

AGRICULTURAL
ECONOMICS
RESEARCH UNIT



Lincoln College

STUDIES IN COSTS
OF PRODUCTION

PROCESS PEAS & BEANS, 1974-75

by

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THE AGRICULTURAL ECONOMICS RESEARCH UNIT

THE UNIT was established in 1962 at Lincoln College, University of Canterbury. Its major sources of funding have been annual grants from the Department of Scientific and Industrial Research and the College. These grants have been supplemented by others from commercial and other organisations for specific research projects within New Zealand and overseas.

The Unit has on hand a programme of research in the fields of agricultural economics and management, including production, marketing and policy, resource economics, and the economics of location and transportation. The results of these research studies are published as Research Reports as projects are completed. In addition, technical papers, discussion papers and reprints of papers published or delivered elsewhere are available on request. For list of previous publications see inside back cover.

The Unit and the Department of Agricultural Economics and Marketing and the Department of Farm Management and Rural Valuation maintain a close working relationship in research and associated matters. The combined academic staff of the Departments is around 25.

The Unit also sponsors periodic conferences and seminars on appropriate topics, sometimes in conjunction with other organisations.

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PREFACE

Periodically the Unit has undertaken cost of production studies, sometimes as part of a research contract and sometimes as part of its internal research programme.

We are aware of the continuing debate on the legitimacy and value of cost of production surveys - in fact in this publication we briefly review the major arguments.

Our conclusion is that such surveys, when properly designed, analysed and interpreted, do fulfil a need in the primary industry sector.

It so happens that the Unit has had a number of requests recently for cost of production surveys and at present we do have suitably qualified staff to undertake such work.

Accordingly the pea and bean survey is the first of a series.

The major characteristics of individual reports in the series are that the costing approach is economical rather than excessively detailed and some attempt has been made to draw out management implications.

Owen McCarthy
Director

October 1975

PART I : COST OF PRODUCTION IN PERSPECTIVE

In both the U.S. A. and parts of Europe, cost of production studies became increasingly prevalent from before the first World War up until the 1930s. Campbell [7] believes that the history of agricultural economics began with cost of production studies. Nevertheless an increasing realisation of the limitations of the derivation and use of unit production costs for specific agricultural products occurred during the 1920s and 1930s. Hence, by 1940, the cost of production study aimed at price determination and for farm management purposes, had largely fallen into disrepute. About this time, cost of production studies increased in Australia due to the movement towards government determined prices during the war years. Thus Druce [10] notes "The hue and cry after 'cost of production' has come in this country (Australia) a quarter of a century later than it did in both Britain and the United States." Whilst the arguments regarding cost of production studies (usually involving farm surveys) had been mostly exhausted by the 1950s, surveys aimed at producing information on cost of production continued to be undertaken in most countries.

The major reason for the development of cost of production work was that it would provide a basis for product price determination. Indeed, most pressure for cost of production studies originated from the farming sector itself. Increased support for such studies has been particularly evident whenever government or statutory bodies' influences over prices for agricultural products has increased. During the first World War, as Roberts [19] indicates, government supported prices in U.S. A. stimulated demand for cost of production studies and price control in Britain during and after the first World War led to the development of costing work. Likewise, in Australia during the second World War, demand for cost of production studies increased significantly.

2.

A second reason used for the justification of early cost of production work was the potential benefits that would accrue in the field of management. Attempts were made to use comparisons of unit production costs for different enterprises to determine the best combination of enterprises that should exist on an individual farm; in addition it was advocated that comparison of unit production costs between regions could be used to establish guidelines for individual farms in specific regions.

Substantial literature is available concerning limitations of deriving a satisfactory unit production cost for a product and its subsequent use for price fixing and farm management purposes (see, for example Campbell [7], Druce [10], Crawford [8], Bennett [6] and Roberts [19]). These limitations can be usefully divided into two sets: those that referred to the technical difficulties in deriving a meaningful cost of production figure, and those that referred to the problems involved in applying cost of production figures for the two major purposes for which they had been calculated.

Technical difficulties centred around what costs should be included (e.g. rent on land), what value to place on certain costs (e.g. farm owner's labour) and the allocation of overhead costs between enterprises (e.g. machinery maintenance charges, depreciation). In addition, the variation of costs between years and between farms for the one year, created difficulties in choosing a single cost of production figure.

Once a cost production figure had been established, the value of such a figure in price fixation was considered doubtful. An important argument was that price determined many of the costs of production (via land values and so on) and not vice versa. Also, a price fixing administration usually wished to fix a price so as to obtain a desired volume of a specific product (e.g. national self sufficiency). Costs obtained in a survey were usually historical to which were added imputed values for certain items. Such costings were considered not

directly related to those costs that the farmer would be willing to incur in producing a particular volume of a specific product. For example, when guaranteed prices were re-introduced into British agriculture in 1932, prices were set, not according to an average cost of production, but as Whetham [22] states "by their effect in producing certain quantities of output". Also of major importance to the price fixer was the lag dictated by the collection of historical data and the possibility of subsequent changes in costs and/or technology occurring before the time that price fixing was to occur.

On the use of production costs for management purposes, it was argued that the neglect of joint, complementary, and supplementary relationships between farm enterprises made any ensuing guidelines on enterprise choice invalid for the individual farm.

Much of the criticism of cost of production surveys may have occurred due to the rather specific purposes, (i. e. price fixation and enterprise comparison), for which such studies were originally undertaken. Whilst a general orientation towards identifying revenues and costs continues, the range of material collected has broadened as have the purposes for which such surveys are undertaken. This "broadening" of the role of farm economic surveys has resulted from the recognition that detailed economic information at the farm level is an indispensable input to rational agricultural policy formation and that surveys can result in valuable feedback to the farm adviser and farmer. Classifications of farm economic surveys are made by Schapper [20] and Ward [21]. The various categories can be amalgamated into two broad groups:

(a) Management orientated surveys.

These surveys are aimed at identifying potentially important management areas. Considerable care has to be exercised in identifying management recommendations due to the multitude of individual farm characteristics unaccounted for in any cross tabulation or regression analysis. In most cases only broad patterns emerge;

closer investigation of causal factors usually needs to be undertaken before general recommendations can be made or individual farm advice given. Surveys that result in providing standards for farmers or extension workers against which individual farm performance can be compared also fall into this category.

(b) Policy oriented surveys.

These include surveys aimed at supplying information regarding the structure and state of an industry so that both strategic and tactical policy decisions can be taken more rationally. Examples of policy decision areas that may gain from such information include pricing policies, subsidisation and welfare considerations, and considerations emanating from resource productivity analyses (e.g. encouragement of increase or decrease in farm size).

Instead of any direct link between cost of production information and product price policies as sought after earlier this century, there now exists a rather indirect link. This link can take a number of forms, most of which utilise cost information as a broad base for discussions and negotiations between producer, processing and marketing organisations, and government. An appropriate role of production costs in a price controlled industry has been stated by Crawford [8] as: "The relationship between costs and prices will be determined by a careful interpretation of both the purpose of price fixing, by a study of the previous economic conditions, and by detailed examination of the cost structure of the industry and of possible behaviour of producers."

Farm economic surveys have played and are playing an important role in New Zealand agriculture. For example the Meat and Wool Boards' Economic Service has been particularly successful with their continuous survey of the sheep and wool industry, aimed at providing information useful in policy decisions including floor prices for meat and wool. The Milk Board's national cost survey

and more localised regional surveys provide information used in setting regional differences in milk prices. Other farm economic surveys have been carried out on a less frequent or ad hoc basis. Many such surveys have been oriented towards describing the resource structure and management practices of farms in a particular region or of a particular industry. Examples here are studies by McCarthy [15] and Gill [11]. Measures of financial success in these surveys are correlated with specific resource attributes or management systems.

The Agricultural Economics Research Unit has published a number of farm economic surveys in the past, including those by McClatchy [16], Morris & Cant [18] and Hamilton and Johnson [12]. However only the latter was cost oriented.

In the present situation of rapidly rising costs and the increasing influence of producer boards and government on agricultural product prices, demand for 'cost of production' information is increasing. All such information is useful. Many of the limitations outlined earlier still occur but once appreciated, do not detract from the general usefulness of cost and revenue information for policy purposes. If such studies are combined with analyses of management practices and industry resource structures, further benefits accrue. The primary purpose of any survey largely determines its content; however, in the case of cost of production surveys, the balance between the depth and breadth of information collected is critical in order to maximise the returns to the usually heavy input of research resources that characterise such surveys.

PART II : BACKGROUND TO THE PEA & BEAN SURVEY

In mid 1974 an enquiry was received by the Agricultural Economics Research Unit, from the General Secretary, New Zealand Vegetable and Produce Growers' Federation concerning the possibility of the Unit undertaking re-surveys of costs and returns for some of the major vegetable crops. The Unit had previously surveyed process peas and tomatoes for the Federation.

Following further discussions the Federation contracted with the Unit for re-surveys of process peas and beans, the data to relate to the 1974-75 season.

The objectives of the 1974-75 surveys were:

- (a) To provide the Federation and individual growers with data and trends on costs and returns for process peas and beans.
- (b) To provide a basis for pre-season price discussions with processors.
- (c) To provide growers with data to aid in improving management and for future planning.

Parts III and IV of this Report include the results for process peas and beans respectively. Part V makes some comparisons between the two crops and Appendices I & II contain methodology details and costs and returns on a district basis. The districts delineated were Gisborne, Hawkes Bay and Christchurch for both peas and beans and Timaru for peas only.

PART III : PROCESS PEAS

1. Summary

Yields in the four major process pea districts ranged from an average of 3.70 tonnes per hectare for the Timaru area to 4.60 tonnes per hectare for Hawkes Bay. Average total revenue (including an assessed value for hay bales) varied from \$316.04 per hectare (Timaru) to \$387.95 per hectare (Hawkes Bay).

The major direct cost items were seed, cultivation, herbicides and fertiliser. Cultivation costs showed the widest variation among districts. There was little variation among district total direct costs.

Differences in land values led to wide fluctuations in district total indirect costs. The assessed land rental or mortgage interest of all growers surveyed ranged from 73 per cent to 86 per cent of total indirect costs.

The Timaru district, despite the lowest total revenue per hectare, had the highest surplus per hectare before the deduction of a management allowance. It was followed by Hawkes Bay, Gisborne and Christchurch, the latter being 74 per cent below Timaru.

An attempt has been made to determine if variation in the quantity of input items (measured as costs) contributed to the wide variation in yield and revenue in each district.

Sampled farms in each district were placed into groups of high, medium and low gross surplus (before the deduction of a management charge). In all districts farms making up the high surplus group had the highest average yield and total revenue per hectare and the lowest costs per hectare. Farms in the lowest surplus group were associated with low yield, low revenue and high total costs per hectare.

Total yields and the price received per kilogram were more important than total cost variation in determining profitability.

For three of the four districts the high yielding farms had crops with the lowest tenderometer reading and hence received the highest average payment per kilogram.

Possible inefficient management practices such as ill-timed irrigation and excess cultivation by the low group growers are suggested as contributing to their outcome.

Yields are very sensitive to climatic conditions especially rainfall. The sowing date may have more influence on yields than any other single factor. To test this an analysis of sampled crop yields and gross surpluses for Timaru, Christchurch and Hawkes Bay was made according to the crop's date of sowing.

Farms in Timaru and Christchurch were divided into irrigated and non-irrigated groups. Irrigation usually resulted in increased yields but a lower quality pea. Yield increases induced by irrigation were insufficient to cover the costs of the irrigation for over half of the farmers in the Timaru irrigating group.

A comparison with an earlier 1967-68 report has been made. A marked total revenue increase and small yield increases have been noted. Substantial increases in total costs have occurred.

2. Method of Approach

2.1 The Sample:

Process peas are grown in a number of districts in New Zealand. Following discussions with representatives of the two major processing companies it was decided that a random sample be selected from growers in each of the four major processing districts - Timaru, Christchurch, Hawkes Bay and Gisborne. A total sample size of 100 growers was considered by the Federation to be adequate to provide a reasonable range of growers.

Lists of growers were provided by the processing companies. Each listed grower was given a number and the required district sample was drawn using tables of random numbers. To allow for inadequate responses or refusals extra growers were also drawn. The location of the sampled growers with respect to their distribution throughout each district was checked to determine whether any major production area had been omitted. In two districts further random samples had to be drawn to achieve a complete district coverage.

2.2 Definition of Cost and Returns Items:

One of the objectives of this report is to provide a base for updating costs in future years. To help achieve this, a full description of the derivation of cost and returns items is set out in Appendix I.

2.3 Bypassing:

The process companies contract a sufficient number of growers to grow peas to meet their expected processing capabilities and markets. The sowing dates are spread to assist factory handling at harvest. Every year some growers have their crop bypassed, usually due to climatic conditions. Hot dry winds (e.g. Canterbury nor-westers) can cause rapid maturing and drying of crops with the result that it is impossible to harvest all crops with the equipment available. Also, rain at harvest can prevent access of heavy harvesting machines on to the paddock.

The bypassed crops are left to ripen for seed. The company undertakes to buy from the grower his mature threshed and field dressed seed (at a comparatively lower price) and charges for only half the initial seed used.

A pea crop bypassed and left for seed has some disadvantages to the grower. Apart from obtaining a lower overall profit, the ground is usually unavailable for a longer period. This can seriously impair the grower's cropping programme, for example his ability to meet autumn and winter feed requirements.

Table 1 lists the numbers of growers partially or completely bypassed during the 1974/75 season.

TABLE 1

Proportion of Sampled Growers Bypassed during the
1974/75 Season

	<u>Timaru</u>	<u>Christchurch</u>	<u>Hawkes Bay</u>	<u>Gisborne</u>
Number of sampled growers partially bypassed	1	2	2	0
Number of sampled growers fully bypassed	1	4	2	1
Number of growers in final analysis	25	31	43	10
Percentage sampled growers partially or fully bypassed	8	11	9	10

Bypassing results in increased costs for harvesting. The average revenue and total cost results for each region include figures from the bypassed farms.

3. Costs and Returns by District

3.1 Introduction:

Table 2 sets out the average costs and returns from the surveyed growers in the four major pea growing districts. Standard deviation figures are added to indicate the range of the observations. Figure 1 is a graphical representation of Table 2.

3.2 Yield in Kilograms:

Total yield in kilograms was highest for the Hawkes Bay sampled farms which produced an average of 4,589 kg per hectare. Timaru surveyed farms recorded the lowest production, averaging 3,704 kg per hectare. Yields vary according to their maturity at harvest; peas harvested at a lower maturity yield less but receive a higher payout per kilogram due to the lower tenderometer reading (TR). Research by Anderson and White [1] on the relationship between green pea yield and TR found that there was a rapid increase in dryland pea yields at the lower end of the TR scale but above a TR of 110 (grade 4) little yield increase occurred as TR increased.

3.3 Revenue:

The average payment per kilogram for the sampled farms in each district was:

<u>Timaru</u>	<u>Christchurch</u>	<u>Hawkes Bay</u>	<u>Gisborne</u>
8.04 cents	7.95 cents	8.01 cents	7.55 cents

Timaru farmers with the highest payment per kilogram therefore have the lowest district TR. The major type of processing at Timaru - dehydration - demands a crop with a low TR although the average payment for Hawkes Bay and Timaru is very similar.

More hay is harvested in Hawkes Bay than in other districts. Baled pea vines fluctuate in price throughout the year and among districts, demand being dependent on weather conditions. A constant price per bale (\$0.50 in the paddock) has been assumed in this report.

TABLE 2

Average Costs & Returns for Process Peas - 1974-75¹

(All figures refer to one hectare)

	Timaru		Christchurch		Hawkes Bay		Gisborne	
	Mean	SD ²	Mean	SD	Mean	SD	Mean	SD
Yield kg per hectare	3,704.0	(922.0)	3,845.0	(1,404.0)	4,589.0	(1,334.0)	4,431.0	(1,048.0)
	\$	\$	\$	\$	\$	\$	\$	\$
Gross Revenue								
Pea Revenue	297.66	(72.99)	305.49	(115.10)	367.39	(110.16)	334.57	(86.41)
Hay bales	18.38	(8.01)	13.91	(1.85)	20.56	(6.03)	16.11	(4.25)
Total Revenue	<u>316.04</u>	(78.48)	<u>319.40</u>	(115.37)	<u>387.95</u>	(115.46)	<u>350.68</u>	(87.67)
Direct Costs								
Vegetable levy	1.49	(0.37)	1.53	(0.57)	1.84	(0.54)	1.67	(0.42)
Cultivation:								
Tractor running costs	13.32	(6.21)	14.14	(4.94)	10.06	(3.39)	10.12	(4.81)
Tractor labour	16.21	(7.91)	17.20	(6.10)	12.23	(4.40)	12.31	(6.24)
Contract Cultivation	0		0		12.48	(18.85)	13.34	(3.99)
Seed ex store	44.73	(4.42)	48.95	(6.40)	41.56	(4.77)	41.78	(6.50)
Seed cartage	1.04	(0.27)	1.28	(0.44)	0.82	(0.30)	0.91	(0.27)
Fertiliser ex store	11.29	(2.15)	11.19	(4.10)	11.02	(5.86)	8.33	(9.29)
Fertiliser cartage	0.57	(0.25)	0.52	(0.25)	0.54	(0.32)	0.52	(0.40)
Herbicide materials	12.95	(6.13)	15.10	(6.94)	13.96	(4.27)	21.10	(8.95)
Herbicide application	4.32	(1.53)	4.37	(0.59)	7.46	(1.14)	10.77	(3.88)
Irrigation costs:								
Running costs	1.38	(2.03)	1.61	(3.26)	0		0	
Labour costs	0.94	(1.58)	1.26	(2.74)	0		0	
Total Direct Costs	<u>108.24</u>	(13.64)	<u>117.15</u>	(16.31)	<u>111.97</u>	(18.68)	<u>120.83</u>	(21.17)
Gross Margin	<u>207.80</u>	(71.25)	<u>202.25</u>	(113.54)	<u>275.98</u>	(118.48)	<u>229.85</u>	(94.16)
Indirect Costs								
Irrigation fixed costs	5.32	(7.56)	4.70	(6.21)	0		0	
Tractor fixed costs	7.09	(4.74)	7.07	(5.29)	5.20	(3.64)	5.23	(4.94)
Implement fixed costs	9.66	(8.49)	10.60	(8.81)	8.21	(7.73)	9.53	(8.91)
General costs	5.05	(4.74)	7.53	(2.58)	10.57	(8.54)	8.16	(2.28)
Land rental or mortgage interest	71.23	(15.72)	109.59	(30.18)	148.54	(49.20)	118.13	(52.80)
Total Indirect Costs	<u>98.35</u>	(40.32)	<u>139.49</u>	(37.74)	<u>172.52</u>	(54.18)	<u>141.05</u>	(58.25)
Total Revenue	316.04		319.40		387.95		350.68	
Less Total Costs	<u>206.59</u>	(42.50)	<u>256.64</u>	(47.11)	<u>284.59</u>	(57.31)	<u>261.88</u>	(49.84)
Gross surplus per hectare ³	109.45	(65.94)	62.76	(78.90)	103.46	(100.24)	88.80	(82.63)
Management Charge	41.70	(17.65)	52.00	(30.82)	57.53	(49.42)	47.74	(43.19)
Nett surplus per hectare	<u>67.75</u>	(63.54)	<u>10.76</u>	(72.63)	<u>45.93</u>	(87.21)	<u>41.06</u>	(70.45)

