	3.08	2.65	2.05

-
1. Group service charges are included in expenses for management surplus calculation for supermarkets.
 2. The cost of the store manager's services to the Produce Department operation was estimated at \$300 per year.

Fruiterers have higher average costs for all components of fixed costs than grocer/dairies, a reflection of greater capital intensity. The average fruiterer has about \$1,700 worth of fruit and vegetable plant and equipment and the average grocer/dairy about \$330.

3.3.3 Discretionary Fixed Costs

Supermarkets have higher average levels of cost in this category also. This is largely because of the level of labour costs for this group. In addition to direct labour costs of 9.15 cents per dollar of sales, which is second only to grocer/dairies with 10.71 cents, supermarkets have a further 1.92 cents labour cost per dollar of sales. This is the produce department's share of the cost of operating checkout and carryout services. Further, distinct from the other three groups, supermarkets do not show a share of the input of the store manager's labour. Nor does it include any group administration charges for chain stores. These deficiencies are rectified in the profitability analysis.

However supermarket labour charges are not the only labour charges understated. Most grocer/dairies buy produce without using any internal labour resources. Their equivalent costs are usually included in the cost of the goods, for which they can therefore be expected to pay more than other groups. No allowance for the extra cost of goods is made in the cost analysis as all buying and delivery costs have been analysed separately. The buying costs for this group will be reflected in the profitability analysis. That these costs for grocer/dairies have been substantially

understated is evident from the buying cost analysis. This shows that it costs this group 6.58 cents per dollar of sales to buy fruit and vegetables, more than double the next highest buying cost.

The average discretionary fixed cost level for both fruiterers and super fruiterers is substantially lower than that for the other two groups, even before any corrections for the latter have been made (adjustments would increase these costs). The major difference is in the wage cost per dollar of sales, with super fruiterers wages being only 6.75 cents per dollar of sales (Table 5).

As with the total costs analysis discretionary costs other than wages are comparatively minor and vary little between retail groups as is shown below:

	<u>Super-</u> <u>markets</u>	<u>Fruiterers</u>	<u>Grocer/</u> <u>Dairies</u>	<u>Super</u> <u>Fruiterers</u>
Average Discretionary fixed costs other than labour costs	2.44	2.90	2.70	3.19

The largest of these other discretionary fixed costs were supermarket advertising and super fruiterers vehicle running costs.

3.3.4 Total Costs and Efficiency The analysis of fruit and vegetable costs alone means that interpretation of total average costs as an indicator of efficiency of resource use, is not complicated by gross differences in the type of produce handled. Differences within the fruit and vegetable group do exist, however, for although the 1967 survey of fruit and vegetable retail outlets indicated that

the range of produce handled by supermarkets, super fruiterers and fruiterers did not vary greatly, the grocer/dairy group had a substantially poorer range. The differential effect on costs of the limited range of fruit and vegetable items handled by grocer/dairies is likely to be biased in favour of this group for they stock predominantly less perishable items requiring a minimum of handling. A fuller range of produce items stocked by this group is therefore likely to increase their average costs.

It has also been noted that grocer/dairies stock poorer average quality fruit and vegetables. For this reason also, treatment of average costs as a measure of efficiency introduces a bias in favour of this group.

Other introductions of bias have already been noted. These include the understatement of supermarket labour costs because the store manager's labour has been excluded, the exclusion of group administration charges for supermarkets, the non-allowance for buying costs for grocer/dairies, and the inclusion of all packaging materials costs for supermarkets only.

A further difference in the mix of products exists due to closer grading of some items by some groups. This would introduce a bias against fruiterers and super fruiterers who offer many items of the same sort at a range of different prices.

Perhaps the most important factor to consider however, when costs are used to approximate efficiency, is the assumption that estimation or allocation techniques reflect resource usage by produce operations. This is so particularly for the labour costs

of grocer/dairies and fruiterers. Managers of most of these stores were able to give little guide as to labour usage in selling fruit and vegetables when items other than these were sold at the same time. A good portion of labour usage for these groups was necessarily based on estimates of only a few members of each group. Were labour not such an important single cost, this would not present such a problem.

