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THE ORGANISATION OF DAIRY FARMING IN THE WAIKATO, NEW ZEALAND.

By F.B. STEPHENS.

PREFACE.

The present study is an attempt to combine a descriptive account of the technical and financial organisation of Waikato Dairy Farms with an analytical discussion of the factors affecting efficient butterfat production. Management is perhaps the greatest need in the Dairying Industry today. While there is evident a "Desire to know" how to overcome the present difficulties, there is still a great deal of attachment to the routine of habit and custom. This fact is frequently lost sight of and the popular description of farming in New Zealand generally err by discussing farming practice in terms of the best farmers. In the present essay an attempt is made to discuss things as they are and to indicate, where possible, the lines on which advance is being made.

The present study is occupied with Dairy Farm organisation occupation in the Waikato and as a consequence does not discuss the marketing of Dairy Produce. It is agreed that marketing has repercussions on Farm practice and it will impossible to avoid absolutely the question of marketing. In Part Section IV where finance is being discussed, there is naturally presupposed some knowledge of the Dairy Company system of "Pay-Out."

One of the prime interests of the present study is the fact that there is at present in progress a remarkable change in the technique of Dairy-farming. The last great change took place immediately after the war, in the mechanisation of the milking process. In the interim electric power has been widely applied. In the last two years the problem of " grass- land " farming has assumed enormous importance. Not only is there an attempt to produce more grass by heavier and more scientific fertilising but there is also the problem of the more effective use of available grass growth, a problem intimately bound up with smaller paddocks, rotational grazing and the conservtion of surplus grasses as hay and ensilage. As a consequnce it thought that in a year or two the present area will carry at least

50% more stock at little extra expense.

New Zealand methods differ entirely from methods of Dairy farming inmother countries. Pracyically no supplementary feed except grass conserved as hay or ensilage, is used; cows are not stalled in the winter, and very fewed cows in the North Island are rugged. Again though the Dairy farm of 100 acres is a small scale farm when compared with a 10,000 acre sheep run, yet it is on a much larger scale than Dairy farming in the older countries. Again such a farm would carry 50 to 60 cows which is much more than is handled on the average, by , say, a Danish farmer Finally the almost complete mechanisation of the Industry differentiates it from Dairying in older lands.

Although the specific object of this study is the Waikato area, much of the discussion would describe Dairy Farming and Dairy Farm practice at least throughout the North Island of New Zealand, if not throughout New Zealand as a whole. The Waikato is easily the largest Dairying area in New Zealand and it is to some degree the centre of the Dairying Industry of New Zealand.

The knowledge upon which this study is based is derived from the following sources;-

1. I was a resident in the district for three years engaged in work which brought me into intimate contact with the "Farming problem."

2. As a result of the above activities there arose a demand from some farmers for the formation of a farm costing group. This was organised under the direction of the Auckland University College. There were nine farmers in the group. The full method of the investigation is discussed in chapter 2 Part I. The intimate knowledge of farm affairs gained on the very frequent visit to these farms convinced me of the desirability of a wider investigation, into farm organisation, but with particular reference to (a) factors affecting butterfat production and (b) the influence of fertilisers on butterfat production. An attempt is made to correlate

the results of the investigation into the affairs on the nine farms with the results of the wider investigation discussed below. Probably the most impyrtant results from this more intensive study are those in Part. IV. relating to farm costs. It will be suggested that the farms chosen are representative farms and hence there is some ground for thinking that the results are indicative atx least of the cost of the Dairying Industry today.

3. Finally a wider investigation was carried out by means of a questionnaire submitted through the New Zealand Co-operative Herd Testing Association. For the privilege of being allowed to use that channel, for personally overlooking the questionnaires returned and for adding to each questionnaire certain further data I am deeply indebted to Mr A H Ward the Secretary of the Association. A discussion of the questionnaire appears in chapter 2. Part I The fact the some 970 questionnaire were returned gives some ground for considering the tabulated results to be very representative of conditions in the dairying industry.

In addition to a ground survey of the area covering several weeks, the writer was able to make an extensive aerial survey of the whole district. In these ways an intimate knowledge of the distribution of the industry was gained.