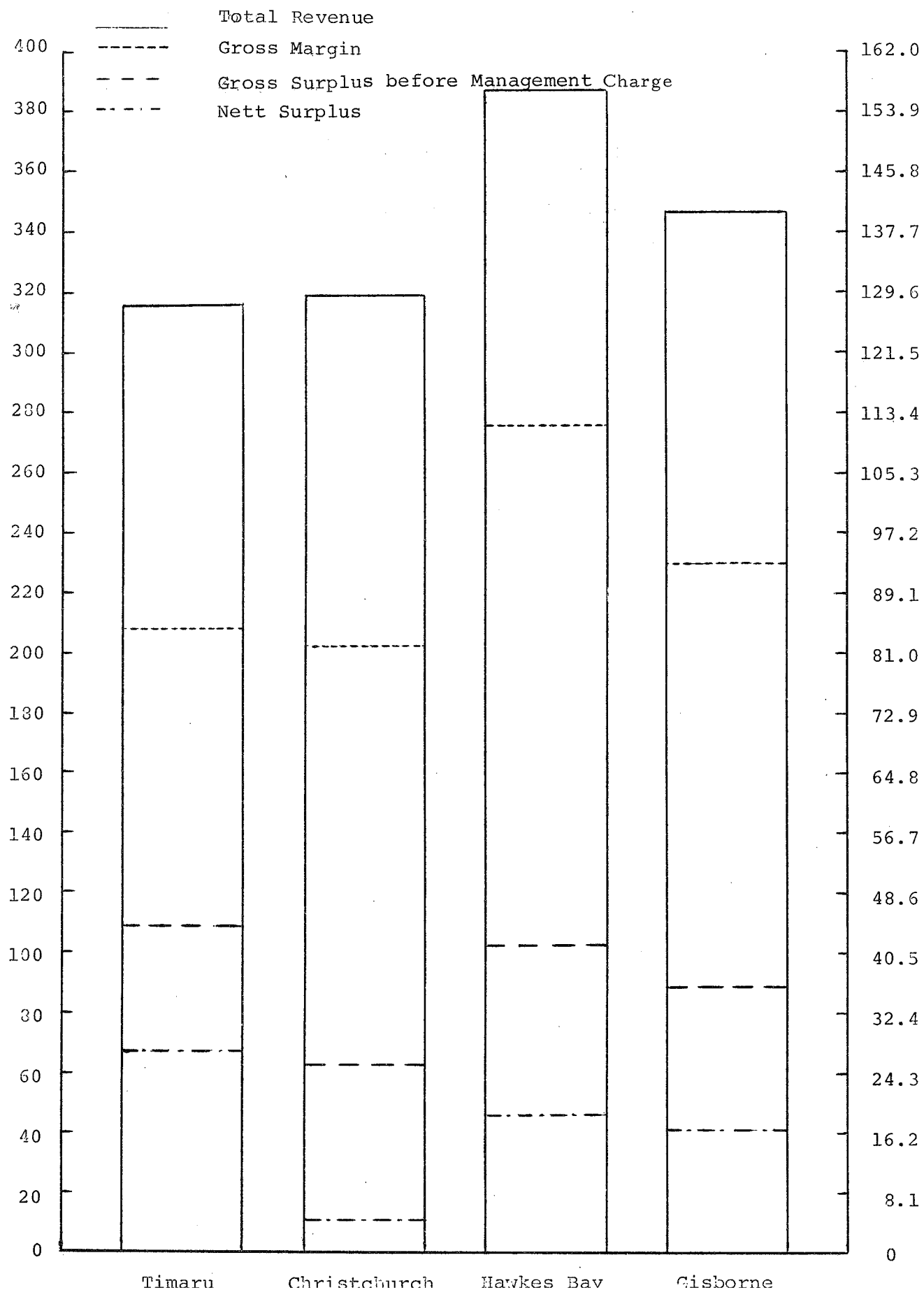
¹The data refer to 25 growers in Timaru, 31 in Christchurch, 43 in Hawkes Bay and 10 in Gisborne.²SD The standard deviation indicates how spread or dispersed the observations are. In general approximately 66% of the observations lie between the mean value and plus or minus 1 SD. (e.g. a narrow spread exists for seed ex store compared with the wide spread of observations for tractor fixed costs).³An imputed management wage.

FIGURE 1

Revenue, Gross Margin and Surplus for
Process Peas in Each District 1974-75

\$/hectare

\$/acre



The total revenue for the survey farms ranged from an average of \$316.04 per hectare in the Timaru district to \$287.95 in Hawkes Bay.

3.4 Direct Costs:

Total direct costs did not vary appreciably among the four surveyed districts. Average total direct costs ranged from \$108.24 per hectare for Timaru to \$120.93 per hectare for Gisborne. Seed cost is the principal direct cost item followed by cultivation costs, herbicide materials and fertiliser. Table 3 lists the percentage contribution to total direct costs of each of the major direct cost items.

TABLE 3

<u>Percentage Contribution of the Major Direct Cost Items to Total Direct Costs</u>				
	<u>Timaru</u>	<u>Christchurch</u>	<u>Hawkes Bay</u>	<u>Gisborne</u>
Seed ex store	41	42	37	35
Cultivation costs	27	27	31	30
Herbicide materials	12	13	12	17
Fertiliser	10	10	10	7

Less seed was used in the two North Island districts but cultivation costs were higher. Contract cultivation was a common expense in the North Island survey districts. Many North Island farmers hire a contractor to do specialised tasks such as drilling.

The two South Island districts had higher tractor cultivation costs than the North Island. Growers in the Christchurch district indicated that cultivation costs were higher this season, mainly as a result of late winter rain hampering the normal winter pre-season soil preparation.

The average cost of herbicide application by contractor ranged from \$4.32 per hectare in the Timaru area, to \$10.77 per hectare in

Gisborne. This latter figure includes a number of farms with double applications.

3.5 Gross Margins:

Gross margins showed more variation than did total direct costs. This was a reflection of the yield and revenue differences among districts. Hawkes Bay had the highest gross margin (\$275.98 per hectare) which was 36 per cent greater than Christchurch which had the lowest (\$202.25 per hectare).

3.6 Indirect Costs:

A wide fluctuation of total indirect costs among districts occurred due principally to the variation in land values (expressed as land rental or mortgage interest). This item represented at least 73 per cent of total indirect costs (Timaru district) and attained a maximum of 86 per cent of total indirect costs for the Hawkes Bay district. Each indirect cost item expressed as a percentage of total indirect costs is shown in Table 4.

TABLE 4

Indirect Costs as a Percentage of Total Indirect Costs

	<u>Timaru</u>	<u>Christchurch</u>	<u>Hawkes Bay</u>	<u>Gisborne</u>
	%	%	%	%
Irrigation fixed costs	5	3	0	0
Tractor fixed costs	7	5	3	4
Implement fixed costs	10	8	5	7
General costs	5	5	6	6
Land rental or mortgage interest	73	79	86	83
	—	—	—	—
	100	100	100	100
	—	—	—	—

The lowest average total indirect costs were in the Timaru region (\$98.35 per farm) and the highest from the surveyed growers in Hawkes Bay (\$172.52 per farm).

Tractor and implement fixed costs varied partly due to the different number of tractor hours worked in each district. The hours worked per hectare for the sampled farms were:

Timaru	Christchurch	Hawkes Bay	Gisborne
11.1	11.8	8.41	8.41

3.7 Gross Surplus per hectare before Management Charge:

The highest gross surplus per hectare before the deduction of management charge (an estimate for wages of management) was for the Timaru surveyed farms (\$109.45). This is 74 per cent greater than the lowest gross surplus district, Christchurch (\$62.76). The district with the lowest total revenue (Timaru) has the highest gross surplus per hectare. While Timaru had the lowest total direct costs (12 per cent below the highest - Gisborne), the major difference was in total indirect costs where Timaru was 75 per cent lower than the highest - Hawkes Bay. This is mainly due to the lower land values in the Timaru region, and is reflected in the land rental or land mortgage cost item. Hawkes Bay, with the highest total revenue, is a close second behind Timaru in surplus per hectare (before management charge).

The largest single cost item for each district was land rental or mortgage interest. This item for Hawkes Bay was the biggest overall and more than twice that of Timaru. For some of the sampled farms in Hawkes Bay, land values were inflated by the potential for urban development.

3.8 Comparison of yield and gross surplus per hectare:

Figures 2 to 6 relate yield in kilograms to gross surplus per hectare and provide an alternative view of some of the tabular data. Yield was plotted against each farmers' gross surplus because this latter figure was found to be the most reliable measure of crop profitability. Plotting yield against gross margin is of limited use because of the similarity of total direct costs for each farm.

The trend lines were derived using least squares regression techniques and as the r values indicate, "fit" the observations reasonably well. The graphs allow individual survey farmers to check their performance and also provide non survey farmers with a simple basis of comparison after estimating their own gross surplus from their yield figures.

Process Pea Yield in Kilograms per Hectare and
Gross Surplus per Hectare for Timaru

Gross Surplus
\$/ha

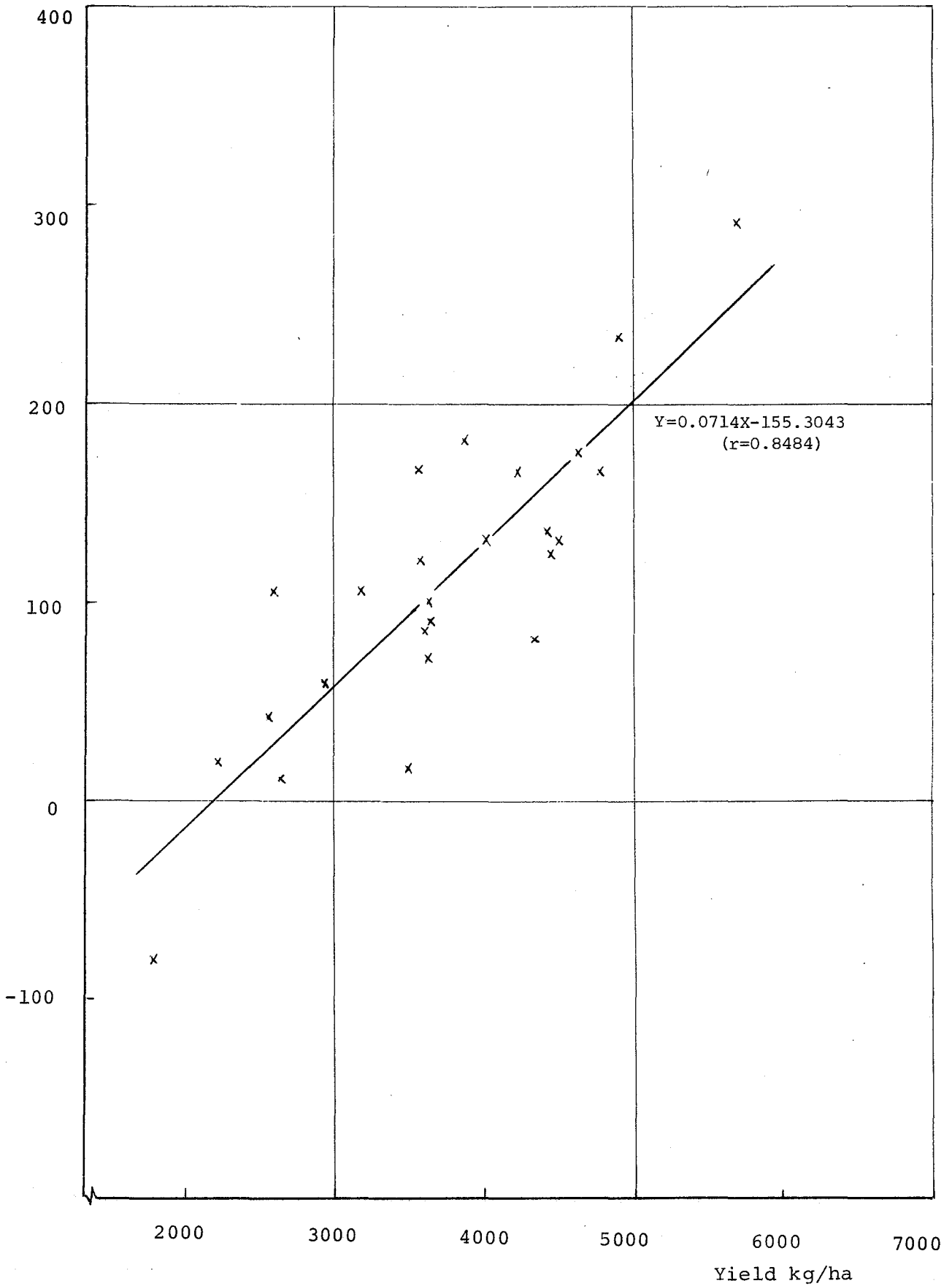


FIGURE 3 18.
Process Pea Yield in Kilograms per Hectare and
Gross Surplus per Hectare for Christchurch

Gross Surplus \$/ha.

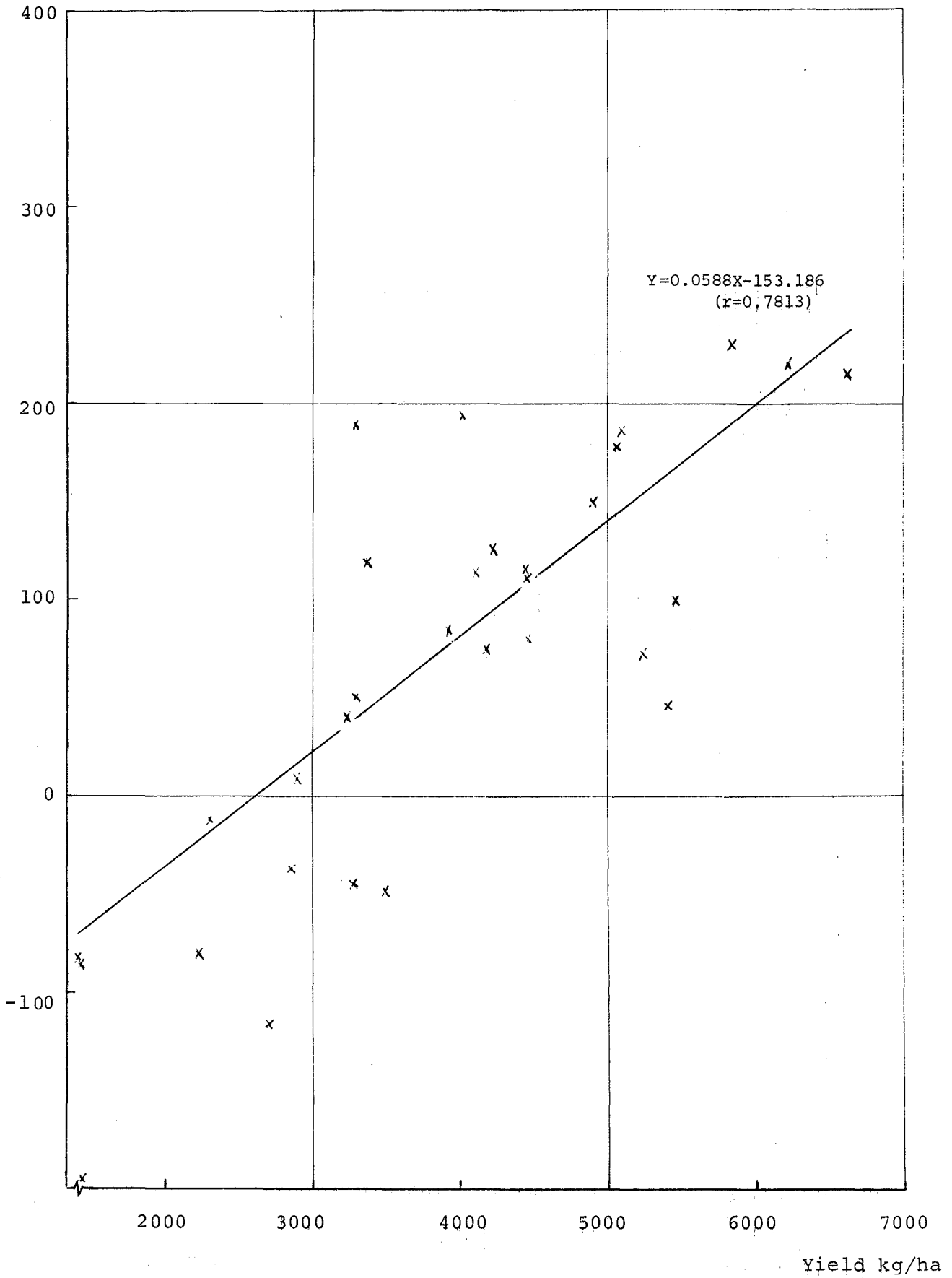
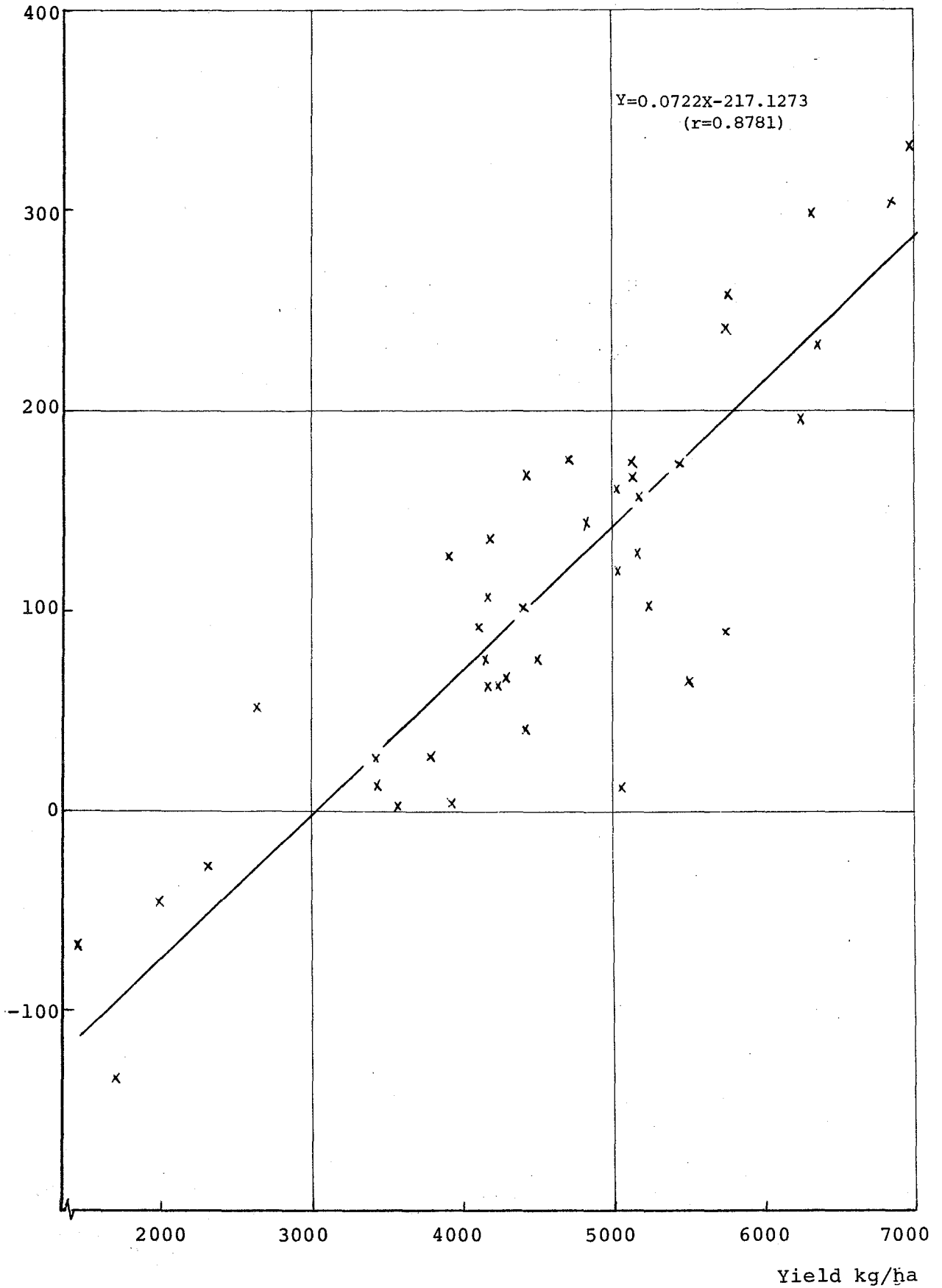