3.3.5 Productivity Ratios After allowing for ambiguities in the presentation of results and for the effects of differences in quality and mix of produce and services, there is likely to be little difference between supermarkets and grocer/dairies as the least efficient retailers of fruit and vegetables when this is measured by average total cost levels. On this score super fruiterers are clearly the most efficient fruit and vegetable retailers. The latter conclusion is confirmed when the productivity ratios in Table 5 are examined. Of the five ratios considered super fruiterers fail to record best results on only one occasion. The fruiterer group is the most efficient user of labour, which for productivity calculations excludes buying time. Supermarkets, although only marginally less efficient in labour use than super fruiterers, are clearly inferior to these groups in capital usage where this is indicated by sales per square foot. Grocer/dairies are the least efficient users of selling space. Their higher ranking on the score of total fruit and vegetable area reflects the fact that this group rarely stores

substantial supplies of fruit and vegetables and that they handle largely items which need little preparation.

Packaging costs reflect the variation of these costs with sales, as there is little difference in their level between retail types.

3.3.6 Buying and Delivery Costs The most notable point about buying and delivery costs is the average levels of these costs for grocer/dairies compared with other outlets (Table 5).

The prices and margins study provides an indication of the level of these costs where produce is bought through semi-wholesale agents of various types. This study indicated that, where a retailer was supplied with one wholesale container of each survey item per buying day, the additional cost of having produce bought in this way rather than buying it himself would be \$4.69 per day. This means that a retailer could afford to spend \$4.69 per day as payment for his own labour or that of a member of his staff, and for using a vehicle for delivery.

Using the 12c per mile figure supplied by the Public Service Garage for all capital and vehicle running costs, and an average figure of 12 miles per day, the vehicle running costs would be \$1.44 per day.

This would leave a figure of \$3.25 to cover labour charges. If buying time were estimated at 2.5 hours per day the retailer could calculate his buying time at \$1.30 per hour, considerably above the average earning rate of members of the grocer/dairy group, whose average hourly earning rate has been calculated at 93 cents.

Furthermore the real cost to the retailer of buying his own produce is not his average hourly earning rate, but the marginal productivity of his own labour in his shop in the early morning, or the cost of employing someone to replace him for the time spent buying fruit and vegetables, whichever is the larger. The larger figure will almost certainly be the latter.

According to the above analysis it is clearly worthwhile for a retailer to buy his own fruit and vegetables provided he buys fifteen wholesale containers per buying day. The point at which it would become marginal would be when the daily cost of getting supplies from a semi-wholesaler was \$3.19. This would be at a figure of ten wholesale containers, assuming that the additional costs of getting supplies through semi-wholesalers were spread evenly over each type of produce.

This analysis ignores quality differences in produce. If poorer quality produce were supplied by these semi-wholesalers the real cost of having produce supplied in this way would be greater and the break even number of containers for which it would be economic for the retailer to buy his own produce, would be reduced.

Table 5 indicates that the average buying costs and delivery costs for grocer/dairies are 6.58 cents per dollar of sales. The sample over which this cost was measured was composed of both retailers who bought their own produce, and those who bought on a pure percentage commission basis, principally the latter. It did not include retailers who bought from semi-wholesalers of the speculative type. Had it done so it is suspected that this cost

would have been even higher.

3.3.7 Deterioration and Wastage Costs

These costs were the subject of two surveys conducted at the same time as the two prices and margins surveys.

The following table indicates the average wastage rates for individual items within three retail groups.

Waste for each Survey Item as Percentage of its Purchases

<u>Item</u>	<u>Super- markets</u>	<u>Fruiterers</u>	<u>Grocer/ Dairies</u>	<u>All Groups</u>
Carrots (lb)	1.3	8.0	NA	7.1
Carrots (bunches)	0.1	1.5	1.2	0.6
Celery	10.0	14.9	NA	11.8
Cabbage	11.5	16.3	34.4	15.8
Tomatoes	2.5	2.1	1.1	2.4
Lettuce	7.1	10.7	17.8	9.2
Onions	0	0.8	0	0.3
Apricots	4.9	7.0	17.1	7.0
Peaches	15.1	16.3	12.7	15.6
Plums	12.4	14.9	6.1	13.2
Apples	0.4	2.6	0	1.4
Strawberries	15.7	3.3	4.9	5.4
Grapefruit	11.8	3.8	0.8	5.3
Nectarines	NA	NA	9.2	9.2
All listed itmes	<u>4.44</u>	<u>7.1</u>	<u>6.9</u>	<u>6.08</u>

This table shows the wholesale value of items thrown out as unsaleable, as a percentage of the value of purchases of this item over the same period. The table indicates that for the items

considered, the supermarket group had the lowest rate of wastage and the fruiterer group the highest, although this was only slightly higher than the grocer/dairy group. The supermarket group's advantage was more pronounced for vegetables rather than fruit and especially for carrots, celery, cabbage, and lettuce. This group of items are the main items within the survey list which are put into a cooler overnight.