When this study was more the 75% complete an authoritative publication on New Zealand Dairying by Mr. E.J.Fawcett M.A., Farm Economist of the Department of Agriculture, appeared. Chapter 3 Part I which contains a broad description of the place of dairying in the National economy owes much to the above publication. In one or two other cases (each case is acknowledged) use was made of certain of Fawcett's figures which were otherwise unavailable to the writer.

Although certain of the most pressing of the problems of the farmer today are relative to marketing problems, yet such factors as the efficient use of fertilisers,

the economy of high producing cows, the relation of wages to the net returns, the relative merits of raising or purchasing stock for replacements and many similar questions are all vital not only to the individual farmer but also to the industry as a whole, and ultimately to the whole Dominion. The present study aiming at a study of Dairy farm Organisation has sought to isolate some of these problems.

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Part. I

Introduction

Part I. Chapter. 1.

Farm Management.

FARM MANAGEMENT.

Dairy farming as practised in New Zealand, though on a larger scale than that practised in European countries, is yet a small scale industry. There is little scope for specialisation of function, and statistics on page 160 suggest that the modal group of dairy farms, is that commonly described as the "family farm".

As a consequence of the above, the farmer is not only a worker, but also the manager of the business, and as natural factors, such as land, seasons, climate, and geographic position, play such a large part in farm life in general, and these determine the period of work and the concentration necessary, there is less attention paid to management than to the factor of manual labour. The farm is looked at as a "job" rather than a "business" which must be managed.

There might be laid down as the requisites of management in any sphere, (a) knowledge of the technique of the industry to be managed, and (b) accurate records of the facts of the industry. While it is true that managerial ability of high levels possesses considerable mobility between certain manufacturing industries, this is due rather to the fact that the leader has at his command technical experts, who with him, form the management, than to the fact that the qualification of technical knowledge is unnecessary.

In small scale industry, the manager must be a technical expert, or at least thoroughly familiar with technical processes. As an illustration of this point, it has been noted that there is little mobility in New Zealand between pastoral and arable farmers, particularly is this so in the case of pastoral to arable. The reason is obviously that the technique of arable farming is quite different from that of pastoral farming; while the arable farmer usually keeps some stock and hence has some experience of stock management, so that there is greater mobility from arable to pastoral than vice versa.

That adequate records are necessary to satisfactory management is a truism that needs no emphasis, hence the fact that these records are practically non-existent on New Zealand dairy farms, requires some comment. The absence of these records makes a general detailed investigation of New Zealand farming practically impossible. Probably the primary reuasonn for the non-existence of records is due to the fact that the farmer is not fully conscious of the ramifications of intelligent management. There is in all rural life a tendency to the crystallisation of methods which have provided returns in the past, and these methods tend to remain till some extraneous cause makes a change imperative.

A further factor which causes farm management to be left to custom is, that the farmer as a general rule is also the principal manual labourer. This of course is due to the fact that dairy farming in particular is carried on / over relatively small areas, and that even apart from financial reasons, there is an optimum size of herd which can be dealt with in one shed. Decreasing returns set in very early, due to the practical impossibility of extensive specialisation, so that two small dairy farms will generally pay better than one very large farm, even if one of the two farms is let on a sharemilking agreement. The farmer being also the manual labourer, is apt to do what he sees needs doing rather than work to a general plan.

Further there is the factor that the average farmer has not in general the ability to keep records in such a form as to be of value to him as an aid to management. The first cause of this of course is isolation. The nature of his work makes it that he has no means other than that of general observation and hearsay of Knowing the doings of his neighbours. The general competitive urge is less prominent among rural workers than among urban trades. This is due among other things to the earlier appearance of decreasing returns in rural pursuits as well as to the fact that the general nature of the industry is such that marketing is divorced from the producing, and as a consequence the farmer is less able to

influence his market. The product of the individual farmer is so small compared with the aggregate production of the industry, that there is little scope for combative advertising among rural workers. (1)

This does not, of course refer to those concerns which market the farm products, but deals solely with the farm production.

Another cause of lack of ability to keep accounts is the general character of the education of the farmer. The tendency is for those who receive education higher than that of the primary school to go to non-rural occupations, and as the child of primary school age is too young to realise the value of such training as is given in record-keeping, this knowledge is forgotten by the time the child has a farm of his own. Add to the above factors of isolation and education, those of physical ~~weakness~~ weariness due to the relatively heavy nature of the work, and of the greater dependence on natural factors which frequently necessitates that the whole time is concentrated on manual labour, and it will be evident that keeping of records accurately, and particularly the keeping of records in such a form as to be useful for managerial purposes, involves a much larger problem than that present in manufacturing industry.