FIGURE 4

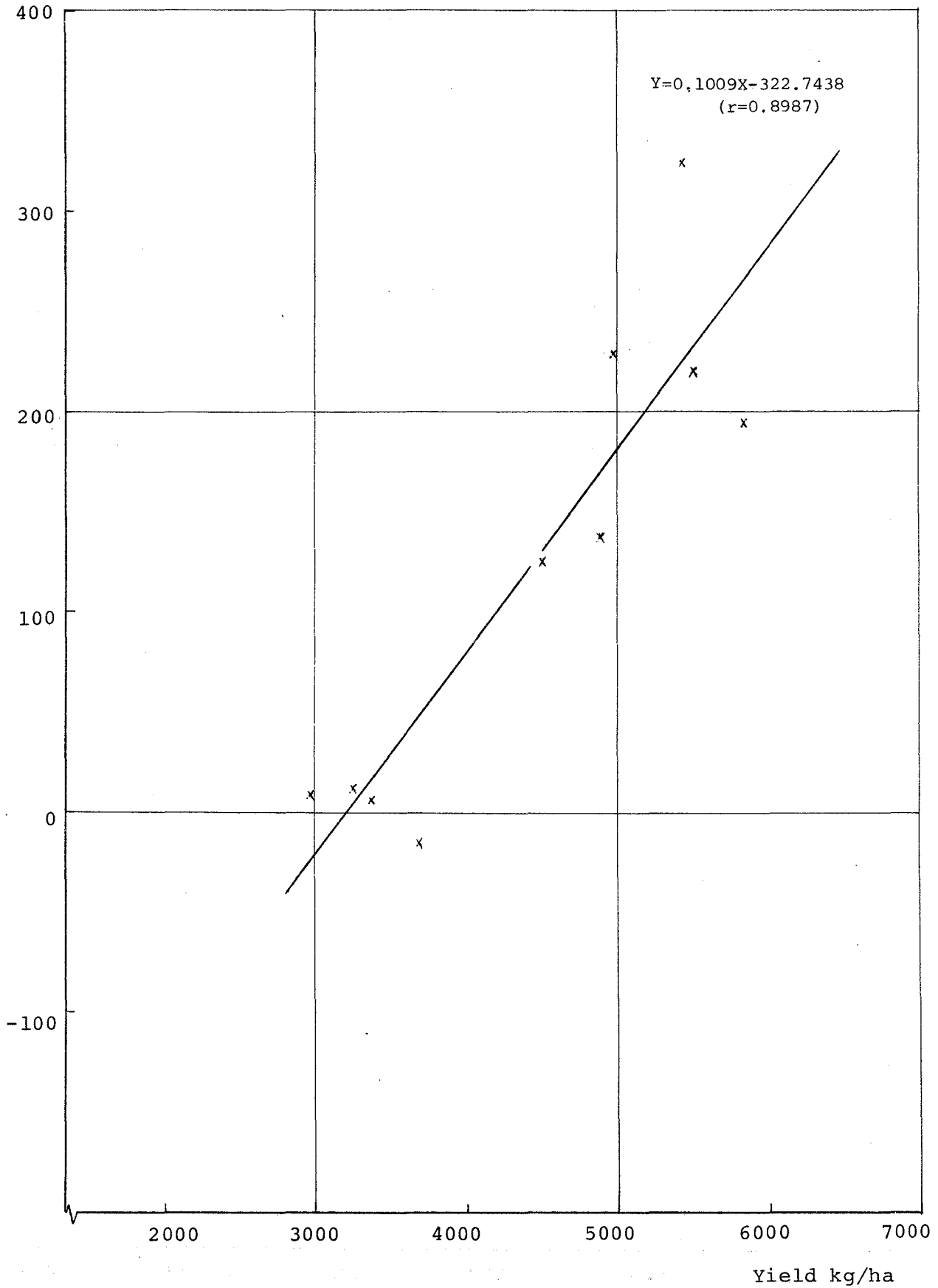
Process Pea Yield in Kilograms per Hectare and
Gross Surplus per Hectare for Hawkes Bay

Gross Surplus
\$/ha



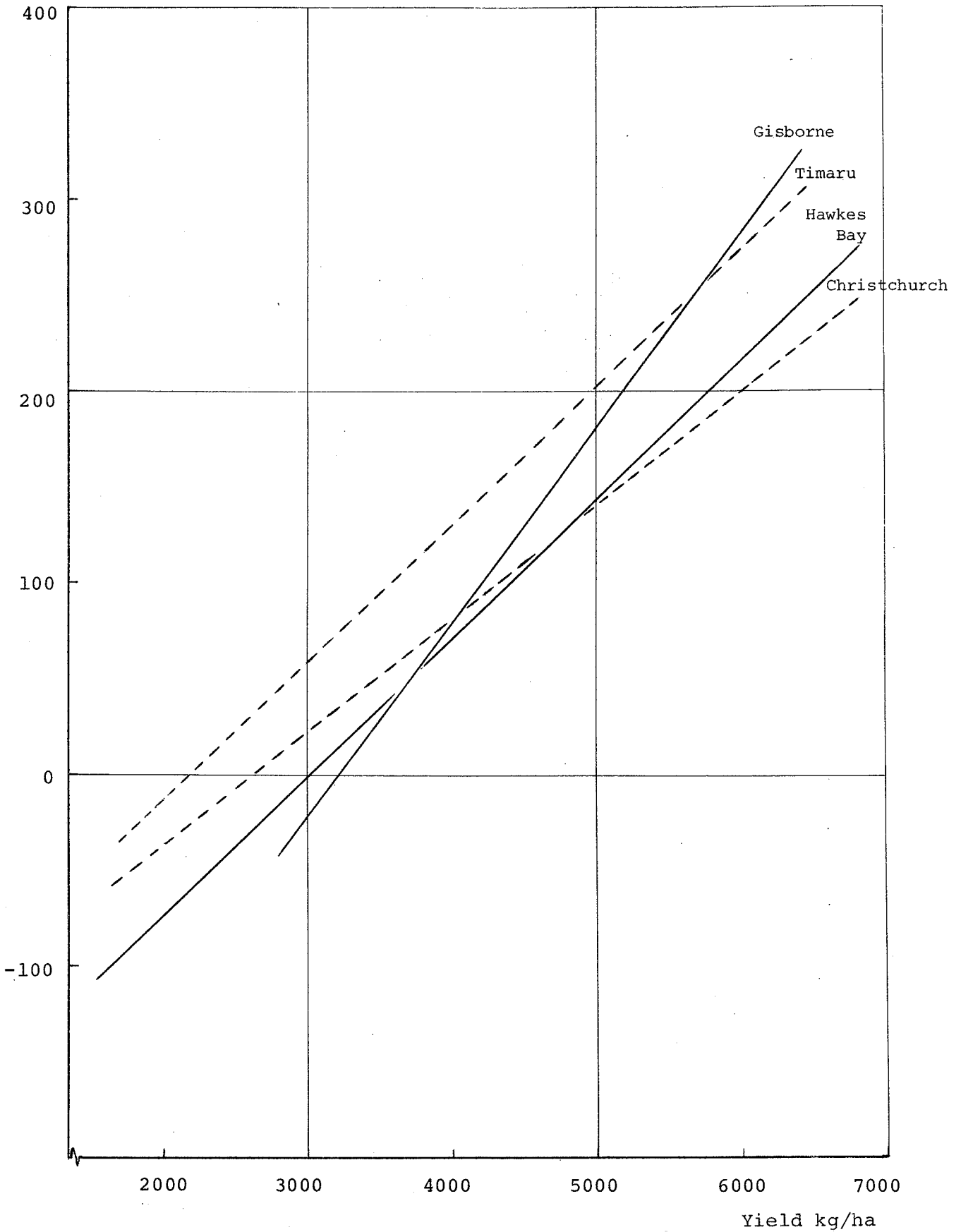
Process Pea Yield in Kilograms per Hectare and
Gross Surplus per Hectare for Gisborne

Gross Surplus
\$/ha



Process Pea Yield in Kilograms per Hectare and
Gross Surplus per Hectare for All Districts

Gross Surplus
\$/ha



3.9 Net Surplus per hectare:

The net surplus per hectare figure is the balance after deducting direct and indirect costs plus an estimate for wages of management (called management charge in the tables and elsewhere).

The region with the highest net average surplus - Timaru at \$67.75 per hectare - is more than five times greater than the lowest - Christchurch at \$10.76 per hectare.

Wages of management represent a payment to the entrepreneur or owner as a reward for his management skills. While it is well recognised that a charge should be made for managing the crop, the calculation of this amount for one crop is somewhat arbitrary. The method used is detailed in Appendix I. It attempts to allocate a management reward to both the capital invested in the land and the amount of tractor labour used.

4. Analysis by Farm Groups

4.1 Farms grouped according to Gross Surplus per hectare (before Management charge):

4.1.1 Introduction

Yields and gross surplus are influenced by various aspects of organisation, management and cultural practices. In an effort to quantify some of these aspects, the surveyed growers of each district have been grouped into high, medium and low performance, according to their gross surplus per hectare (before management charge).

Yield differences within any one district are due to a combination of many variables such as overall management, rainfall, soil type, cultivation, and so on. Few of these can be reliably or accurately measured so an analysis of all reasons for yield differences is not possible. However, inferences can be drawn from differences in variable costs.

In analysing costs, some items appear to be more significant in the high surplus group. If this is true then less successful growers may be able to increase future yields by adjusting their input mix towards that of the high surplus farm group.

4.1.2 Timaru

Table 5 lists the variation in the revenue and direct and indirect costs for Timaru in the sampled farms grouped according to gross surplus per hectare before management charge. The average payment per kilogram for each group is listed below.

	High Surplus Farms	Medium Surplus Farms	Low Surplus Farms	All Farms
Average Payment per kilogram	\$0.0857	\$0.0799	\$0.0769	\$0.0804

TABLE 5

Costs and Returns of Groups of High, Medium and Low
Surplus Growers in the Timaru District 1974-75 per Hectare

	<u>High Surplus Farms</u>	<u>Medium Surplus Farms</u>	<u>Low Surplus Farms</u>	<u>All Farms</u>
Number of farms	9	8	8	25
Farms with irrigation (number)	4	3	3	10
Average farm hectares	187.5	143.4	181.8	171.3
Average pea hectares	8.1	12.2	10.5	10.2
Yield kg per hectare	4273	3746	2847	3704
	\$	\$	\$	\$
<u>Gross Revenue</u>				
Pea Revenue	366.25	299.16	218.96	297.66
Hay bales less baling charge	21.28	20.58	12.92	18.38
Total Revenue	<u>387.53</u>	<u>319.74</u>	<u>231.88</u>	<u>316.04</u>
<u>Direct Costs</u>				
Vegetable levy (0.005 pea revenue)	1.83	1.50	1.09	1.49
Cultivation:-				
Tractor running costs	12.74	12.44	15.32	13.32
Tractor labour @ \$1.46/hour	15.82	15.01	18.05	16.21
Seed ex store	45.89	45.22	42.97	44.73
Seed cartage (carrier)	1.11	0.94	1.04	1.04
Fertilizer ex store	11.09	10.75	12.08	11.29
Fertilizer cartage (carrier)	0.62	0.54	0.59	0.57
Herbicide Materials	14.50	12.11	12.43	12.95
Herbicide application (contractor)	4.15	4.40	4.35	4.32
Irrigation costs:-				
Running costs	2.13	0.86	1.04	1.38
Labour costs for pipe shifting	1.24	1.11	0.44	0.94
Total Direct Costs	<u>111.12</u>	<u>104.88</u>	<u>109.31</u>	<u>108.24</u>
Gross Margin	<u>276.41</u>	<u>214.86</u>	<u>122.57</u>	<u>207.80</u>
<u>Indirect Costs</u>				
Irrigation fixed costs	5.54	5.41	4.94	5.32
Tractor fixed costs	4.72	7.07	9.71	7.09
Implement fixed costs	8.98	9.65	10.29	9.66
General Costs	5.05	5.32	4.06	5.05
Land rental or mortgage interest	68.65	78.24	64.37	71.23
Total Indirect Costs	<u>92.94</u>	<u>105.69</u>	<u>93.37</u>	<u>98.35</u>
Total Revenue	387.53	319.74	231.88	316.04
Less total costs	204.06	210.57	202.68	206.59
Gross surplus per hectare before management charge	<u>183.47</u>	<u>109.17</u>	<u>29.20</u>	<u>109.45</u>

Not only do the farms in the high surplus group have higher yields per hectare ((4,273 kg) which is 50 per cent greater than the low surplus farms), they also have a higher average payment per kilogram.

The average payment for the top group is equivalent to a TR of 105-110 (grade 4), whereas the medium and low surplus farms have an average TR of between 110-120 (grade 5 and 6).

Cultivation costs were highest for the farm groups with the lowest surplus. This implies that whilst a balance between a fine seedbed tilth and excessive cultivation should be aimed at, some growers may be spending too much time on soil preparation before sowing. The total cultivation cost (including tractor and implement fixed costs) for the low surplus groups was 25 per cent greater, indicating that there has been more tractor work done compared with the high surplus farms. Peas benefit from good soil aeration. Excessive cultivation may reduce this. The excess tractor work, instead of increasing yields, may have contributed towards the 40 per cent lower total revenue which this group achieved when compared with the top surplus group.

Amongst the indirect costs, the low surplus farms had the lowest land rental or mortgage interest charge. The land rental figure is based on 6 per cent of the Government land valuation (multiplied by the proportion of the growing season taken up by peas). The low figure is a partial reflection of the yield result - lower quality land has a lower Government valuation. However, it is the medium surplus farm group which has the highest land rental figure.

4.1.3 Christchurch

Table 6 shows the costs and returns for the surveyed farms in the Christchurch district grouped according to gross surplus per hectare.

There are pronounced differences between mean yields for the surveyed Christchurch farms. The average yield for the high surplus farm group (at 5,002 kilograms per hectare) was 117 per cent greater than the average for the low surplus farms (2,303 kilograms per hectare). The average payment per kilogram showed a similar trend to that in the Timaru district.

	High Surplus Farms	Medium Surplus Farms	Low Surplus Farms	All Farms
Average Payment per kilogram	\$0.0820	\$0.0779	\$0.0760	\$0.0794

Seventy per cent of the farms using irrigation were in the medium surplus group. Only two of the ten farmers irrigating were in the high surplus group.

The ten farms making up the low surplus group had an average total revenue of \$188.69 per hectare which was 56 per cent below the average for the high surplus group (\$429.43).

There do not appear to be any prominent cost differences among the farm groups which might result in such a large revenue variation. However, the top group had cultivation costs (including tractor and implement fixed costs), 27 per cent less than the low surplus group. This situation also occurred in the Timaru district. Herbicides and fertiliser for the Christchurch high surplus group are also lower cost items compared with the other groups. These cost items all contribute towards a lower total direct cost for the high surplus farm group.

TABLE 6

Costs and Returns of Groups of High, Medium
and Low Surplus Growers in the Christchurch
District 1974-75 per Hectare

	<u>High Surplus Farms</u>	<u>Medium Surplus Farms</u>	<u>Low Surplus Farms</u>	<u>All Farms</u>
Number of Farms	10	11	10	31
Mean total farm hectares	76.1	82.6	74.5	77.8
Mean pea hectares	7.5	8.8	7.5	8.0
Farms with irrigation (number)	2	7	1	10
Yield kg per hectare	5002	4171	2303	3845
<u>Gross Revenue</u>	\$	\$	\$	\$
Pea gross revenue	414.68	324.94	174.95	305.49
Hay bales less baling charge	14.75	13.29	13.74	13.91
Total Revenue	<u>429.43</u>	<u>338.23</u>	<u>188.69</u>	<u>319.40</u>
<u>Direct Costs</u>				
Vegetable levy (0.005 pea revenue)	2.07	1.62	0.87	1.53
Cultivation:				
Tractor running costs	12.93	12.92	15.11	14.14
Tractor labour @ \$1.46/hour	16.34	17.06	18.86	17.20
Seed ex store	48.63	51.12	46.90	48.95
Seed cartage (carrier)	1.28	1.21	1.33	1.28
Fertilizer ex store	8.97	12.55	11.89	11.19
Fertilizer cartage (carrier)	0.47	0.49	0.52	0.52
Herbicide materials	12.06	16.11	17.00	15.10
Herbicide application (contractor)	3.46	4.55	4.20	4.37
Irrigation costs:				
Running costs	0.89	3.63	0.12	1.61
Labour costs	0.91	2.59	0.17	1.26
Total direct costs	<u>108.01</u>	<u>124.85</u>	<u>116.97</u>	<u>117.15</u>
Gross Margin	<u>321.42</u>	<u>213.38</u>	<u>71.72</u>	<u>202.25</u>
<u>Indirect Costs</u>				
Irrigated fixed costs	3.14	10.60	1.89	4.70
Tractor fixed costs	5.88	6.28	8.99	7.07
Implement fixed costs	8.23	10.00	12.08	10.60
General costs	7.85	7.85	7.48	7.53
Land rental or mortgage interest	109.35	105.57	112.32	109.59
Total Indirect Costs	<u>134.45</u>	<u>140.30</u>	<u>142.76</u>	<u>139.49</u>
Total Revenue	429.43	338.23	188.69	319.40
Less Total Costs	242.46	265.15	259.73	256.64
Gross surplus per hectare before management charge	<u>186.97</u>	<u>73.08</u>	<u>-71.04</u>	<u>62.76</u>

An average net loss per hectare occurs for the low surplus groups. More than a third of the farms surveyed around Christchurch recorded a loss (before management charge) from their process pea crop for the 1974-75 season.

The three farms in the Christchurch sample of 31 who were growing process peas for the first time were all in the low surplus farm group. This group also had the highest land rental or mortgage interest charge, suggesting that some of these growers were farming land valued for its position relative to Christchurch City rather than by its cropping potential.

4.1.4 Hawkes Bay

Hawkes Bay farms had the highest average yields of both peas and hay. The average payment per kilogram for each of the three subgroups for this region is listed below.

	High Surplus Farms	Medium Surplus Farms	Low Surplus Farms	All Farms
Average payment per kilogram	\$0.0819	\$0.0799	\$0.0817	\$0.0801

Analysis of the data in Table 7 shows that the total direct costs were slightly higher for the low surplus farm group. The most prominent direct cost item contributing to this position was contract cultivation charges. This, at \$18.38 per hectare, was over 56 per cent higher than contract charges for the high surplus farm group (\$8.13 per hectare).

The high surplus group farmers tended to do most of their own cultivation and rely less on contractors. This is demonstrated by the increased tractor running costs, tractor labour, tractor fixed costs and implement fixed costs figures for this group (\$40.37 per hectare compared with \$30.32 per hectare for the low surplus group). These results suggest there is an association between the use of contractors and

TABLE 7

Costs and Returns of Groups of High, Medium
and Low Surplus Growers in the Hawkes Bay
District 1974-75 per Hectare

	High Surplus Farms	Medium Surplus Farms	Low Surplus Farms	All Farms
Number of farms	14	15	14	43
Mean total farm hectares	67.8	84.1	80.0	77.5
Mean pea hectares	7.7	10.0	9.0	8.8
Yield kg per hectare	5738	4675	3289	4589
	\$	\$	\$	\$
Gross Revenue				
Pea gross revenue	469.84	373.44	268.70	367.39
Hay bales less baling charge	24.51	19.10	18.16	20.56
Total Revenue	494.35	392.54	286.86	387.95
Direct Costs				
Vegetable levy (0.005 pea revenue)	2.35	1.87	1.34	1.84
Cultivation:				
Tractor running costs	11.40	10.41	9.03	10.06
Tractor labour @ \$1.46/hour	14.09	12.79	10.83	12.23
Contract cultivation	8.13	11.61	18.36	12.48
Seed ex store	40.47	41.49	42.70	41.56
Seed cartage (carrier)	0.84	0.79	0.82	0.82
Fertiliser ex store	11.89	9.98	10.33	11.02
Fertiliser cartage (carrier)	0.59	0.52	0.52	0.54
Herbicide materials	14.18	12.53	15.30	13.96
Herbicide application (contractor)	7.41	7.41	7.93	7.46
Total Direct Costs	111.35	109.40	117.16	111.97
Gross Margin	383.00	283.14	169.70	257.98
Indirect Costs				
Tractor fixed costs	7.15	3.89	3.52	5.20
Implement fixed costs	7.73	8.32	6.94	8.21
General costs	10.39	9.84	10.98	10.57
Land rental or mortgage interest	135.60	158.14	155.84	148.54
Total Indirect Costs	160.87	180.19	177.28	172.52
Total Revenue	494.35	392.54	286.86	387.95
Less Total Costs	272.22	289.59	294.44	284.49
Gross surplus per hectare before management charge	222.13	102.95	-7.58	103.46

lower yields. Possible explanations for this could be that the farmers who hire contractors may be less proficient managers. Alternatively contractors may be less able to choose the optimum time to cultivate or may be less efficient in cultivating.