The grocer/dairy group had the lowest rate of wastage for six items. Their advantage was mainly in fruit and tomatoes. This is probably due in part to their low turnover of these items, and their ability to use these items in the retailer's house by immediate consumption or bottling. It is also probable that they retain fruit and vegetables in their shops for a longer period than other groups before throwing out.

The August survey of wastage was conducted over twenty-three fruit and vegetable retailers.

The wastage rates of all fruit and vegetables were as follows:

	<u>Super-</u> <u>markets</u>	<u>Fruiterers</u>	<u>Grocer/</u> <u>Dairies</u>	<u>Super</u> <u>fruiterers</u>	<u>All</u> <u>Groups</u>
Value of Wastage at wholesale prices	\$39.62	\$140.41	\$16.16	\$34.16	\$230.35
Total Sales over survey period	\$5515.00	\$5760.00	\$406.00	\$1950.00	\$13631.00
Wastage as percent- age of sales	0.17	2.43	3.98	1.75	1.68

Over all items supermarkets had easily the lowest rates of wastage. This is in agreement with the findings for only the survey

items. However over all items the position of the fruiterer and grocer/dairy groups is now reserved, while super fruiterers have lower wastage rates than either of these groups.

Most overseas sources (mainly American) quote 5 per cent as being a common wastage rate for produce in supermarkets. This figure, however, usually includes both weight loss on storage and price markdowns due to deterioration. Nevertheless, even allowing for a substantial seasonal increase in wastage in Christchurch supermarkets, and for markdowns and weight loss, the figure of 0.17 per cent would compare very favourably.

The lower loss rates for supermarkets is probably a reflection of two things. The first is that supermarkets were better equipped with cool storage facilities than other outlets except super fruiterers. The second is that supermarkets have larger turnovers than other main outlets and probably therefore have faster rates of stock turnover. It is also possible that the proportion of sales of more durable items like potatoes and onions is higher for supermarkets than other groups, fruiterers in particular, for the latter tend to specialise in more perishable items of produce.

4. COMPARATIVE DISTRIBUTION COSTS FROM GROWER TO RETAILER
DIRECT AND THROUGH NORMAL WHOLESALE CHANNELS

The costs and returns from marketing two varieties of apricots in two seasons were analysed with a view to assessing whether or not a grower selling direct to a retailer was better off or worse off, than one marketing through auction. In order to make the comparison as valid as possible, two growers from the Alexandra district were chosen. Each grower produced fruit of similar quality and marketed this in Auckland at the same time of year. The analysis was made of each grower's entire marketings of apricots to Auckland each year. For the auction seller this was 850 and 679 cases in 1968 and 1969 respectively, and for the direct seller 2000 and 2478 cases.

Net returns per case, for the auction seller, were calculated from auction receipts less the charges incurred after the Alexandra railway station. Comparisons of net returns per case for each fruit variety are summarised for each grower below:

	<u>Net Returns Per Case at Railhead Alexandra (\$)</u>			
	<u>1968</u>		<u>1969</u>	
	<u>Roxburgh Red</u>	<u>Moorparks</u>	<u>Roxburgh Red</u>	<u>Moorparks</u>
Auction seller	1.58	1.70	1.74	1.89
Direct seller	1.75	1.92	1.95	2.10

This table indicates that the direct seller has a clear

advantage over the auction seller on the basis of returns.

To investigate the reasons for the substantial advantage to the direct seller, marketing charges through either method of selling were analysed. Typical marketing charges to the point in the marketing chain where the retailer must arrange local cartage into store, are summarised below. This table may underestimate direct trading costs by showing no cooltainer costs, or costs of communicating with growers. However, the table also shows that these are likely to be minimal if they do exist for the direct trader. The major difference between each distribution method is existence of commission charges for auction trading.