While the above remarks are largely true of farming generally they are particularly true of dairy farming, where not only do long hours, duetto the character of the industry produce greater physical ~~weakness~~ weariness than in other branches, but the greater prevalence of the " one man " farm, as defined on page 154 renders it that the head of the family has little time to keep records. (2).

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(1). See Marshall "Industry and Trade " p 304/7

(2). This problem in so far as it affects financial records is elaborated in Chapter .

Part I Chapter II

Methods of Investigation

METHODS OF INVESTIGATION.

The general basis for the discussion following is

1. an intimate knowledge of the district, and of the problems of dairy farm management in that district.
2. A questionnaire submitted through the Waikato Herd Testing Association, to which 970 replies were received, asking for details as to acreage, stock, etc.
3. A detailed investigation covering a period of twelve months, being a couplete dairy farm year, into the affairs of nine dairy farms in the Waipa county.

THE GENERAL QUESTIONNAIRE.

Through the courtesy of Mr.A.M.Ward, secretary of the New Zealand Herd Testing Association, the writer was enabled to submit the questionnaire as on the next page to the 1800 members of the Herd Testing Association. The Association's activities are very wide, and thoroughly covered the Waikato district. The questionnaires were to be filled in by herd testing officers on their visits to the farms. The questionnaire had to be modelled as it was, on account of the fact that another questionnaire was being submitted by the Department of Agriculture at the same time. In addition to the details asked for on the questionnaire, Mr. Ward himself kindly noted on each questionnaire used, the area, phosphates and lime used, number of cows and yearlings, length of lactation period, and average production per cow. (1).

The fact that 970 questionnaires out of 1800 submitted, were returned, is most gratifying, and the largeness of the sample gives confidence, not only that errors due to bias will tend to cancel out, but that the results will be such as to give a comprehensive picture of dairy farming and dairy farms practice in the Waikato today.

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(1). The writer has acknowledged in the preface his deep gratitude to Mr. Ward for the heavy work he undertook in entering all the above details on each of the 970 questionnaires.

Specimen of Questionnaire submitted through Herd Testing Association.

1.

A. CATTLE other than for dairying, viz. Steers and Cows for fattening

number .....

B. SHEEP

Maximum during past season .....

Minimum during past season .....

Number sold .....

C. PIGS

Maximum during past year .....

Minimum during past year .....

Number sold .....

Area of Farm. .... Acres
Area used for Dairying .... Acres

2. FARM LAY-OUT

(a) Number of paddocks .....

(b) Size of paddocks

5 - 10 acres .....

10 - 15 acres .....

15 - 20 acres .....

over 20 acres .....

For Season 37 Cows 1242 Days 254 2/ Fat

3. CROPS

(a) Area in Grass.

(1) Total ..... acres.

Phosphates .... cwts (2) Used for hay ..... acres.

Lime .... cwts. (3) Used for ensilage..... acres.

(b) Area under Crops.

(1) Root Crops ..... acres.

(2) Lucerne ..... acres.

(3) Other ..... acres.

THE INVESTIGATION INTO THE NINE FARMS.

In the case of the nine farms, the writer kept financial books of all the members of the group for 12 months. The group was organised as a result of stimulus given to research into agricultural problems, by a series of lectures given by the writer, The Farmers' Union actually formed the group, which after formation became an entirely separate unit from the Union.

Before commencing the investigation, members of the group met on each of four evenings, the meeting lasting for two hours. The object of these gatherings was, firstly to outline the results which would be aimed at, in the investigation, then to show the relation of the work to be done including questions to be asked, to the ultimate result; and finally to ensure a homogeneity of returns from each of the farms by explaining the relevancy of the questions to be asked to the final result. An intensive questionnaire - too ambitious as it turned out - was drawn up.(1

In general, the actual filling up of these returns was done by the writer, who personally visited each farm for that purpose; thus still further guaranteed the comparability of the results.

The questionnaire was divided into four parts as under:-

1. THE INITIAL STATEMENT. (being pages 333 1 to 342 of the appendix), which enumerated all details relevant to a picture of the farms at a point of time - namely at the beginning of the 1929/30 dairying season - August 1st. 1929. (2).