The land rental or mortgage interest cost was the lowest for the high surplus farms. In common with the Christchurch district, some growers who are obtaining lower yields are farming land whose value is inflated by urban demand.

Total costs are lowest for the high surplus farm group but are only 8 per cent less than the low surplus group. Revenue however, at \$494.35 per hectare is 72 per cent higher for the high surplus group compared with the low group (\$286.86 per hectare).

For the Hawkes Bay district, as with Timaru and Christchurch, changing the input mix to that of the high surplus farms probably will not achieve any marked change in yield. The reasons for the very great revenue variability among groups do not show up in the analysis of Table 4.

4.1.5 Gisborne

Of the four major pea growing districts in New Zealand, Gisborne had the smallest number of growers. The number sampled was ten. This means that the analysis, while demonstrating overall trends, may not be as reliable as for the other three regions.

The sampled farms have been divided into two instead of three groups based on each farm's gross surplus figure. The results appear in Table 8. The average payment per kilogram was:

	High Surplus Farms	Low Surplus Farms	All Farms
Average payment per kilogram	\$0.0752	\$0.0760	\$0.0755

The average payment for the Gisborne subgroups was very similar to that in the other three districts.

TABLE 8

Costs and Returns of High and Low Surplus Growers
in the Gisborne District 1974-75 per Hectare

	<u>High Surplus Farms</u>	<u>Low Surplus Farms</u>	<u>All Farms</u>
Number of farms	5	5	10
Average total farm hectares	123.4	41.3	82.6
Average pea hectares	5.3	3.6	4.4
Yield kg per hectare	5,313	3,546	4,431
<u>Gross Revenue</u>	\$	\$	\$
Pea gross revenue	399.63	269.55	334.57
Hay bales less baling charge	17.12	15.10	16.11
Total Revenue	<u>416.75</u>	<u>284.65</u>	<u>350.68</u>
<u>Direct Costs</u>			
Vegetable levy (0.005 pea revenue)	2.00	1.35	1.67
Cultivation:			
Tractor running costs	8.38	10.45	10.12
Tractor labour @ \$1.46/hour	10.13	12.70	12.31
Contract cultivation	13.02	15.82	13.34
Seed ex store	44.36	40.30	41.78
Seed cartage (carrier)	0.86	0.96	0.91
Fertilizer ex store	11.49	5.88	8.33
Fertilizer cartage (carrier)	0.62	0.44	0.52
Herbicide materials	19.99	20.78	21.11
Herbicide application (contractor)	10.38	11.17	10.76
Total Direct Costs	<u>121.23</u>	<u>119.85</u>	<u>120.83</u>
Gross Margin	<u>295.52</u>	<u>164.80</u>	<u>229.85</u>
<u>Indirect Costs</u>			
Tractor fixed costs	4.47	6.40	5.23
Implement fixed costs	5.98	11.39	9.53
General costs	7.81	10.26	8.16
Land rental or mortgage interest	81.79	148.83	118.13
Total Indirect Costs	<u>100.05</u>	<u>176.88</u>	<u>141.05</u>
Total Revenue	416.75	284.65	350.68
Total Costs	221.28	296.73	261.88
Gross surplus before management charge	<u>195.47</u>	<u>-12.08</u>	<u>88.80</u>

Cultivation (including tractor and implement fixed costs) together with the contract cultivation charges for the top group (\$40.21 per hectare) was 21 per cent less than the low surplus group (see Table 8). Farmers from the top group use significantly more fertiliser than their low surplus neighbours.

For Gisborne, the total revenue for the top group was 46 per cent greater than for the low group. As with Hawkes Bay, it is unlikely that slight adjustments to cost inputs will cause the marked yield increases necessary to boost the revenue of the low group farms up to that of the top group.

4.2 The Effect of Date of Sowing:

4.2.1 Introduction

To assist with the logistics of harvesting the process companies in each district allocate sowing dates for each farmer. The companies endeavour to spread their sowing dates according to expected daily temperatures and soil type. The lighter soils which are the quickest to dry out following the winter rains are the first sown and the heavier soils with good moisture holding capacity are sown last.

Data in Tables 9, 10 and 12 indicate the revenue, costs and gross surplus (before management charge) for the sampled farms in Timaru, Christchurch and Hawkes Bay, grouped according to their date of sowing. Because of sample size limitations, an arbitrary definition of early, mid and late sowing dates has been used.

4.2.2 Timaru

As Table 9 indicates, for the 1974-75 season, the early sowing farm group had the lowest average yield, revenue and gross surplus. The mid season sowing farms (date of sowing

TABLE 9

Process Peas - TimaruVariation in Yields and Costs and Returns per Hectare with Date of Sowing 1974 - 1975

Sowing Date	Early Sowing Farms		Mid-Season Sowing Farms		Late Sowing Farms		All Farms	
	1 Aug 7 Oct	- -	18 Oct 31 Oct	- -	1 Nov 22 Nov	- -		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Yield kg per hectare	3,563	(1070)	3,894	(1075)	3,615	(776)	3,704	(992)
	\$	\$	\$	\$	\$	\$	\$	\$
Total Gross Revenue	<u>273.42</u>	(78.40)	<u>346.11</u>	(95.68)	<u>304.72</u>	(51.79)	<u>316.04</u>	(78.48)
Total Direct Costs	109.83	(6.67)	105.83	(12.53)	106.94	(15.74)	108.24	(13.64)
Total Indirect Costs	<u>95.32</u>	(13.92)	<u>101.12</u>	(15.42)	<u>109.60</u>	(46.48)	<u>98.35</u>	(40.32)
Total Costs	<u>205.15</u>	(15.49)	<u>206.95</u>	(19.92)	<u>216.54</u>	(49.09)	<u>206.59</u>	(42.59)
Gross surplus per hectare before management charge	68.27		139.16		88.18		109.45	
Number of farms	5		9		11		25	
Farms with Irrigation (number)	2		3		5		10	

between 18 October and 31 October) share both the highest gross revenue and the highest gross surplus per hectare.

The late sowing farm group revenue includes a late sowing bonus of up to 5 per cent of the pea revenue figure. There is little variation in total costs between the three groups.

Because non-irrigated yields from late sown peas are very susceptible to lack of rainfall, a bonus scheme tied to the amount of rainfall during the summer may be worth further investigation.

4.2.3 Christchurch

The early sowing farms surveyed near Christchurch had the highest gross revenue and the highest gross surplus per hectare as Table 10 indicates.

For the late sowing farms a 15 per cent lower yield resulted in a marginally higher total gross revenue. A greater proportion of the later crop was harvested at the (higher paying) lower TR grades.

Christchurch results are dissimilar to those of Timaru. Here the early season sowings had the highest average yields and gross surplus. One contributing explanation for this may have been the unusual climatic conditions - especially rainfall - for the 1974-75 season. This is shown in Table 11 and Figure 7.

The rainfall figures are monthly totals, and hence indicate broad trends only. The 9 mm total November 1974 rainfall at Lincoln may have conveniently fallen during flowering for particular growers, whereas others, sowing earlier, may have received little benefit. Generally, the non-irrigated crops which flowered during the critically dry months of November and December would have experienced reduced yields.

TABLE 10

Process Peas - ChristchurchVariation in Yields and Costs and Returns per Hectare with Date of Sowing 1974-1975

Sowing Date	Early Sowing Farms		Mid-Season Sowing Farms		Late Sowing Farms		All Farms	
	1 Sept - 14 Sept		18 Sept - 1 Nov		2 Nov - 31 Nov			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Yield kg per hectare	4,193	(1159)	4,043	(1638)	3,442	(604)	3,845	(1404)
	\$	\$	\$	\$	\$	\$	\$	\$
Total Gross Revenue	345.54	(90.39)	303.22	(122.39)	316.83	(129.28)	319.40	(115.37)
Total Direct Costs	119.10	(18.98)	117.52	(17.40)	113.51	(32.49)	117.15	(37.74)
Total Indirect Costs	130.59	(34.55)	140.17	(45.25)	112.43	(34.49)	139.49	(47.11)
Total Costs	249.69		257.69		225.94		256.64	
Gross surplus per hectare before management charge	95.85		45.53		90.89		62.76	
Number of farms	8		11		12		31	
Farms with irrigation (number)	2		5		3		10	

TABLE 11

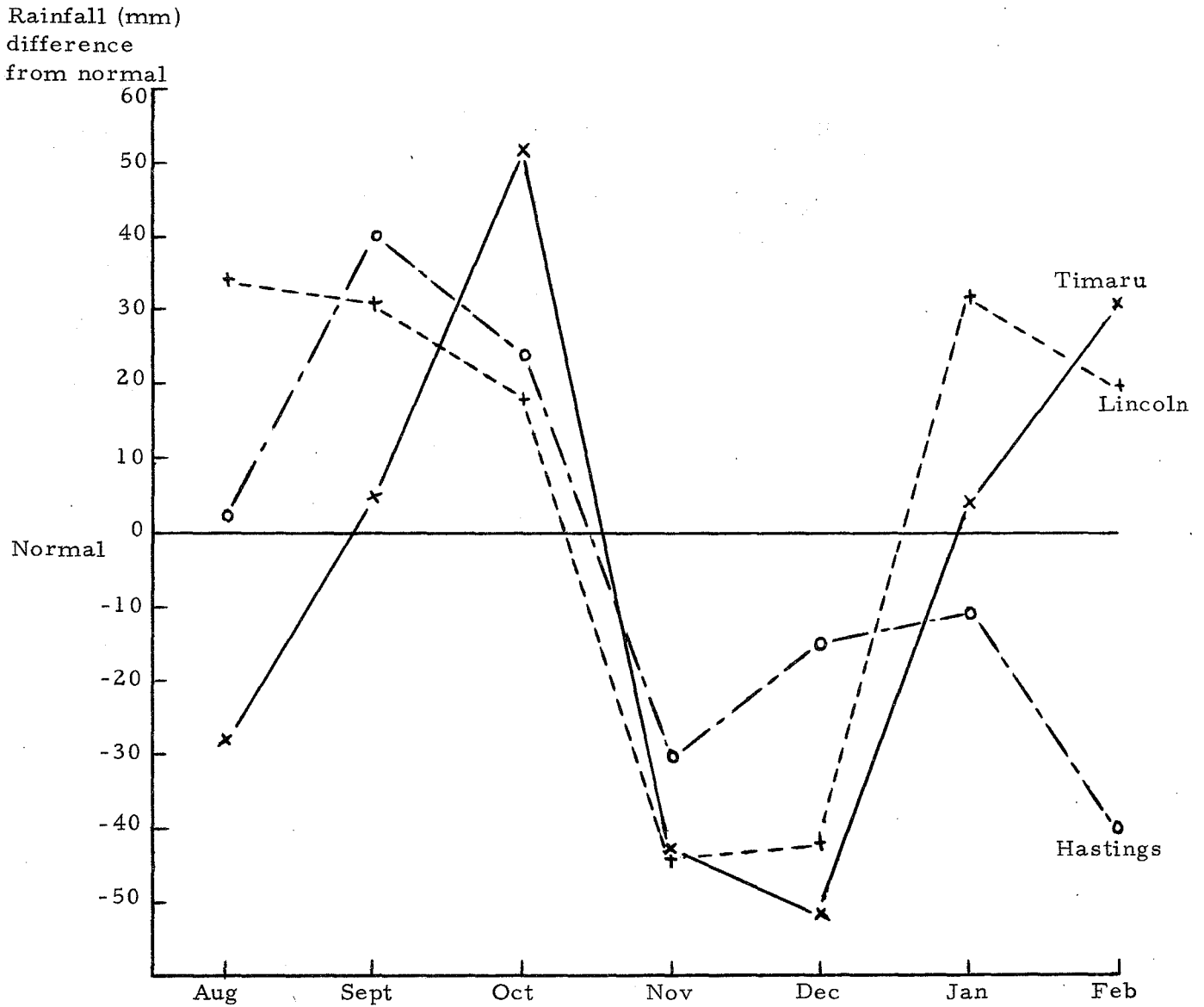
Air Temperature and Rainfall Records for
Timaru Aerodrome, Lincoln and Hastings

MONTH	AIR TEMPERATURE °C		RAINFALL (mm)	
	Mean of max. and min.	Difference from normal	Actual	Difference from Normal
<u>Weather Records, Timaru Aerodrome</u>				
August 1974	5.0	-0.8	14	-27
September	8.4	+0.6	46	+ 5
October	9.7	-0.4	98	+52
November	13.0	+0.7	10	-43
December	15.7	+1.4	14	-52
January 1975	17.2	+2.3	62	+ 4
February	16.2	+1.3	89	+31
<u>Weather Records, Lincoln</u>				
August 1974	6.0	-0.4	90	+34
September	9.4	+0.9	77	+31
October	10.6	-0.3	66	+18
November	13.8	+1.0	9	-44
December	16.7	+1.9	16	-42
January 1975	18.5	+2.5	88	+32
February	16.9	+1.1	76	+20
<u>Weather Records, Hastings</u>				
August 1974	9.2	-0.1	88	+ 2
September	12.8	+2.0	86	+40
October	13.9	+0.7	70	+24
November	15.8	+0.4	11	-30
December	18.4	+0.9	38	-15
January 1975	20.0	+1.4	55	-11
Februray	20.4	+1.5	13	-40

Source : [4]

FIGURE 7

Rainfall (mm) expressed as Difference from Normal



Source: [4].

TABLE 12

Process Peas - Hawkes BayVariation in Yields and Costs & Returns per Hectare with Date of Sowing 1974 - 1975

Sowing Date	Early Sowing Farms		Mid-Season Sowing Farms		Late Sowing Farms		All Farms	
	1 Sept - 25 Sept		1 Oct - 21 Oct		22 Oct - 16 Nov		Mean	SD
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Yield kg per hectare	4,438	(1,391)	5,439	(1,063)	5,145	(1,169)	4,589	(1,334)
	\$		\$		\$		\$	
Total Gross Revenue	<u>378.13</u>	(115.08)	<u>466.12</u>	(90.20)	<u>428.79</u>	(110.63)	<u>387.95</u>	(115.47)
Total Direct Costs	113.03	(22.71)	108.56	(11.05)	99.76	(11.14)	111.97	(18.68)
Total Indirect Costs	194.43	(64.42)	166.33	(41.86)	150.12	(31.51)	172.52	(54.18)
Total Costs	<u>307.46</u>		<u>274.89</u>		<u>249.88</u>		<u>284.59</u>	
Gross surplus per hectare before management charges	70.67		191.23		178.91		103.46	
Number of farms	11		9		8		43	

4.2.4 Hawkes Bay

As Table 12 indicates results from Hawkes Bay show a similar trend to those of Timaru. The highest average yield, revenue and gross surplus occurred for the mid season sowing group. The early sowing group recorded the lowest.

Contributing to the poor results by the late sowing group were the drought conditions experienced in the district over this period (see Table 11 and Figure 7).

4.2.5 Conclusion

Many surveyed farmers believed that date of sowing is a critical factor influencing yield. For the 1974-75 season, October sowings yielded the highest returns for the Timaru and Hawkes Bay districts but for Christchurch, peas sown during the first two weeks of September had the highest yields.

The poorest group yields were obtained from early sowings (prior to October) for Timaru and Hawkes Bay, whereas for Christchurch the late (November) sowings had the lowest yields.

Still, these results are for one season only and have some inconsistencies.

4.3 The Effect of Irrigation:

4.3.1 Introduction

Throughout most of Canterbury probably the major cause of limited crop production is the soil moisture deficit (Lobb [14]). An irrigation system, efficiently managed, may be the means of correcting this problem. However irrigation is frequently very labour demanding and the costs of operation are high. As the popularity of irrigation among farmers increases, they are turning to process crops and the higher financial returns

they offer. However it is critical that these be at least sufficient to offset the extra running costs and labour demands inherent in irrigation.

Nevertheless processors find that irrigated pea crops tend to be uneven.(Davidson[9]).

The variability may be a result of uneven water application inherent with overhead irrigation sprinklers.

4.3,2 Timaru

A 15 per cent increase in average yield occurred on the irrigated, compared with non-irrigated, farms around Timaru (Table 14). However, this increase resulted in only a 4 per cent increase in total pea revenue. A higher average TR with a lower payout may have been the cause as shown in Table 13.

TABLE 13

The effect of Irrigation on Average Payment per Kilogram near Timaru

	Non-Irrigated Farms	Irrigated Farms	All Farms
Number of Farms	15	10	25
Average payment per kilogram	\$0.0837	\$0.0759	\$0.0804
TR	105-115	110-120	110-120

Cultivation costs (including tractor and implement fixed costs) were less for the irrigated sample, being 30 per cent below those calculated for the non-irrigated sample.

Small increases in seed and fertiliser costs (i. e. rates) were apparent for the irrigated group.

The gross margin for irrigated farms is 6 per cent greater (at \$215.16 per hectare) than for the non-irrigated (\$203.00).

TABLE 14

Process Peas - TimaruVariation in Irrigated & Non Irrigated Yields & Costs & Returns per Hectare 1974-75

	Non Irrigated Farms		Irrigated Farms		All Farms	
	Mean	SD	Mean	SD	Mean	SD
Number of farms	15		10		25	
Yield kg per hectare	3,494	(1,031)	4,022	(649)	3,704	(992)
<u>Gross Revenue</u>	\$	\$	\$	\$	\$	\$
Pea revenue	292.52	(85.48)	305.37	(52.41)	297.66	(72.99)
Hay bales less baling charge	17.35	(11.71)	20.83	(12.38)	18.38	(8.01)
Total Revenue	309.87	(86.24)	326.20	(53.84)	316.04	(78.48)
<u>Direct Costs</u>						
Vegetable levy (0.005 pea revenue)	1.46	(0.42)	1.53	(0.27)	1.49	(0.37)
Cultivation:						
Tractor running costs	14.84	(5.61)	11.53	(1.09)	13.32	(4.67)
Tractor labour @1.46/hour	18.22	(7.59)	13.35	(1.75)	16.21	(6.38)
Seed ex store	42.97	(4.27)	47.37	(3.36)	44.73	(4.42)
Seed cartage (carrier)	0.91	(0.25)	1.21	(0.20)	1.04	(0.27)
Fertiliser (ex store)	11.07	(1.73)	11.64	(2.74)	11.29	(2.15)
Fertiliser cartage (carrier)	0.57	(0.25)	0.59	(0.25)	0.57	(0.25)
Herbicide materials	12.48	(6.80)	13.94	(5.21)	12.95	(6.13)
Herbicide application	4.35	(0.86)	4.30	(1.04)	4.32	(1.53)
Irrigation costs:						
Running costs	0		3.43	(1.80)	1.38	(2.03)
Labour costs for pipe shifting	0		2.35	(1.28)	0.94	(1.58)
Total Direct Costs	106.87	(12.55)	111.04	(7.61)	108.24	(13.64)
Gross Margin	203.00	(85.32)	215.16	(53.30)	207.80	(71.25)
<u>Indirect Costs</u>						
Irrigation fixed costs	0		13.30	(5.93)	5.32	(7.56)
Tractor fixed costs	8.18	(5.26)	5.39	(3.46)	7.09	(4.74)
Implement fixed costs	9.94	(8.57)	9.25	(7.41)	9.66	(8.49)
General costs (telephone, rates & accountant x % of growing season occupied by peas)	5.56	(1.32)	6.19	(1.80)	5.05	(4.74)
Land rental or mortgage interest (6% land G.V. x % of growing season occupied by peas)	69.45	(4.40)	74.24	(3.93)	71.23	(15.74)
Total Indirect Costs	93.13	(39.54)	108.37	(18.36)	98.35	(40.32)
Total Revenue	309.87		326.20		316.04	
Total Costs	200.00	(19.60)	219.41	(19.30)	206.59	(42.59)
Gross surplus before management Charge	109.87	(85.03)	106.79	(52.68)	109.45	(65.94)

The total cost of running an irrigation system (including capital fixed costs) for the Timaru sampled farms is \$19.05 per hectare. This sum must be recouped from increased revenue. Adding \$19.05 to the total non-irrigated farm revenue results in a figure which is \$2.72 above the actual total revenue (\$326.20) received by the irrigating farms. So more than half of the irrigating farmers in the survey are not benefiting financially from irrigation.