Typical Marketing Charges to Railhead Auckland
for Direct Trading and to Auction Floor Auckland
(\$ per case)

	<u>Auction Trading</u>	<u>Direct Trading</u>
Freight	0.617	0.617
Commission	0.268	-
Cooltainer	0.025	-
Cartage from Rail	0.020	-
Telegrams	0.003	-
Total	<u>0.933</u>	<u>0.617</u>

The direct purchaser also has advantages. Firstly he buys his apricots cheaper than if he had paid the local auction price. The marketing charge added to the average net return for the auction

seller and direct seller indicate the cost to the buyer in Auckland. This sum for each method of trading is shown in the following table for each variety and each year.

Total Cost to Buyer in Auckland Through Each
Method of Trading (\$ per case)

	<u>1968</u>		<u>1969</u>	
	<u>Roxburgh Red</u>	<u>Moorpark</u>	<u>Roxburgh Red</u>	<u>Moorpark</u>
Auction buyer	2.51	2.63	2.67	2.82
Direct buyer	2.37	2.54	2.57	2.72

This table indicates an advantage to the direct buyer over the auction buyer of around 10 cents per case.

Secondly, he buys the produce at a known price and is thus able to advertise extensively using this known price as a basis. Thirdly, he has to pay only the cost of carting the fruit from the nearest railhead into store and not from a congested central auction floor area into store. There may well be a significant advantage here.

The evidence presented indicates that a reduction of the marketing costs through direct trading, for apricots from about 93 cents per case to 62 cents per case, a reduction of 31 cents per case, has resulted in an increased return to the grower of around 21 cents per case. This means that the grower has had over 70 per cent of the extra revenue available from a reduction

in marketing cost, perhaps an indication of the advantage the retailer sees himself getting by being able to pre-advertise at a known price and by receiving produce at his nearest railhead.

4.1 Price Arrival in Direct Trading

This analysis also provides clues on other factors significant in a discussion of direct selling. It indicates firstly and very significantly that the direct buyer and seller were able to make extremely accurate assessments of the average price per case for apricots in the coming season. This is especially significant in view of the difference in average price of 18 cents per case, or about 10 per cent for Moorparkes between the 1968 and 1969 seasons. It should also be remembered that this assessment has been made with very limited resources. If the retailer has been able to make an accurate assessment of the average retail price for the coming season it appears that the payment to the grower has been based on this after allowing for the freight charges and not by exercising oligopsonistic power in order to drive the grower's price down.

However, an entirely different view may be held of the extreme closeness of the average price achieved at the Auckland auction market and the price paid by the direct buyer plus his marketing charges. This view is that the direct seller and direct buyer do not accurately assess the seasons average price at all, although they may think they do, but that the price which

they decide on, plus the direct buyer's freight charges and his normal retail margin determine the price which other retailers will pay at auction. If this was so it would be expected that the average prices paid at auction would not vary greatly from day to day. Analysis of the auction seller's prices suggest that this is not so. For example, the following are the prices received by the auction seller at two different Auckland auction markets for Moorpark in the 1968 season:

Average Auction Prices (\$ per case) - 1968

<u>Date</u>	<u>Turners & Growers</u>	<u>Radley & Co.</u>
Feb. 5	3.05	-
Feb. 12	2.69	2.95
Feb. 13	-	2.43
Feb. 15	2.88	2.64
Feb. 19	2.68	2.93
Feb. 20	2.88	2.54
Feb. 21	2.92	2.40
Feb. 22	2.69	3.16
Feb. 26	2.62	1.53
Feb. 27	2.55	-
Feb. 27	2.03	-
Feb. 28	2.27	2.18
Mar. 4	-	2.10

This indicates clearly that prices varied markedly not only from day to day but between wholesale firms. These price differences cannot be explained by day to day quality and size variations to any great extent, for all sizes were commonly represented on each day and the minimum selling lot was normally 25 cases. This pattern of fluctuations was repeated for 1969 and repeated for Roxburgh Reds. This evidence suggests that direct buyers prices do not determine auction price levels. If this is so then it is likely that the direct grower and seller are able, by unsophisticated means, to assess the size and price of the crop for the coming season. This conclusion is significant when evaluations are made of the possibilities for stabilisation schemes.

5. SUMMARY

The first question to be answered by the study was whether or not Christchurch supermarkets have higher produce gross profit percentages and lower retail prices than other groups. The costs of operations survey indicated that they have lower gross profit percentages than all other groups except the super fruiterer group, with fruiterers the highest. This pattern of results was confirmed by the study of margins for individual items, conducted in the prices and margins surveys. These latter surveys also produced a similar pattern for prices of the items surveyed. Although the lowest price position changed between super fruiterers and supermarkets between survey periods, these two groups had substantially lower prices than the grocer/dairy group and the fruiterer group, which had highest prices.

Relative procurement costs for different retail types is an important variable, for it may provide an indication of the efficiency of operation of the distribution system in New Zealand. Studies made of wholesale prices paid at auction gave no indication that buyers from any particular group bought at any advantage over other groups where produce was sold under the hammer. However, for produce bought on a treaty basis through the auction system, the group of largest buyers, the super fruiterer group, bought at a distinct advantage. This was especially so for potatoes.

It was also noted that procurement costs varied markedly

at different levels of the marketing chain. For example, members of the grocer/dairy group who bought from commission buyers of various sorts, were found to pay about \$4.70 more for a parcel composed of one wholesale container of each survey item, than if they had bought this produce themselves at auction. This parcel was probably made up of poorer quality produce than they could have bought themselves. This cost was reflected in part by the figure of 6.58 cents per dollar of sales which is the cost to this group of buying produce. This figure was about double the cost for the other three retail outlets.

A further example of the influence of marketing costs on procurement costs was indicated by the comparative study of direct selling and auction selling. This indicated a net saving in marketing cost of about 31 cents per case of apricots by selling direct to a retailer¹, due largely to the avoidance of commission charges at auctions. Although the procurement cost to the retailer was around ten cents per case less than the average auction price, the major advantage of this saving went to the grower.

Margins studies have also noted features of the way in which margins are applied between different items of produce. For example, it was noted that highest percentage margins were present for lower prices goods, an indication of the degree of fixity in margins. Exceptions to this pattern were, however, noted to exist in the case study supermarket where a good deal of price discrimination was recorded. Items such as onions

and carrots, packaged in small lots and prominently displayed, had substantially higher margins than the same item in bought prepacks and displayed less obviously. It was also noted that the highest margins in absolute terms were for stone fruit and subtropical fruit sold in pound lots. For fruit sold in case lots, however, the margin was only about 20 per cent of the margin for pound lots.

The surveys of wastage losses showed supermarket losses to be rather lower than loss rates for other retail types. Highest wastage loss rates were recorded for the grocer/dairy group.

The study of costs of operation and efficiency of different retail types presents a new conflict of criteria. While for the whole store operations supermarkets are clearly more efficient than other retail outlets, in terms of both average total costs and various productivity ratios, for fruit and vegetable operations only, supermarkets are clearly inferior to super fruiterers and fruiterers. In the case study supermarket operational decisions were made largely on the basis of the performance of the whole supermarket.¹ This policy was found to be associated with a scarcity of performance data on the operations of individual departments. The criteria used for short term departmental decisions were gross profit percentage, labour costs, sales value, and total customers. Little more information was available even

1. Discussion of the case study results is to be found in A.E.R.U. Technical Paper No. 12, "The Economics of Retailing Fresh Fruit and Vegetables with Special Reference to Supermarkets".

on an annual basis. In particular, no further information was available on departmental costs. This state of affairs was found, with a few exceptions, to be general for most supermarkets surveyed.

That is, few supermarkets were interested in departmental costs other than labour. This is possibly because they feel that gross profit, sales, and labour costs provide a sufficient indication of departmental performance by themselves or because they consider all other costs fixed in any case, at least to any particular department.

Whatever the reason, however, the principal point remains that the management receive little specific economic incentive to make the operations of any particular department more efficient, although such is not the case for the whole store.

The case study also showed that a number of important decision variables are available to supermarket operators on the operations of a typical produce department. But because systems provide no information on the level of and costs of these inputs, they are ignored. Packaging materials would be very significant in this respect.

The results noted for costs and productivity ratios, for both whole store and solely fruit and vegetable operations, were reflected in profitability ratios. These indicated that supermarket managers, super fruiterers, fruiterers and grocer/dairies received hourly and total returns descending in that order. Net

profits for produce operations only, however, showed supermarkets to have the lowest profit per dollar of sales and fruiterers the highest. The grocer/dairy profit was slightly ahead of the super fruiterer profit.