Water stress is a major limiting factor in achieving high yields. There are two critical stages of growth when adequate water is essential to obtain high yields. The first is at early flowering and the second is at pod swelling, as indicated by Anderson and White [1]. Less than 30 per cent of the sampled farmers with irrigation indicated they applied water during pod swelling. This was true for both Timaru and Christchurch districts. Throughout the sample, all growers with irrigation acknowledged that water at early flowering is critical but the results on Tables 14 and 5 indicate that some growers are not doing this in practice. Table 5 indicated that of the 10 farms with irrigated pea crops, only four were in the high surplus group. Three of the ten were in the low surplus group.

An irrigation trial at Lincoln College [1] gave a 56 per cent increase in pea yield, compared with no irrigation. This is well above the actual 15 per cent yield increase found at Timaru. Other research near Hastings reported by Wraight [23] found pea yield responses to irrigation over two seasons varied from nil to 50 per cent.

4.3.3 Christchurch

The ten Christchurch farms which applied irrigation had an average 21 per cent yield increase over the non-irrigating group (Table 15). This 21 per cent fell to a 15 per cent increase in pea revenue. The average payment per kilogram for the groups is shown below.

	Non-irrigated Farms	Irrigated Farms	All Farms
Average payment per kilogram	\$0.0808	\$0.0769	\$0.0795

In common with Timaru, the irrigated pea crops received a lower average payment per kilogram.

There was a slight difference between the total cultivation costs of the two groups (the irrigated farm group was 9 per cent less). Christchurch farmers with irrigation, unlike their Timaru counterparts, increased fertiliser applications by an average 22 per cent to help offset the expected increased leaching and plant growth demands.

The estimated total irrigation cost per hectare at \$23.50 helped towards the \$43.70 increase in total revenue. Compared with Timaru, where more than half the irrigated farmers surveyed were not recouping their irrigation investment through increased revenue, most near Christchurch were.

The gross surplus for the irrigating farm group (\$96.43 per hectare) was more than twice that of the farm group without irrigation.

4.4 The Effect of Soil Type:

For the three major districts each farmer's yield was plotted against soil type, to test if the six or seven highest yielding growers were on the better cropping soils and the lower yielding farmers on the lighter, less productive soils. This was often found to be true but there were some growers obtaining high yields from medium soils, others with low yields on the best soils. Thus soil type, by itself, did not appear to be the predominant reason for yield variability.

TABLE 15

Process Peas - ChristchurchVariation in Irrigated & Non-Irrigated Yields & Costs & Returns per Hectare 1974-1975

	<u>Non-Irrigated Farms</u>		<u>Irrigated Farms</u>		<u>All Farms</u>	
	Mean	SD	Mean	SD	Mean	SD
Yield kg per hectare	3613	(1430)	4354	(1221)	3845	(1404)
Number of Farms	21		10		31	
<u>Gross Revenue</u>	\$	\$	\$	\$	\$	\$
Pea Revenue	291.99	(128.32)	334.68	(65.95)	305.49	(115.10)
Hay bales less baling charge	13.22	(1.48)	14.23	(1.93)	13.91	(1.85)
<u>Total Revenue</u>	<u>305.21</u>		<u>348.91</u>		<u>319.40</u>	
<u>Direct Costs</u>						
Vegetable levy (0.005 pea revenue)	1.46	(0.64)	1.67	(0.33)	1.53	(0.57)
Cultivation						
Tractor running costs	14.28	(4.00)	13.84	(5.93)	14.14	(4.94)
Tractor labour @ \$1.46/hour	17.52	(5.54)	16.53	(7.27)	17.20	(6.10)
Seed ex store	47.54	(6.90)	51.92	(6.28)	48.95	(6.40)
Seed cartage (carrier)	1.16	(0.42)	1.38	(0.52)	1.28	(0.44)
Fertilizer (ex store)	10.45	(4.52)	12.73	(2.59)	11.19	(4.10)
Fertilizer cartage (carrier)	0.49	(0.28)	0.49	(0.12)	0.52	(0.25)
Herbicide materials	14.83	(8.03)	15.91	(4.05)	15.10	(6.94)
Herbicide application	4.20	(1.06)	4.28	(0.44)	4.37	(0.59)
Irrigation costs:						
Running costs	0		5.02	(3.87)	1.61	(3.26)
Labour costs for pipe shifting	0		3.93	(3.66)	1.26	(2.74)
<u>Total Direct Costs</u>	<u>111.93</u>		<u>127.70</u>		<u>117.15</u>	
<u>Gross Margin</u>	<u>193.28</u>		<u>221.21</u>		<u>202.25</u>	
<u>Indirect Costs</u>						
Irrigation fixed costs	0		14.55	(2.56)	4.70	(6.21)
Tractor fixed costs	7.76	(5.46)	5.67	(3.26)	7.07	(5.29)
Implement fixed costs	10.82	(8.98)	10.14	(6.20)	10.60	(8.81)
General costs (telephone, rates & accountant x % of growing season occupied by peas)	8.67	(2.35)	5.14	(4.55)	7.53	(2.58)
Land rental or mortgage interest (6% land G.V. x % of growing season occupied by peas)	119.26	(44.70)	89.28	(28.99)	109.59	(30.18)
<u>Total Indirect Costs</u>	<u>146.51</u>		<u>124.78</u>		<u>139.49</u>	
<u>Total Revenue</u>	<u>305.21</u>		<u>348.91</u>		<u>319.40</u>	
<u>Total Costs</u>	<u>258.44</u>		<u>252.48</u>		<u>256.64</u>	
Gross surplus/ha, (before management charge).	<u>46.77</u>		<u>96.43</u>		<u>62.76</u>	

5. A Comparison with the 1967/68 Report

5.1 Introduction:

Wherever possible the costing procedures used in the 1967/68 survey 12 were followed. However, there have been slight changes in the costing of some items, especially indirect costs. Some costing procedures relevant in 1967/68 are not entirely appropriate at present, partly because of rapidly inflating prices of items such as tractors and implements and their replacement parts.

The treatment of direct cost items in this report is similar to those in the 1967/68 report. However, instead of combining some cost items (e.g. seed and seed cartage), the current report lists them separately.

Among the indirect costs, general costs and land rental or mortgage interest have been adjusted by a factor based on the length of growing season and not by a direct time factor. Other slight changes have been brought about by increased overhead charges such as interest rates.

5.2 Total Revenue:

A graphical comparison between 1967/68 results and 1974/75 shows a marked increase in total revenue received for 1974/75 (Figure 8). Revenue for the Christchurch region has risen 58 per cent, while for Hawkes Bay it has increased by 67 per cent.

The revenue increases have been mostly due to increased prices paid per kilogram by processors although increased yields have helped. Yield differences are shown in Table 16 below.

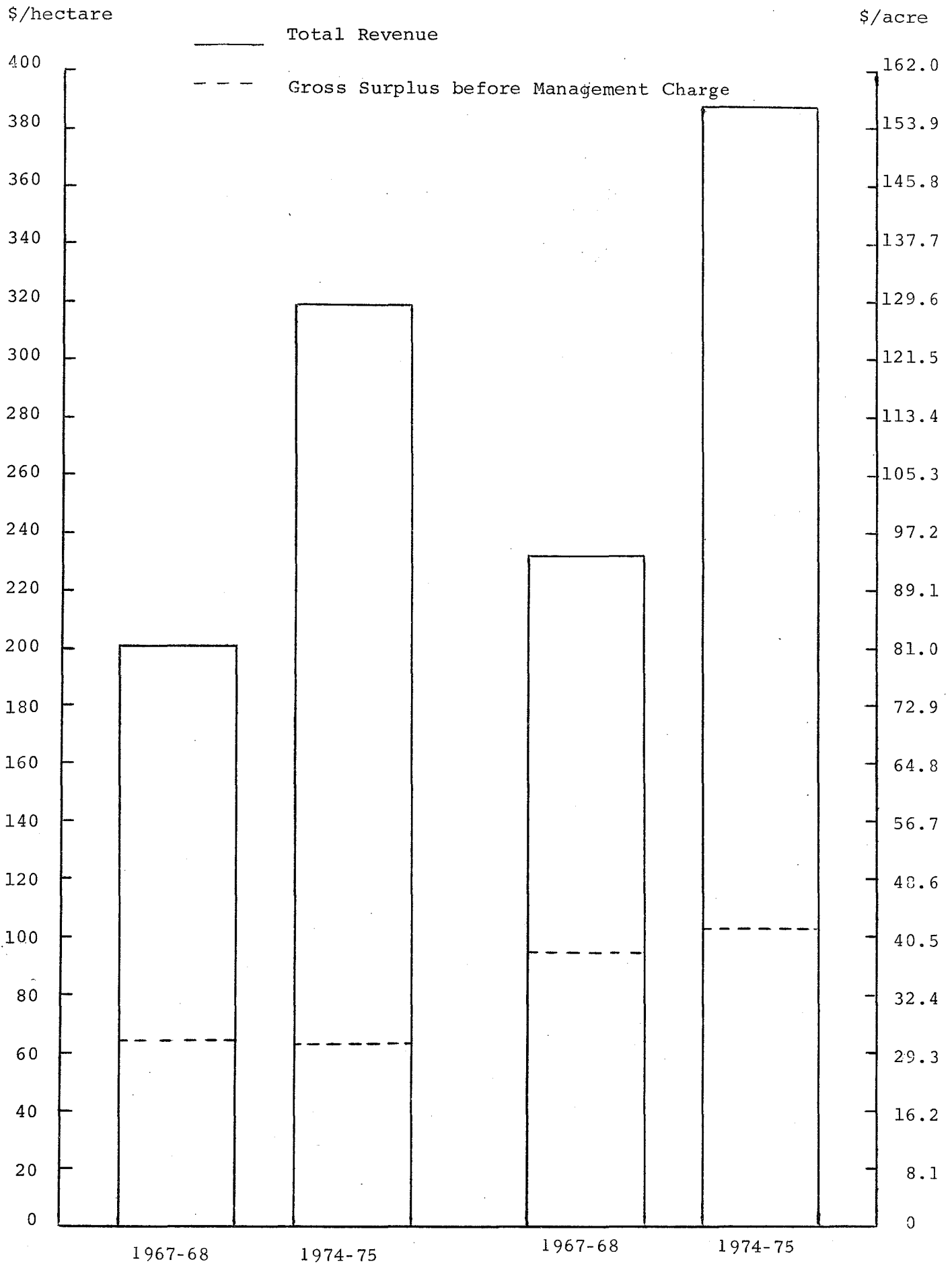
TABLE 16

Average yields per hectare for 1967-68 and for
1974-75 by district

	<u>Timaru</u>	<u>Christchurch</u>	<u>Hawkes Bay</u>	<u>Gisborne</u>
1967-68 tonnes per hectare	not available	3.50	3.72	not available
1974-75 tonnes per hectare	3.70	3.85	4.60	4.43
Percentage increase	-	7	24	-

FIGURE 8

Revenue and Surplus (before management charge) for Process Peas
Comparing 1974-75 Results with 1967-68 Results



5.3 Total Costs:

The major feature of Figure 8 is the escalation of total costs. These have increased for Christchurch farmers from \$136.97 to \$256.64 per hectare (87 per cent) over seven years. In Hawkes Bay the increase has been 100 per cent (from \$136.08 to \$284.59 per hectare).

5.4 Gross Surplus (before management charge):

A close similarity exists for gross surplus between the two periods. But because of the rise in total costs, 1974/75 farmers need a higher total revenue to achieve the same gross surplus. In 1967/68 gross surplus made up 32 per cent of the total revenue for Christchurch (41 per cent for Hawkes Bay) but by 1974/75 this had been eroded to 20 per cent (27 per cent for Hawkes Bay). Because of inflation the purchasing power of the gross surplus at present is well below the purchasing power of the same figure seven years ago.

5.5 Net Surplus:

The 1974/75 report treats the return to management in a different manner from that used earlier. A direct comparison is not possible.

PART IV : GREEN BEANS

1. Summary

Average yields in the three major green bean districts ranged from 7.76 tonnes per hectare for Christchurch to 10.64 tonnes per hectare for Gisborne. The average gross revenue varied from \$592.45 per hectare (Hawkes Bay) to \$729.77 per hectare (Gisborne).

Wide fluctuations in individual direct costs occurred among districts. Seed was the most costly item in all three. Depending on district, fertiliser, herbicide materials or insecticide and fungicide materials were next.

Unlike total direct costs, there was little difference among average district total indirect costs.

The districts' average gross surpluses ranged from \$240.90 per hectare (Christchurch) to \$418.69 per hectare (Gisborne). For each of the surveyed districts a graph relating yield to gross surplus using least squares regression has been drawn.

Because of the higher management skills demanded by green beans compared with peas, an increased management charge has been allowed. The average net surplus, after deducting the management charge from the gross surplus figures, ranges from \$177.20 per hectare for Christchurch to \$358.00 for Gisborne.

As identical costing procedures have been used for both process peas and green beans a comparison of profitability between the two has been made. Beans return a gross revenue and gross margin around twice that of process peas. The gross surplus comparison shows that in Christchurch and Gisborne beans are nearly four times as profitable and in Hawkes Bay one and one half times. The net surplus comparison is even more extreme.

2. Method of Approach

2.1 The Sample:

Green beans are grown in a number of districts in New Zealand. Following discussions with representatives from the two major processing companies it was decided that a random sample be selected from growers in each of the three major processing districts - Christchurch, Hawkes Bay and Gisborne. While green beans is an important process crop, it is grown in fewer districts and by a smaller number of growers compared with process peas. For these reasons a smaller total sample size of 40 growers with a minimum of 10 farms in any one district was decided on.

Similar sampling procedures to those reported for the pea grower survey were used.

2.2 Definition of Cost and Return Items:

Definitions of cost and return items are the same as for the process pea analysis.

2.3 Bypassing:

Of the 40 growers interviewed in the three districts only two in Canterbury had part of their crop bypassed. In both cases the areas were flooded following heavy summer rainfall.

3. Costs and Returns by District

3.1 Introduction:

Table 17 sets out the average costs and returns from the surveyed growers in the three bean growing districts covered. Figure 9 gives a diagrammatic representation of differences in costs and returns.

The low sample numbers in each district (Christchurch 11, Hawkes Bay 16 and Gisborne 13) preclude a detailed management analysis. However a comparison between district averages indicates

TABLE 17

Average Costs and Returns for Green Beans - 1974-75¹

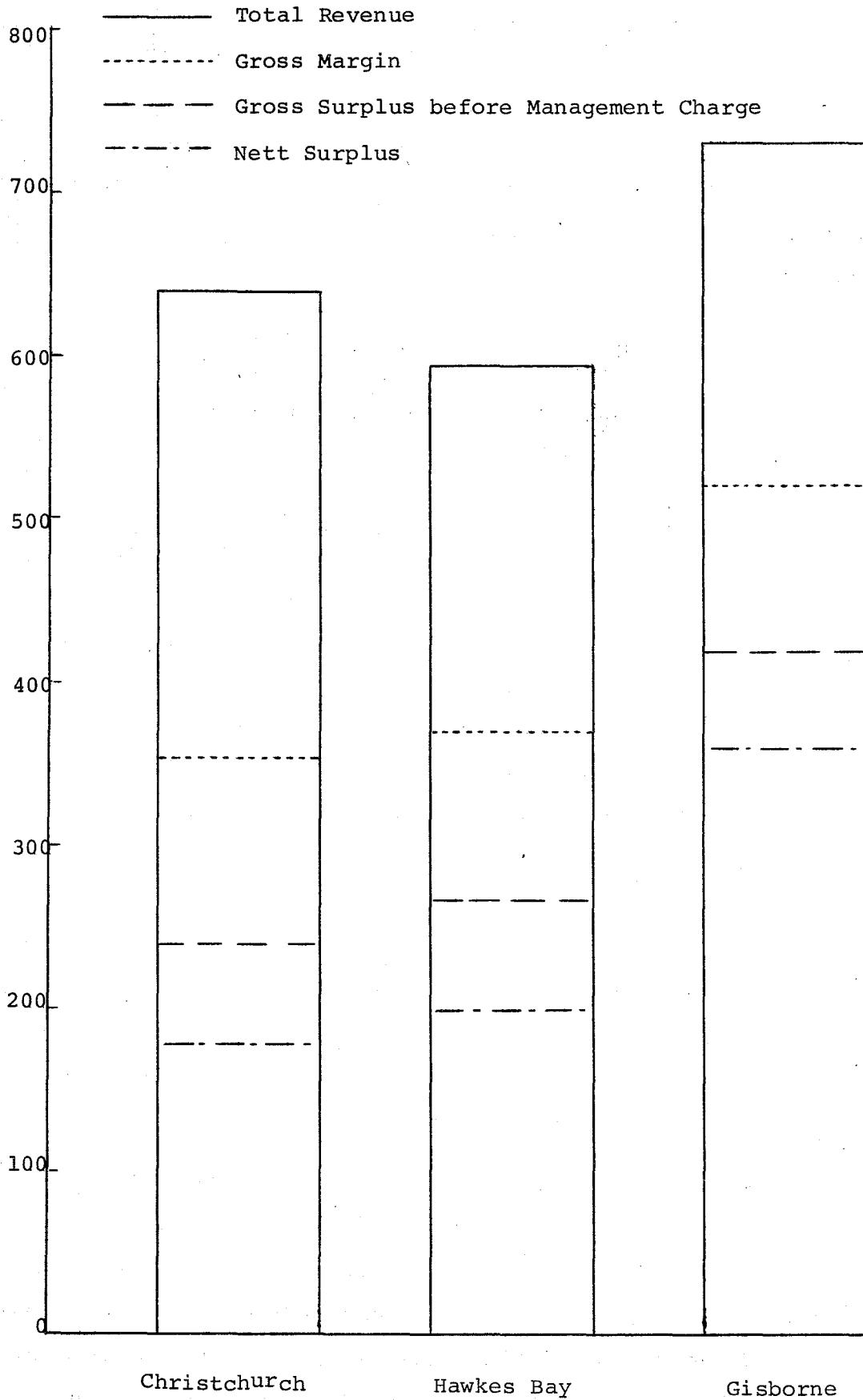
(All figures refer to one hectare)

	<u>Christchurch</u>		<u>Hawkes Bay</u>		<u>Gisborne</u>	
	Mean	SD	Mean	SD	Mean	SD
Average area in green beans (hectares)	5.34	(2.41)	4.94	(2.63)	5.75	(2.06)
Yield kg per hectare	7,757	(1,741)	8,464	(2,782)	10,638	(1,857)
	\$		\$		\$	
<u>Gross Revenue</u>	<u>639.25</u>	<u>(148.66)</u>	<u>592.45</u>	<u>(237.50)</u>	<u>729.77</u>	<u>(163.34)</u>
<u>Direct Costs</u>						
Vegetable levy	3.20	(0.73)	2.96	(1.19)	3.65	(0.82)
Cultivation:						
Tractor running costs	10.66	(3.73)	8.55	(7.78)	8.22	(1.71)
Tractor labour	11.97	(4.13)	9.39	(4.03)	9.84	(1.95)
Contract drilling	35.29	(1.19)	16.43	(2.45)	11.05	(1.09)
Contract inter-row cultivation	17.59	(10.65)	21.00	(3.39)	21.30	(6.80)
Seed ex store	131.56	(6.20)	56.77	(12.26)	73.69	(12.36)
Seed cartage	0.52	(0.17)	0.20	(0.02)	0.22	(0.02)
Fertiliser ex store	44.35	(10.58)	26.48	(11.44)	32.42	(19.84)
Fertiliser cartage	1.33	(0.44)	0.67	(0.27)	0.52	(0.17)
Herbicide materials	18.35	(9.79)	17.69	(5.63)	21.71	(18.16)
Herbicide application	4.20	(1.48)	7.54	(2.97)	10.35	(10.85)
Insecticide/Fungicide materials	0		41.99	(22.22)	11.26	(2.67)
Insecticide/Fungicide application	0		7.41	(3.04)	6.05	(0.42)
Irrigation costs:						
Running costs	4.52	(2.59)	3.14	(4.52)	0	
Labour costs	2.85	(1.41)	2.05	(3.19)	0	
Total Direct Costs	286.39		222.27		210.28	
Gross Margin	352.86		370.18		519.49	
<u>Indirect Costs</u>						
Irrigation fixed costs	10.14	(4.15)	3.21	(4.62)	0	
Tractor fixed costs	5.41	(1.90)	3.99	(1.71)	4.99	(0.91)
Implement fixed costs	7.46	(3.36)	5.98	(2.57)	6.94	(1.75)
General costs	6.08	(2.17)	7.07	(1.73)	5.93	(1.80)
Land rental or mortgage interest	82.87	(29.08)	85.57	(23.08)	82.94	(26.05)
Total Indirect Costs	111.96		105.82		100.80	
Total Revenue	639.25		592.45		729.77	
Less Total Costs	398.35		328.09		311.08	
Gross Surplus per hectare	240.90		264.36		418.69	
Management Charge	63.70		66.04		60.69	
Nett Surplus per Hectare	177.20		198.32		358.00	

¹The data refer to 11 growers in Christchurch, 16 in Hawkes Bay and 13 in Gisborne.

FIGURE 9 : Average Revenue, Gross Margin and Surplus for Green Beans in Three Districts 1974-75

\$/hectare



certain cost anomalies (e. g. Christchurch seed cost) and illustrates some of the differences among districts.

3.2 Yield in Kilograms:

The Gisborne surveyed farms had the highest average yield. The district with the lowest average, Christchurch, at 7,757 kilograms per hectare, was 27 per cent below the 10,638 kilograms per hectare achieved by Gisborne.

3.3 Revenue:

The average payment per kilogram was:

Christchurch	Hawkes Bay	Gisborne
8.24 cents	7.00 cents	6.86 cents

In some districts the basis of payment has recently changed from a flat rate per kilogram to a sliding scale based on average seed length. The more mature beans with higher average seed length attract lower payment. The method of processing influences factory demand for particular maturity and length levels. The desirable average seed length for freezing is about 10.5 mm, whereas a seed length of about 12.5 mm is preferred if dehydration is to be undertaken.

3.4 Direct Costs:

Total direct costs ranged from \$210.28 per hectare for Gisborne to \$286.39 per hectare for Christchurch. Marked variability in some costs existed among districts. Table 18 lists the percentage contribution to total direct costs of the major direct cost items.

Seed, which was the major individual direct cost item for all areas surveyed, ranged from \$56.77 per hectare for Hawkes Bay to \$131.56 per hectare for Christchurch. The reason for the low Hawkes Bay figure is a combination of both seed cost per kilogram (the cost of seed was 20 to 25 per cent lower than Christchurch) and a lower seeding rate (resulting in fewer plants per square metre).

Drilling charges at \$35.29 per hectare for Christchurch were substantially higher than for the other districts (\$16.43 for Hawkes Bay and \$11.05 for Gisborne). This is a reflection of the wider use of precision sowing equipment and the preference for narrow row spacings in the Christchurch region. Further investigation is needed to determine why Christchurch growers, with their higher sowing rates per hectare and use of precision drills have lower average yields than both North Island districts.

In Hawkes Bay the cost of insecticide and fungicide materials is the second largest direct cost item. In view of the rapidly escalating cost of many of these materials investigation into cheaper substitutes may be worthwhile. (e. g. A less expensive replacement for the fungicide Benlate - which currently makes up 45 per cent of the average insecticide and fungicide material cost.)

TABLE 18

Direct Costs as a Percentage of Total Direct Costs

	Christchurch	Hawkes Bay	Gisborne
	%	%	%
Seed ex store	46	26	35
Fertiliser ex Store	15	12	15
Contract drilling	12	7	5
Contract inter-row cultivation	6	9	10
Cultivation (excluding drilling and inter-row cultivation)	8	8	9
Herbicide materials	6	8	10
Insecticide/Fungicide materials	0	19	5
Miscellaneous direct costs	7	11	11
	<hr/> 100 <hr/>	<hr/> 100 <hr/>	<hr/> 100 <hr/>

3.5 Gross Margins:

The higher total direct costs in the Christchurch area resulted in a gross margin which is 47 per cent below that of Gisborne (\$352.86 compared with \$519.49 per hectare). Christchurch growers had an average gross revenue only 14 per cent below that of Gisborne growers but the higher direct costs substantially worsened

this position. Of the 15 direct cost items listed in Table 17, Christchurch has the highest district average for all but six.

3.6 Indirect Costs:

The district with the highest average indirect cost total was Christchurch at \$111.96 per hectare, followed by Hawkes Bay (\$105.82) and Gisborne (\$100.80). Unlike direct costs, there was little variation in the relative importance of individual indirect costs between districts, as Table 19 indicates.

TABLE 19

Indirect Costs as a Percentage of Total Indirect Costs

	Christchurch	Hawkes Bay	Gisborne
	%	%	%
Irrigation fixed costs	9	3	0
Tractor fixed costs	5	4	5
Implement fixed costs	7	5	7
General Costs	5	7	6
Land rental or mortgage interest	74	81	82
	—	—	—
	100	100	100
	—	—	—

3.7 Gross Surplus per hectare before Management Charge:

The Gisborne district had the highest average gross surplus of \$418.69 per hectare. The surveyed Gisborne farms not only had the highest average yield, they also had the highest gross revenue and the lowest total costs. The Christchurch gross surplus of \$240.90 per hectare was 73 per cent below that of Gisborne. Hawkes Bay started with an average yield close to eight and one half tonnes per hectare and a per hectare gross revenue of \$592.45. However, after deducting total costs, the gross surplus figure of \$264.36 per hectare was still 58 per cent below that of Gisborne.

Each surveyed grower's yield per hectare together with his calculated gross surplus per hectare has been plotted for the three districts. These results appear in Figures 10, 11, 12 and 13. A trend line has also been derived using least squares regression. Farmers can determine their own position relative to other farmers in their district by plotting their per hectare yield on the graph.

Green Bean Yield in Kilograms per Hectare and
Gross Surplus per Hectare for Christchurch

Gross Surplus \$/ha

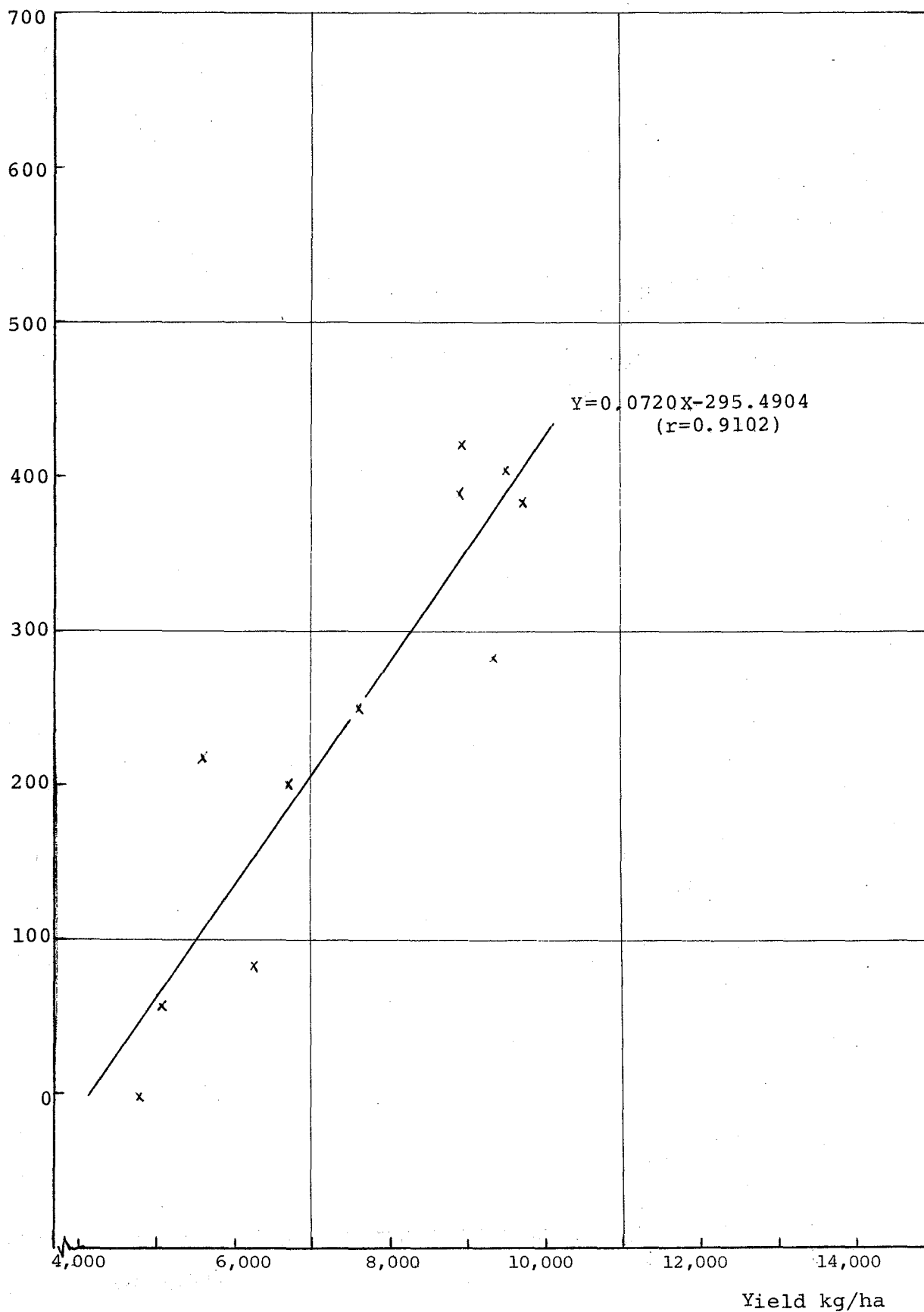
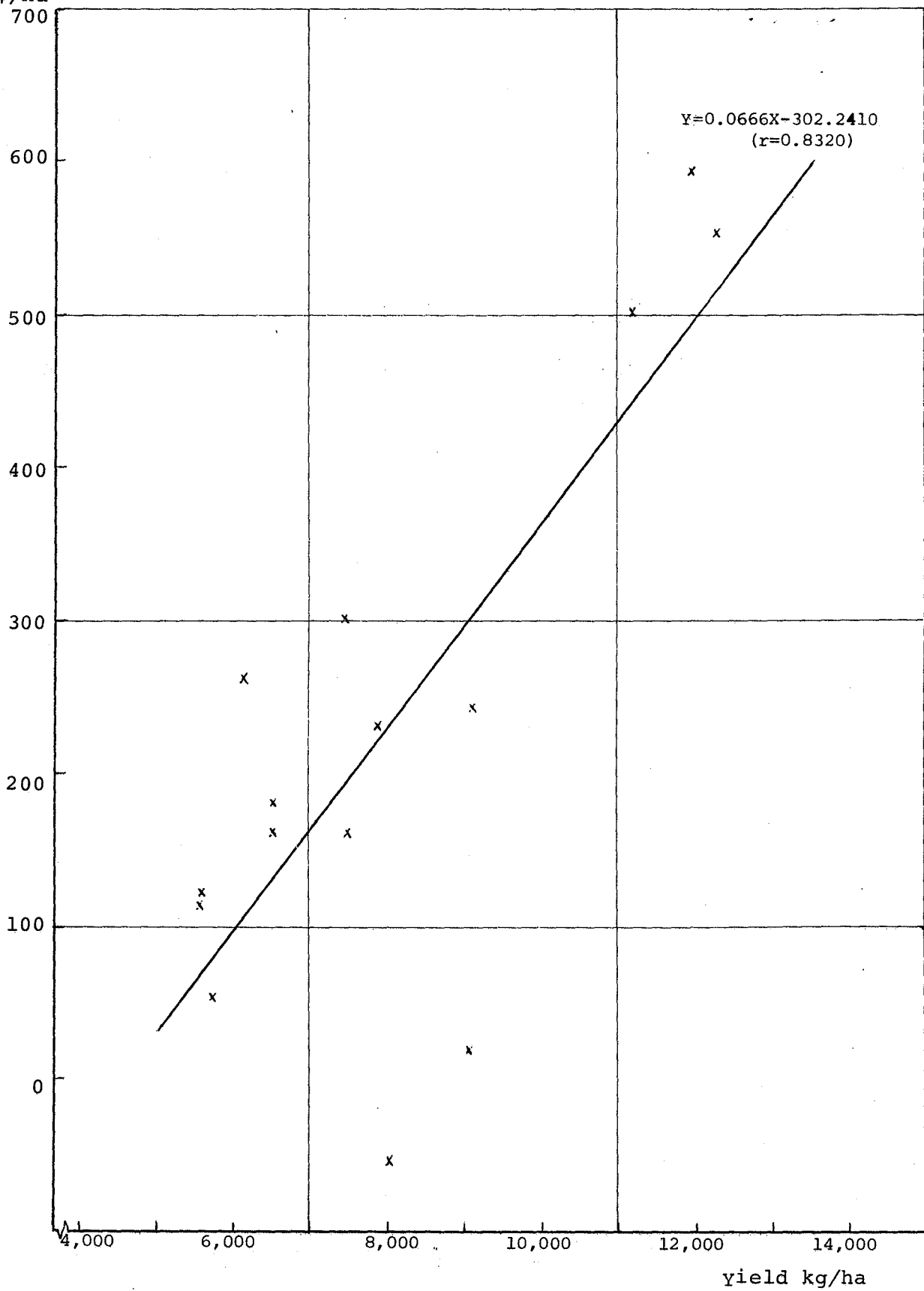


FIGURE 11

Green Bean Yield in Kilograms per Hectare and
Gross Surplus per Hectare for Hawkes Bay

Gross Surplus
 \$/ha



Green Bean Yield in Kilograms per Hectare and
Gross Surplus per Hectare for Gisborne

Gross Surplus
\$/ha

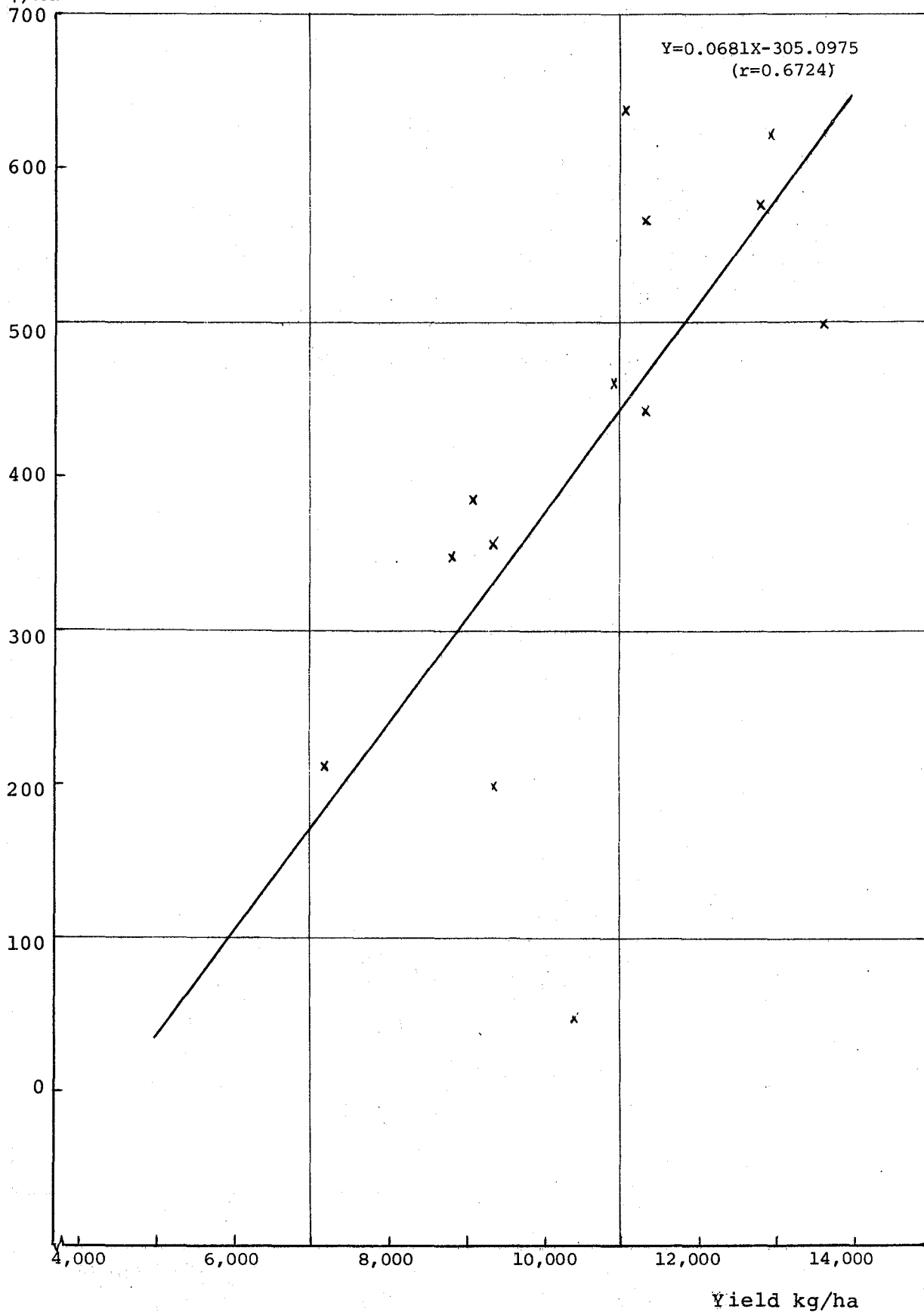
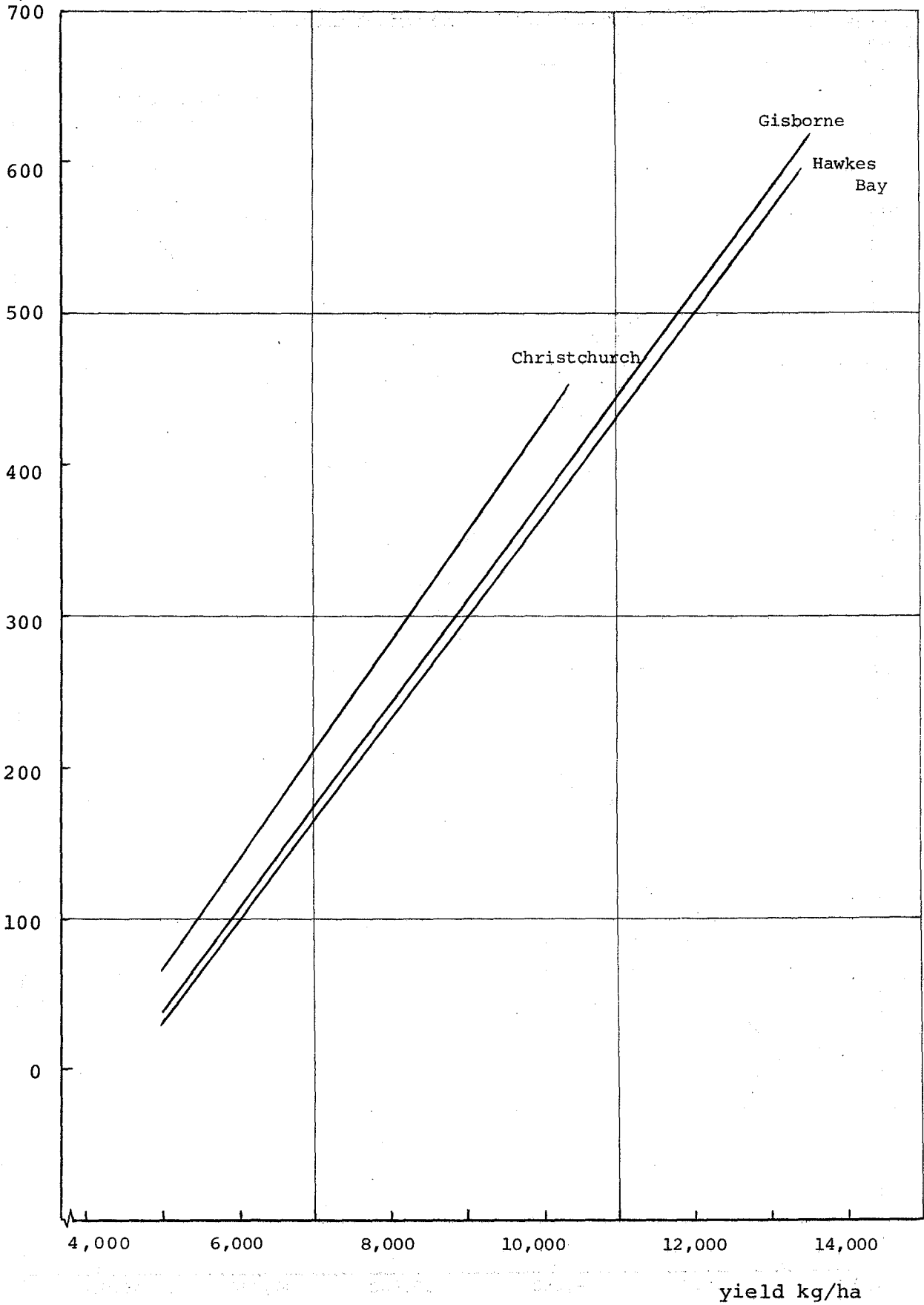


FIGURE 13

Green Bean Yield in Kilograms per Hectare and
Gross Surplus per Hectare for All Districts

Gross Surplus
\$/ha



3.8 Net Surplus per hectare:

The net surplus per hectare is the balance after deducting direct and indirect costs plus an estimate for wages of management (called management charge in the tables and elsewhere).