5.1 Major Results in Brief

- (1) Supermarket retail prices were substantially lower than prices for all other groups except super fruiterers.
- (2) Supermarket margins over all items and for the individual survey items were lower than for other retail groups except super fruiterers.
- (3) Supermarkets are more efficient in their overall operations than other retail types, whether efficiency is measured by total cost or in terms of productivity of principal inputs.
- (4) For fruit and vegetable operations alone supermarkets are considerably less efficient than all other retailers except grocer/dairies.
- (5) Procurement cost reductions are available to large buyers, buying on a treaty basis but not under the hammer.
- (6) Distribution costs, where apricots are shipped direct from grower to retailer are substantially lower, than when produce is sold through the auction system. In the example studied the grower gained significantly from this reduction.

- (7) Distribution costs for grocer/dairies from auction to store are substantially higher than those for other retail outlets.

5.2 Conclusions

The objective of this research project has been to investigate the efficiency levels of different forms of fruit and vegetable distribution systems. The result has indicated a contradiction.

Supermarkets in their overall operations are clearly the most efficient type of retail outlet, but for fruit and vegetable operations only they are clearly much less efficient than either fruiterers or super fruiterers. In essence, supermarkets appear to be subsidising their fruit and vegetable operations by their other operations. Few however are aware of this because they lack the information to indicate it and they therefore lack the economic incentive to rectify it.

By what means are they likely to rectify it given a knowledge of the situation? They could on the one hand adopt higher margins policies. (For items which are unimportant compared with grocery lines for inter-store competition this may not mean a substantial loss of fruit and vegetable sales.) On the other hand they may search for ways in which they can use their resources more efficiently. This study has shown that although economies of size doubtless exist in fruit and vegetable handling at retail store level this is dominated by economies available by full utilisation of facilities. The incentive to

build larger and more efficient supermarkets is therefore limited. Nevertheless study has shown that efficiency gains in New Zealand supermarket produce departments are clearly available especially for labour, the dominant cost in retail distribution.¹ Which of these two courses, if any, supermarkets are likely to take to improve their produce department results is uncertain. Both options appear open.

Higher margins policies would mean welfare losses to both the consumer and the grower. The consumer will be worse off through having to pay higher prices and the grower will probably sell less at higher retail prices and will be more vulnerable to income fluctuation. Growers organisations should therefore adopt policies whose impact on market structures makes it less attractive for supermarkets to increase margins. Any policy which makes fruit and vegetable items more attractive as competitive items could be one example of this sort of policy. An important prerequisite to this would be the introduction of some price stability at wholesale level, and the adoption of packaging and quality standards.

These prerequisites are satisfied by direct trading between grower and retailer. It has also been seen that this system of distribution is cost saving for apricots at least, thus providing another argument for its adoption. This should not however be

1. "The Economics of Retailing Fresh Fruit and Vegetables with Special Reference to Supermarkets" A.E.R.U. Technical Paper No. 12.

taken as a blanket recommendation of the adoption of direct trading. Only the principles of direct trading have merit. Further, the cost savings noted for apricots may not be apparent for other produce. Savings are probably magnified for apricots because commission charges, the elimination of which gives the major distribution cost saving for this crop, are calculated on the percentage sales value of the item. This means that savings are likely to be more substantial on high unit value items like stone fruit.¹

There are also costs associated with direct trading.

Foremost among these is the probable increase in cost of distribution through the auction system when produce items suitable for distribution direct from grower to retailer are taken from the auction floor. If economies of size exist on the auction floor this reduction in throughput will result in an increase in average costs to be borne by remaining users of the auction system. Before recommendation of direct trading as a means of making fruit and vegetable items more attractive competitively, the existence of size economies in auction distribution should therefore be investigated. Nor should systems of direct trading receive blanket recommendation before

1. This also means that high unit value produce like stone fruit bear a disproportionate share of marketing charges, for on the auction floor a 20 lb case of apricots will presumably use no more physical resources than a 20 lb case of potatoes. But the latter because of their low unit value will bear only a fraction of the commission charge borne by the apricots.

more thorough investigations of possible economies available to growers through specialisation and size are made.

Finally it should be noted strongly that direct trading, if it were to become widespread, would imply an increase in bargaining power for supermarkets. Growers who contemplate direct trading on such a scale therefore should be prepared to meet this strength on their part by organising themselves into equally strong bargaining organisations.

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