The region with the highest net average surplus - Gisborne at \$358.00 per hectare - is more than twice the lowest regional average (Christchurch) at \$177.20.

In this report estimated wages of management have been calculated based on the capital invested in the property and the amount of tractor labour used (see Appendix I).

While it is very difficult to assess the degree of management skill necessary to grow one crop compared with another, some crops warrant a higher management charge than others. Green beans are an expensive crop to establish and require a high degree of management skill throughout their growth. Compared with a process pea crop, total direct costs for green beans are approximately twice as great. The risk of crop loss from weather fluctuations such as frost, wind and rain, as well as fungi and bacterial attack, is greater. In addition the use of a pre-emergence herbicide limits the range of crops which can follow the beans. Therefore, a higher management charge has been calculated for beans than for peas.

PART V : THE PROFITABILITY OF GREEN BEANS
AND PROCESS PEAS

1. The Comparison

From the average surveyed results green beans return a gross revenue per hectare approximately twice that of process peas, as Figure 14 indicates. Accompanying this increased bean revenue are higher direct costs - around \$200 per hectare compared with around \$100 for process peas. The district average gross margin for green beans ranges approximately from \$350 to \$520 per hectare. The equivalent process pea range is approximately \$200-\$280.

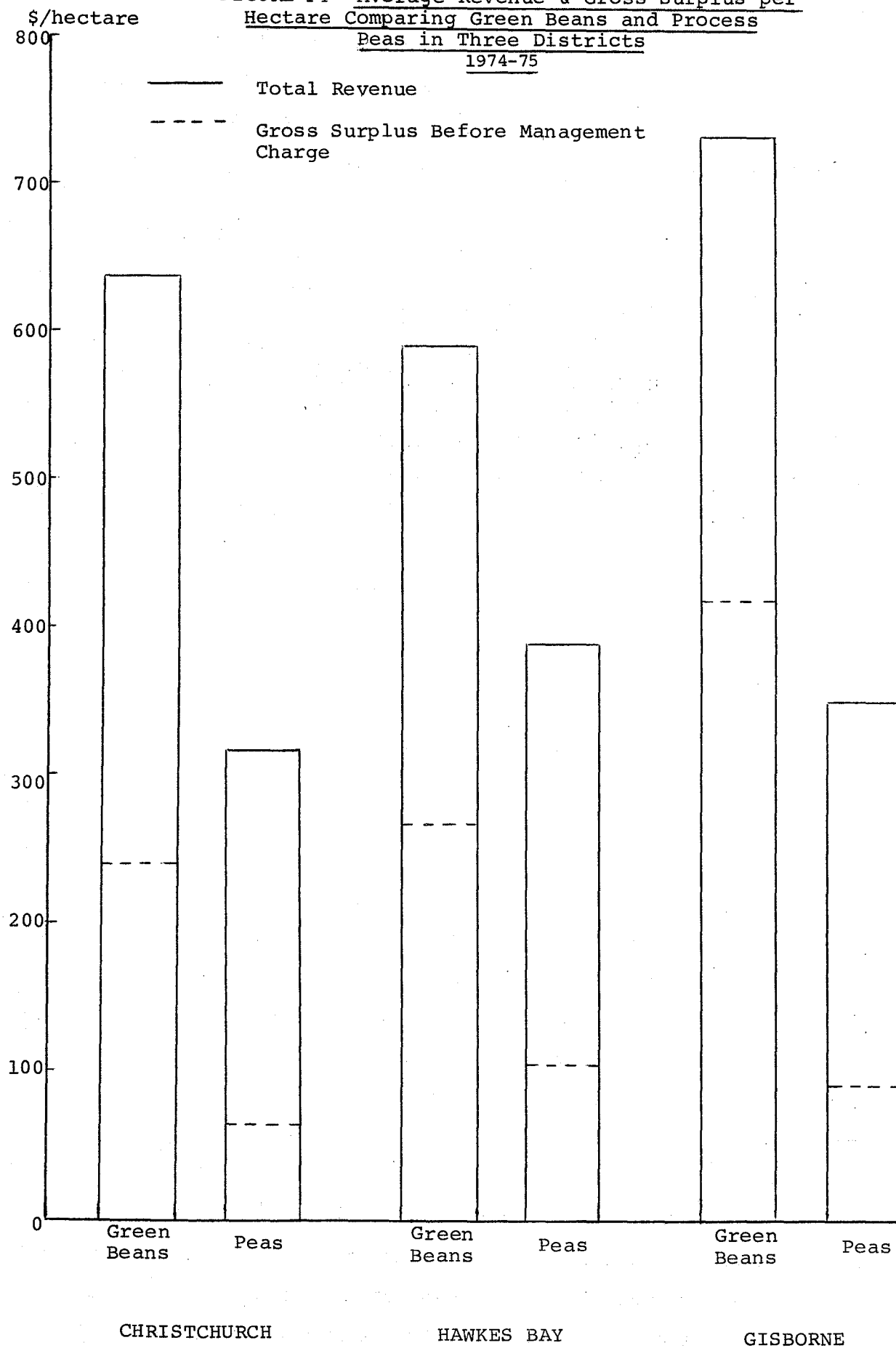
Total indirect costs are 24-63 per cent less for the beans depending on district. This is due either to a lower charge for land rental or mortgage interest payment, because of the shorter period the beans occupy the ground (see Table 20). The average green bean crop in the two North Island districts takes up only one third of the growing season. This provides an opportunity of planning a double cropping programme around a green bean crop whereas this is more difficult for peas.

TABLE 20

The calculation of average district land rental or mortgage interest for green beans and process peas

	<u>Christchurch</u>		<u>Hawkes Bay</u>		<u>Gisborne</u>	
	Green Beans	Process Peas	Green Beans	Process Peas	Green Beans	Process Peas
Mean Govt. land Valn/ha.	\$2,656	\$2,647	\$3,753	\$3,751	\$3,840	\$4,801
Rental or mortgage interest at 6 per cent	\$159.36	\$158.82	\$225.18	\$225.06	\$230.40	\$241.08
Percentage of growing season occupied by beans or peas	52%	69%	38%	66%	36%	49%
Rent or mortgage interest	\$ 82.87	\$109.59	\$ 85.57	\$148.54	\$ 82.94	\$118.13

FIGURE 14 Average Revenue & Gross Surplus per Hectare Comparing Green Beans and Process Peas in Three Districts
1974-75



The district green bean average gross surplus ranges approximately between \$240 and \$420 per hectare. The equivalent range for process peas is \$60-105 per hectare. Table 21 compares the gross and net surplus (profitability) of the two crops.

TABLE 21

Gross surplus, management charge and net surplus
for green beans and process peas

	<u>Christchurch</u>		<u>Hawkes Bay</u>		<u>Gisborne</u>	
	Green Beans	Process Peas	Green Beans	Process Peas	Green Beans	Process Peas
Gross surplus	240.90	62.76	264.36	103.46	418.69	88.80
Management charge	63.70	52.00	66.04	57.53	60.69	47.74
Net Surplus	177.20	10.76	198.32	45.93	358.00	41.06

Because of the method of analysis and the somewhat different basis for calculating the management charge for peas and beans, comparison between crops based on the gross surplus figures is the most realistic. The predominant reason for the wide net surplus district differences is due to the shorter period of the growing season the beans occupy the ground (see Table 20).

2. Conclusion

Green beans are financially a more attractive crop than peas. However they are a more difficult crop to grow well. The influence of climate and pests and diseases is of major importance and each stage of growth brings its own problems and risks.

Yield reductions due to weed and insect or fungi attack can be minimised by judicious spraying. Winds or very high temperatures at crucial stages of growth can have serious effects on yield.

The results of this survey conducted over the 1974-75 season indicate that green beans are substantially more profitable than process peas. However such differences may not occur in other seasons. In any case the returns from a crop tend to reflect both the risk involved and the degree of skill required by the farmer.

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APPENDIX I

DERIVATION OF COST & RETURN ITEMS
FOR PROCESS PEAS AND GREEN BEANS

1.1 Introduction

One of the objectives of this study was to provide a framework for future updating of costs and returns. To facilitate this, Tables VI to IX (Peas) and X to XII (beans of Appendix II) briefly list the costing information for each district. For some items the approach followed in this report differs from that used in the earlier 1967-68 pea survey. Derivation of revenue and cost items are explained in greater depth below.

1.2 Revenue

1.2.1 Hay Bales less Baling Charge:

For the process pea crop each bale was assessed at \$0.50 in the paddock. A charge of \$0.19 was deducted from this to cover the cost of baling. Growers who were unable to bale due to weather conditions and used stock to clean the paddock of the pea residue have also been assessed at the mean rate of baling for their district.

1.3 Direct Costs

1.3.1 Cultivation:

(a) Tractor running costs for 1974/75 include fuel, repairs and maintenance, registration and insurance. Running costs are assessed on the size of the tractor.

TABLE I

Tractor running costs according to size
of Tractor

30 - 40 bhp	-	\$1.10/hr
60 - 70 bhp	-	\$1.20/hr
70 - 80 bhp	-	\$1.30/hr

(Source: Anon, [5]).

The mean tractor size varied between districts. For the pea crop it ranged from an average of 68 bhp for Timaru to an average of 57 bhp for Gisborne. The district range for the beans averaged from 73 bhp (Hawkes Bay) to 69 bhp (Gisborne).

(b) Tractor labour at \$1.46 per hour.

Source: Agricultural Workers (Market Gardeners) Order, July, 1974.

(c) Partial contract cultivation and/or drilling for the process pea crop:

Eighty-two per cent and 41 per cent of the sampled growers in the Gisborne and Hawkes Bay areas respectively employed contractors for various cultivation or drilling operations. In both cases, the mean was arrived at by determining the contract charges per hectare for those who hired contractors and spreading this cost over the total number of growers sampled.

Bean growers frequently hire contractors for drilling the crop and occasionally for inter-row cultivation. The standard deviations for these two costs listed in Table 17 gives an indication of the number of growers hiring contractors.

1.4 Indirect Costs

1.4.1 Depreciation and interest:

The value assigned to fixed cost items such as tractors, implements and irrigation equipment has been based on the initial purchase price (Anon, [2]).

Each farmer was asked the age and original cost of his equipment. From this, the expected life of the machine was assessed and a trade-in value calculated. A straight line annual depreciation rate was used and this was expressed as a percentage of the initial cost.

Just as depreciation is charged in order to spread the initial cost of machinery over its working life, an interest charge is made for the use of money invested in farm machinery.

$$\text{Annual interest} = \frac{\text{Initial cost plus trade-in value}}{2} \times \frac{7}{100}$$

The 7 per cent is the overdraft interest rate on bank current accounts.

Providing shelter for farm equipment increases its life and eventual trade-in value. To cover this an annual charge of 1 per cent of initial purchase price has been charged.

1.4.2 Irrigation fixed costs:

Pea and bean irrigation fixed costs are set at 14 per cent of the average capital cost per hectare. (This percentage is calculated from Anon [2]) and includes depreciation, interest and repairs and maintenance.) For the Timaru pea growers only 40 per cent of the sampled farms used irrigation (Christchurch had 32 per cent) so the total irrigation fixed costs were multiplied by this factor (e.g. 0.40 for Timaru) to spread the cost over the total number of growers sampled.

A similar approach was followed for other regions where only a proportion of the surveyed growers used irrigation, e.g. Christchurch pea growers and Hawkes Bay bean growers.

1.4.3 Tractor fixed costs:

For peas tractor fixed costs vary from \$0.60 per hour (Christchurch) to \$0.64 per hour (Timaru) depending on the age, size and original cost of the tractor. The formula used for estimation was:-

$$\frac{\text{Tractor hours used for pea crop}}{\text{Total annual tractor hours for farm}} \times \text{original tractor cost} \times 17.5\%$$

The 17.5 per cent includes depreciation, interest and provision for shelter (based on Anon. [2]). This was then converted back to an average cash rate per hour.

For example, for Hawkes Bay, average tractor fixed costs were:-

$$\frac{8.8 \text{ ha.} \times 8.38 \text{ hours/ha. (peas)}}{1010 \text{ annual hours (farm)}} \times \$3,600 \times 17.5\% = \$46.00$$

$$\frac{\$46.00 \text{ pea tractor fixed costs}}{8.8 \text{ ha.} \times 8.38 \text{ hours/ha.}} = \$0.62 \text{ per hour}$$

Among the surveyed bean growers tractors tended to be larger in size and newer. This contributed towards the higher average tractor fixed costs per hour (\$0.62 per hour for Gisborne to \$0.74 per hour for Hawkes Bay). This higher cost is offset by the lower number of tractor hours worked (e.g. 6.74 hours per hectare for beans compared with 8.43 hours for peas in the Gisborne district).

1.4.4 Implement Fixed Costs:

A wide range of implement average hourly costs was found. The variation is due to each district tending to favour different implements for the initial soil cultivation.

For peas in the Timaru district the grubber was used the most (representing 18 per cent of the total implement fixed costs). For Christchurch, Hawkes Bay and Gisborne districts discs were favoured (30, 42 and 74 per cent of total implement fixed costs respectively).

A similar fixed cost formula to that used for tractor fixed costs was used for the implements with varying percentages to cover depreciation, interest, repairs and maintenance and shelter (based on Anon. [.2]).

$$\frac{\text{Hours used (peas)}}{\text{Annual hours (farm)}} \times \text{original implement cost} \times \text{percentages}$$
 as shown in Table II.

TABLE II

Implement fixed and operating costs
for peas and beans expressed as a
percentage of initial costs

<u>Implement</u>	<u>Total % Charge</u>
Disc	19.5
Plough	22.0
Roto-tiller	20.5
Grubber	20.5
Hayrake	21.5
Drill	18.5
Harrow	15.0
Roller	12.7

1.4.5 General costs apportioned to Peas and Beans:

The annual telephone charges and accountant costs were divided by the total farm area. This per hectare figure was then multiplied by the percentage of the growing season that the ground is set aside for peas and beans. In past reports, the calendar months, as a percentage of the year, have been used as the multiplier. This approach fails to take account of the different seasonal growth pattern which occurs among districts. Because preparatory cultivation and the pea and bean growing season occurs during the peak growth period of the year (spring and summer), a higher percentage than just the proportion of months per year should be used.

Annual pasture production percentage figures as kilograms dry matter per hectare, as estimated by the Ministry of Agriculture and Fisheries, have been used to overcome this problem (Anon, [3]).

TABLE III

Seasonal Pasture Production (kg/DM/ha) as Percentage
Contribution to Annual Yield

<u>Location</u>	<u>Winter</u> (June, July, Aug.)	<u>Spring</u> (Sept. Oct. Nov.)	<u>Summer</u> (Dec. Jan. Feb.)	<u>Autumn</u> (Mar. Apr. May)
Manatuke	17	35	25	23
Takapau	8	60	21	11
Winchmore- dryland	11	57	24	8
Winchmore- irrigated	5	36	42	17

The mean percentage of the growing season occupied by peas and beans for each district was:

TABLE IV

Average percentage of growing season
occupied by peas and beans by region

	Process Peas	Green Beans
Gisborne	49	36
Hawkes Bay	66	38
Christchurch	69	52
Timaru	67	-

1.4.6 Land Rental per year or Land Mortgage
apportioned to Peas:

The Government valuation for the land used by each grower was obtained from the local Valuation Department and after discussions with the officers of that Department was updated to the 31st March, 1974. A rental or mortgage figure of 6 per cent of this valuation has been allowed in these costings. This figure provides for a return to the capital tied up in land.

This approach emphasises that growers with land which is close to a city boundary with a very high land valuation must grow more than one crop per year to achieve a reasonable return for their capital involved. The calculations are:

TABLE V

Process Pea Land Rental or Land Mortgage Assessment
by Region

	<u>Timaru</u>	<u>Christchurch</u>	<u>Hawkes Bay</u>	<u>Gisborne</u>
Mean Govt. land Valuation/ha. (31-3-74)	\$1,772	\$2,647	\$3,751	\$4,081
Rental or Mortgage interest at 6 per cent	\$106.32	\$158.82	\$225.06	\$241.08
Percentage of growing season occupied by peas	67%	69%	66%	49%
	\$ 71.23	\$109.59	\$148.54	\$118.13

1.4.7 Management charge:

This is a measure of the opportunity cost of the grower's supervision of the crop. One possibility is a management charge based on a married farm worker's salary plus 1 per cent of total farm capital (Anon [5]). The approach used in this report is an attempt to modify the above method to suit a single short-term crop.

The basis for costing the farm worker's salary has been calculated as the award rate per hour (\$1.46) for the number of tractor hours worked. To this is added 1.5 per cent of total Government capital valuation per hectare multiplied by the percentage of the growing season occupied by the process pea crop, and results in the following:

	<u>Timaru</u>	<u>Christchurch</u>	<u>Hawkes Bay</u>	<u>Gisborne</u>
Management charge per hectare	\$41.70	\$52.00	\$57.33	\$47.74

This approach permits updating.

Compared with growing peas, green beans are a risky crop demanding a higher degree of management skill. It is difficult to put a value on this. The approach followed here has been to increase the proportion of the farm's Government capital valuation per hectare to 3 per cent (instead of 1.5 per cent as for peas). The three districts average green bean management charges then become

	<u>Christchurch</u>	<u>Hawkes Bay</u>	<u>Gisborne</u>
Management charge per hectare	\$63.70	\$66.04	\$60.69

APPENDIX II

COSTS OF PRODUCTION BY DISTRICT
FOR PROCESS PEAS AND GREEN BEANS

TABLE VI

PROCESS PEAS - TIMARUCosts of Production per Hectare

Average pea hectares	10.2
<u>Gross Revenue</u>	\$
Pea gross revenue of 3,704 kg per hectare @ \$0.0804/kg	297.66
Hay bales 59.29 bales/ha @ \$0.50/bale less \$0.19 baling charge	18.38
Total Revenue	<u>316.04</u>
<u>Direct Costs</u>	
Vegetable levy (0.005 pea gross revenue)	1.49
Cultivation:-	
Tractor running costs 11.1 hours @ \$1.20/hour (68 bhp tractor)	13.32
Tractor labour 11.1 hours @ \$1.46/hour (Agricultural Workers (Market Gardeners Order) July 1974)	16.21
Seed ex store 279.5 kg @ \$0.16/kg	44.73
Seed cartage (carrier) 2,851 kg over 12 miles for 10.2 ha (Cartage Schedule Rates)	1.04
Fertiliser ex store, 350 kg of 30% Pot. molybdate serpentine super @ \$32.25/tonne)	11.29
Fertiliser cartage by carrier (less rebate) for 8 miles 8.77 tonnes for 10.2 hectares	0.57
Herbicide materials 2,55 litres MCPB @ \$1.87/litre plus 3.57 litres Sinox PE @ \$2.29/litre	12.95
Herbicide application by contractor	4.32
Irrigation - Applicable for 10 of the 25 farms sampled (i.e. 0.40)	
Running costs/ha 119 units x \$0.0145/unit electricity x 2 irrigations = \$3.45 x 0.40	1.38
Labour costs for pipe shifting 1.61 hours @ \$1.46/hour = \$2.35 x 0.40	0.94
Total Direct Costs	<u>108.24</u>
Gross Margin	<u>207.80</u>
<u>Indirect Costs</u>	
Irrigation fixed costs. Average capital costs of \$285/ha with total farm irrigations of 6/year. Peas irrigated twice. Depreciation, interest and repairs and maintenance of \$6.65/irrigation x 2 x 0.40	5.32
Tractor fixed costs 68 bhp tractor. Depreciation and interest - \$0.64/hour for 11.1 hours	7.09
Implement fixed costs 11.1 hours @ \$0.87/hour	9.66
General costs telephone, rates & accountant (7.54/ha) x % of growing season occupied by peas (67%).	5.05
Land rental or land mortgage 6% of land G.V. (\$1,772/ha) x % of growing season occupied by peas (67%)	71.23
Total Indirect Costs	<u>98.35</u>
Total Revenue	316.04
Less Total Costs	206.59
Gross Surplus per hectare before management charge	<u>109.45</u>
Management charge based on the Agricultural Workers Wage order of \$1.46/hour for 11.1 hours. Plus 1.5% of Government Capital Valuation. Land Valuation (\$1,772/ha) x 1.43 (value of improvements (\$762/ha) C.V. = \$2463/ha) x % of growing season occupied by peas	41.70
Nett surplus per hectare	<u>67.75</u>

TABLE VII

73.

PROCESS PEAS - CHRISTCHURCHCosts of Production per Hectare

Average pea hectares	8.0
	\$
<u>Gross Revenue</u>	
Pea gross revenue of 3,845 kg per hectare @ \$0.07945/kg	305.49
Hay bales 44.87 bales/ha @ \$0.50/bale less \$0.19 baling charge	13.91
Total Revenue	<u>319.40</u>
<u>Direct Costs</u>	
Vegetable levy (0.005 pea gross revenue)	1.53
Cultivation:-	
Tractor running costs 11.78 hours @ \$1.20/hour (61 bhp tractor)	14.14
Tractor labour 11.78 hours @ \$1.46/hour (Agricultural Workers (Market Gardeners Order) July 1974)	17.20
Seed ex store 305.9kg @ \$0.16/kg	48.95
Seed cartage (carrier) 2,447 kg over 16 miles for 8.0 ha (Cartage Schedule Rates)	1.28
Fertiliser ex store 236.4 kg of 0-6-14-7 pea fertiliser @ \$47.35/tonne	11.19
Fertiliser cartage by carrier (less rebate) for 10 miles 4.67 tonnes for 8.0 hectares	0.52
Herbicide material 3.04 litres MCPB @ \$1.85/litre plus 4.23 litres Sinox PE @ \$2.24/litre	15.10
Herbicide application by contractor	4.37
Irrigation - applicable for 10 of the 31 farms sampled (i.e. 0.32) Running costs/ha 173 units x \$0.0145/unit electricity x 2 irrigations = \$5.02 x 0.32	1.61
Labour costs for pipe shifting 2.69 hours @ \$1.46/hour = \$3.93 x 0.32	1.26
Total Direct Costs	<u>117.15</u>
Gross Margin	<u>202.25</u>
<u>Indirect Costs</u>	
Irrigation fixed costs. Average capital costs of \$315/ha with total farm irrigations of 6/year. Peas irrigated twice.	
Depreciation, interest and repairs and maintenance of \$7.35/irrigation x 2 x 0.32	4.70
Tractor fixed costs 61 bhp tractor. Depreciation and interest = \$0.60/hour for 11.78 hours	7.07
Implement fixed costs 11.78 hours @ \$0.90/hour	10.60
General costs telephone, rates and accountant (\$10.92/ha) x % of growing season occupied by peas (69%)	7.53
Land rental or land mortgage 6% of land G.V. (\$2,647/ha) x % of growing season occupied by peas (69%)	109.59
Total Indirect Costs	<u>139.49</u>
Total Revenue	319.40
Less Total Costs	256.64
Gross Surplus per hectare before management charge	<u>62.76</u>
Management charge based on the Agricultural Workers Wage order of \$1.46/hour for 11.78 hours	
Plus 1.5% of Government Capital Valuation. Land G.V. = \$2,647/ha and Value of Improvements = \$715/ha.	
Total C.V. = \$3,362 (Or total C.V. = 1.27 of land G.V.) x % of growing season occupied by peas	52.00
Nett Surplus per hectare	<u>10.76</u>

TABLE VIII

PROCESS PEAS - HAWKES BAYCosts of Production per Hectare 1974 - 75

Average pea hectares	8.9
	\$
<u>Gross Revenue</u>	
Pea gross revenue of 4,589 kg per hectare @ \$0.08006/kg	367.39
Hay bales 66.32 bales/ha @ \$0.50/bale less \$0.19 baling charge	20.56
Total Revenue	<u>387.95</u>
<u>Direct Costs</u>	
Vegetable levy (0.005 pea gross revenue)	1.84
Cultivation:-	
Tractor running costs 8.38 hours @ \$1.20/hour (68bhp tractor)	10.06
Tractor labour 8.38 hours @ \$1.46/hour (Agricultural Workers (Market Gardens) Order July 1974)	12.23
Contract cultivation (By 22 of 43 farmers or 0.51 x \$24.58)	12.48
Seed ex store 259.75 kg @ \$0.16/kg	41.56
Seed cartage (carrier) 2,312 kg total over 9 miles for 8.9ha (Cartage Schedule rates)	0.82
Fertilizer ex store 217 kg of 30% K Super @ \$50.80/tonne	11.02
Fertiliser cartage by carrier (less rebate) for 11 miles 4.77 tonnes for 8.9 hectares	0.54
Herbicide materials 3.10 litres DNPB @ \$2.24/litre plus 3.08 litres MCPB @ \$2.28/litre	13.96
Herbicide application by contractor/hectare	7.46
Total Direct Costs	<u>111.97</u>
Gross Margin	<u>275.98</u>
<u>Indirect Costs</u>	
Tractor fixed costs 68 bhp tractor. Depreciation and interest = \$0.62/hour for 8.38 hours	5.20
Implement fixed costs 8.38 hours @ \$0.98/hour	8.21
General costs telephone, rates, accountant (\$16.01/ha) x % of growing season occupied by peas (66%)	10.57
Land rental or land mortgage 6% of land G.V. (\$3,751/ha) x % of growing season occupied by peas (66%)	148.54
Total Indirect Costs	<u>172.52</u>
Total Revenue	387.95
Less total Costs	<u>284.49</u>
Gross Surplus per hectare before management charge	<u>103.46</u>
Management charge based on the Agricultural Workers Wage order of \$1.46/hour for 8.38 hours	
Plus 1.5% of Government Capital Valuation	
Land G.V. = \$3,751/ha Value of Improvements = \$825/ha	
Total C.V. = \$4,576/ha (or total C.V. = 1.22 of land G.V.) x % of growing season occupied by peas (66%)	
	<u>57.53</u>
Nett surplus per hectare	<u>45.93</u>

TABLE IX

PROCESS PEAS - GISBORNECost of Production per Hectare 1974 - 75

Average pea hectares	4.5
	\$
<u>Gross Revenue</u>	
Pea gross revenue of 4,431 kg per hectare @ \$0.0755 per kg	334.57
Hay bales 51.97 @ \$0.50/bale less \$0.19 baling charge	<u>16.11</u>
Total Revenue	<u>350.68</u>
<u>Direct Costs</u>	
Vegetable levy (0.005 pea revenue)	1.67
Cultivation:-	
Tractor running costs 8.43 hours @ \$1.20/hour (57bhp tractor)	10.12
Tractor labour 8.43 hours @ \$1.46/hour (Agricultural Workers (Market Gardeners) Order July 1974)	12.31
Contract cultivation and/or drilling (By 8 of 10 farmers or 0.80 x \$16.68/ha)	13.34
Seed ex store 261 kg/hectare @ \$0.16/kg	41.76
Seed cartage (carrier) 2,911 kg for 4.5 hectares over 18 kilometers (Cartage schedule rates)	0.91
Fertiliser ex store 262kg/hectare of Superphosphate @ \$31.75/tonne	8.33
Fertiliser cartage/hectare by carrier (less rebate) 1.18 tonnes/4.5 hectares for 11 kilometers	0.52
Herbicide materials 1.84 litres Treflan @ \$8.31/litre plus 1.12kg of Tribunal @ \$5.20/kg	21.11
Herbicide application by contractor. An average of 1,45 applications @ \$7.42per hectare	<u>10.76</u>
Total Direct Costs	<u>120.83</u>
Gross Margin	<u>229.85</u>
<u>Indirect Costs</u>	
Tractor fixed costs 57 bhp tractor. Depreciation and interest = \$0.62/hour for 8.43 hours	5.23
Implement fixed costs 8.43 hours @ \$1.13/hour	9.53
General costs - telephone, rates and accountant of \$16.65/hectare x % of growing season occupied by peas (49%)	8.16
Land rental or land mortgage 6% of land G.V. (\$4018/hectare) x % of growing season occupied by peas (49%)	<u>118.13</u>
Total Indirect Costs	<u>141.05</u>
Total Revenue	350.68
Less Total Costs	<u>261.88</u>
Gross Surplus per Hectare before management charge	<u>88.80</u>
Management charge based on the Agricultural Workers wage order of \$1.46/hour for 8.43 hours plus 1.5% of Government Capital Valuation. Land G.V. = \$4,018/ha and Value of Improvements = \$803/ha. Total C.V. = \$4,821/ha (Or Total C.V. = 1.20 of land G.V.) x % of growing season occupied by peas (49%)	<u>47.74</u>
Nett surplus per hectare	<u>41.06</u>

TABLE X

PROCESS GREEN BEANS - CHRISTCHURCH
Cost of Production per Hectare 1974-75

Average green bean hectares	5.34
<u>Gross Revenue</u>	\$
Green bean gross revenue of 7,757 kg per hectare @ \$0.08241/kg	<u>639.25</u>
<u>Direct Costs</u>	
Vegetable levy (0.005 green bean gross revenue)	3.20
Cultivation:	
Tractor running costs. 8.2 hours @ \$1.30/hour (71 bhp tractor)	10.66
Tractor labour 8.2 hours @ \$1.46/hour. Agricultural Workers Market Gardeners) Order, July 1974)	11.97
Contract drilling @ \$35.29/ha	35.29
Contract inter-row cultivation @ \$17.59/ha	17.59
Seed ex store 119.6 kg @ \$1.10/kg	131.56
Seed cartage (carrier) 639 kg total for 5.34 ha over 26 km. Cost per ha	0.52
Fertiliser ex store 331kg/ha of Cropmaster Hi Yield at \$134.00/tonne	44.35
Fertiliser cartage (carrier) for 29 km. 1.769 tonne total for 5,34 ha. Cost per hectare	1.33
Herbicide materials 2.3 litres/ha Treflan @ \$7.98/litre	18.35
Herbicide application by contractor	4.20
Irrigation costs:	
Running costs/ha 156 units x \$0.0145/unit electricity x 2 irrigations	4.52
Labour costs for pipe shifting 1.95 hours/ha @ \$1.46/hour	2.85
Total Direct Costs	<u>286.39</u>
Gross Margin	<u>352.86</u>
<u>Indirect Costs</u>	
Irrigation fixed costs. Operating a total of 6 irrigations/yr. Green beans had 2 irrigations. Depreciation, interest and repairs & maintenance of \$5.07/irrigation/ha x 2	10.14
Tractor fixed costs (71 bhp tractor) Depreciation and interest \$0.66/hr for 8.2 hours	5.41
Implement fixed costs 8.2 hours @ \$0.91/hour	7.46
General costs - telephone, rates and accountant (\$11.71/ha) x % of growing season occupied by green beans (52%)	6.08
Land rental or land mortgage. 6% of land G.V. (\$2,656/ha) x % of growing season occupied by green beans (52%)	82.87
Total Indirect Costs	<u>111.96</u>
Total Revenue	639.25
Less Total Costs	<u>398.35</u>
Gross surplus per hectare before management charge	240.90
Management charge based on the Agricultural Workers Wage Order of \$1.46/ hour for 8.2 hours	
Plus 3% of Government Capital Valuation. Land G.V. = \$2,656/ha and Value of Improvements = \$744/ha. Total C.V. = \$3,400/ha x % of growing season occupied by green beans (52%)	63.70
Net Surplus per Hectare	<u>177.20</u>

TABLE XI

PROCESS GREEN BEANS - HAWKES BAY
Cost of Production per Hectare 1974-75

Average number of green bean hectares sampled	4.94
<u>Gross Revenue</u>	\$
Green Bean gross revenue of 8463.5kg at \$0.07/kg	<u>592.45</u>
<u>Direct Costs</u>	
Vegetable levy (0.005 green bean revenue)	2.96
Cultivation:	
Tractor running costs 6.43 hrs @ \$1.33/hr (73 bhp tractor)	8.55
Tractor labour 6.43 hrs @ \$1.46/hr. Agricultural workers (Market Gardeners) Order July 1974	9.39
Contract drilling @ \$16.43/hectare	16.43
Contract inter-row cultivation @ \$10.50/hectare	21.00
Seed ex store 68.4kg @ \$0.83/kg	56.77
Seed cartage (carrier) 338kg total for 4.94 ha. over 10km. Cost per hectare	0.20
Fertiliser ex store 331kg/ha. of 6.10.20 @ \$4.00/50kg	26.48
Fertiliser cartage (carrier) less rebate, for 8km, 1.63tonne total for 4.94 ha. Cost per hectare	0.67
Herbicide materials 2.22 litres/hectare Trelfan @ \$7.97/litre	17.69
Herbicide application by contractor	7.54
Insecticide/fungicide materials - 2.12 litres/ha. Lannate @ \$3.74/litre + 1.12kg/ha Benlate @ \$17.20/kg + 3.36kg/ha copper oxychloride @ \$2.85 kg + 0.71 litres/ha metasystox @ \$7.35/litre	41.99
Insecticide/fungicide application by contractor	7.41
Irrigation costs (applicable for 7 of the 16 farms sampled i.e. 0.44) Running costs/ha 37.6 litres diesel @ \$0.095/litre x 2 irrigations = \$7.14 x 0.44	3.14
Labour costs for pipe shifting; 3.2 hours @ \$1.46/hour x 0.44	2.05
Total Direct Costs	<u>222.27</u>
Gross Margin	<u>370.18</u>
<u>Indirect Costs</u>	
Irrigation fixed costs. Operating a total of 6 irrigations/yr. Beans irrigated twice. Depreciation, interest and repairs and maintenance of \$3.65/irrigation/ha. x 2 x 0.44.	3.21
Tractor fixed costs (73 bhp tractor). Depreciation and interest. \$0.62/hr for 6.43 hours.	3.99
Implement fixed costs 6.43 hrs @ \$0.93/hr.	5.98
General costs - telephone, rates and accountant (\$18.61/ha) x % of growing season occupied by beans (38%)	7.07
Land rental or mortgage interest 6% of land G.V. (\$3753/ha) x % of growing season occupied by green beans (38%)	85.57
Total Indirect Costs	<u>105.82</u>
Total Revenue	592.45
Less Total Costs	<u>328.09</u>
Gross surplus per hectare before management charge	264.36
Management charge based in the Agricultural Workers wage order of \$1.46/hr for 6.43 hrs	
Plus 3% of Government Capital Valuation. Land G.V. = \$3753/ha and Value of Improvements = \$1216/ha. Total C.V. = \$4969/ha x % of growing season occupied by green beans (38%)	66.04
Net Surplus per hectare	<u>198.32</u>

TABLE XII

PROCESS GREEN BEANS - GISBORNECost of Production per Hectare 1974-75

Average number of green bean hectares sampled	5.75
	\$
<u>Gross Revenue</u>	
Green bean gross revenue of 10,638 kg at \$0.0686/kg	<u>729.77</u>
<u>Direct Costs</u>	
Vegetable levy (0.005 green bean revenue)	3.65
Cultivation:	
Tractor running costs 6.74 hours @ \$1.22/hour (69 bhp tractor)	8.22
Tractor labour 6.74 hours @ \$1.46/hour. Agricultural Workers (Market Gardeners) Order July 1974	9.84
Contract drilling at \$11.05/hectare	11.05
Contract inter-row cultivation @ \$9.88/hectare	21.30
Seed ex store 67 kg @ \$1.10/kg	73.69
Seed cartage (carrier) 385 kg total for 5.75 hectares over 14 kilometers. Cost per ha.	0.22
Fertiliser ex store 247 kg/ha of 12.10.10 Maize mix	32.42
Fertiliser cartage (carrier) less rebate, for 13 kilometers, 1.42 tonne total for 5.75 hectares. Cost per hectare	0.52
Herbicide materials 2.72 litres/hectare Treflan @ \$7.98/litre	21.71
Herbicide application by contractor	10.35
Insecticide materials 3.11 litres/hectare Lannate @ \$3.62/litre	11.26
Insecticide application by contractor	<u>6.05</u>
	Total Direct Costs
	210.28
	Gross Margin
	<u>519.49</u>
<u>Indirect Costs</u>	
Tractor fixed costs (69 bhp tractor). Depreciation and interest \$0.74/hour for 6.74 hours	4.99
Implement fixed costs 6.74 hours @ \$1.03/hour	6.94
General costs - Telephone, rates and accountant (\$16.48/ha) x % of growing season occupied by beans (36%)	5.93
Land rental or land mortgage. 6% of land G.V. (\$3,840/ha) x % of growing season occupied by green beans (36%)	<u>82.94</u>
	Total Indirect Costs
	100.80
	Total Revenue
	729.77
	Less Total Costs
	<u>311.08</u>
Gross Surplus per hectare before Management charge	<u>418.69</u>
Management charge based on the Agricultural Workers wage order of \$1.46/hour for 6.74 hours	
Plus 3% of Government Capital Valuation. Land G.V. = \$3,840/ha and Value of Improvements = \$868/ha. Total C.V. = \$4708/ha x % of growing season occupied by green beans (36%)	60.69
	<u>358.00</u>
	Net Surplus per Hectare

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