---

(1). A copy of the questionnaire forms an appendix to this essay.

(2). Some question may be raised as to the commencement being taken on August 1st. instead of June 1st., the date at which Dairy Companies commence their year. It is submitted however, that August 1st. is nearer the commencement of the lactation period that June 1st., and further that June 1st. is a date chosen by the.....

(continued as footnote to next page.

Besides
~~Besides~~ general details of stock, acreage, paddocks, and so on, there was collected at that date, complete financial details, sufficient to compile an initial statement of "assets and liabilities", which although not technically, is to all intents and purposes a balance sheet. (1).

These financial details formed the bases on which financial books were opened for each farm.

2. A MONTHLY SHEET. (page 343/4 of the appendix).

This sheet enabled a track to be kept of all financial and managerial details during the month.

3. A WEEKLY SHEET. (page of the appendix)

Which showed actual cows milked during the week.

4. A DAILY SHEET. (page 346 of the appendix).

The purpose of which was to show the actual work done on one particular day each week.

Statements 3 and 4 above were left to be filled in by the individual farmers, but after about a month they neglected to do this, and data filled in a few weeks after was so unreliable as to be valueless.

The general procedure was as follows:-

At the beginning of the year a day was spent on each farm the purpose of which was (a) to inspect the farm, (b) to value the assets, (c) to inspect documents as to mortgages and such like, (d) to discuss the various problems of farm management, noting the method of attack on these by the farmer, (e) to fill up the questionnaire, which being very involved, could not safely be left to the individual farmers.

Note. footnote continued from last page. ....dairy companies for general financial reasons not connected with lactation periods.

(1). A "balance sheet" can be constructed only after books are kept. As its name implies, it is a " sheet of balance" from a set of books. These balances are those remaining after revenue items have been transferred to the Profit and Loss Account. In technical language a statement as referred to here is not a Balance Sheet, but a Statement of Assets and Liabilities at a given date.

General observations on this and subsequent visits were invaluable as giving first hand knowledge of the relative efficiency of the various farmers, which ultimately enabled some quite baffling discrepancies in returns to be accounted for. Thereafter, monthly visits were paid to each farm to fill in the monthly sheets. These were compiled from (a) from statements accompanying butterfat cheques and other statements accompanying incoming cheques, and (b) from cheque butts supported by invoices and statements. (1).

Questions other than financial were answered verbally.

Twelve monthly visits were made, involving travelling upwards of 2000 miles in all.

It will be obvious that a fairly complete picture of farm organisation would be gained, and that personal collection of the data coupled with observation of the management of the farm, would enable confidence in the homogeneity of the basic data to be fairly well placed.

As might be expected, not only were the questionnaires as originally drawn up, found to be too ambitious, but they had to be modified from time to time to fit in with prevailing conditions. Thus the marketing of pigs by auction, made it impossible to get weights. Again it was found that the almost complete absence of any records, or system of recording, made it impossible to keep other than a detailed cashbook, thus making question 3 on the monthly sheet superfluous.

It remains to say that a visit at the close of the financial year was made to verify figures as to assets and liabilities before compiling final returns.

From time to time in the following pages, reference will be made to specific questions, methods employed to get satisfactory answers to certain questions, to the fact that answers to some questions were unobtainable, and to the general attitude of farmers to the questionnaire as a whole.

---

(1) In the case of cash payments, instruction was given as to the method of passing through the bank by drawing a composite cheque, and hence all payments appeared in the cheque book butts.

The farms investigated were all situated in the Waipa County, the relative position in relation to the Waikato generally, of which can be seen on the map, on page 32. All the farms were in a radius of twelve miles of Te Awamutu, the rural centre.

There is some advantage that the farms are grouped round one given centre, in so far as the returns will then be more comparable inter se, ~~these~~ since arbitrary differences in cost due to such factors as are frequently noticeable even in adjoining rural areas will be absent.

In this connection one interesting factor emerged. Three farms in the district were actually nearer Cambridge than Te Awamutu, but dealt with the latter town, because of the fact that Cambridge was just over 100 miles by rail from Auckland, while Te Awamutu was just under 100 miles, and hence the latter town enjoyed railway rates sufficiently lower to counteract the increased cartage involved.

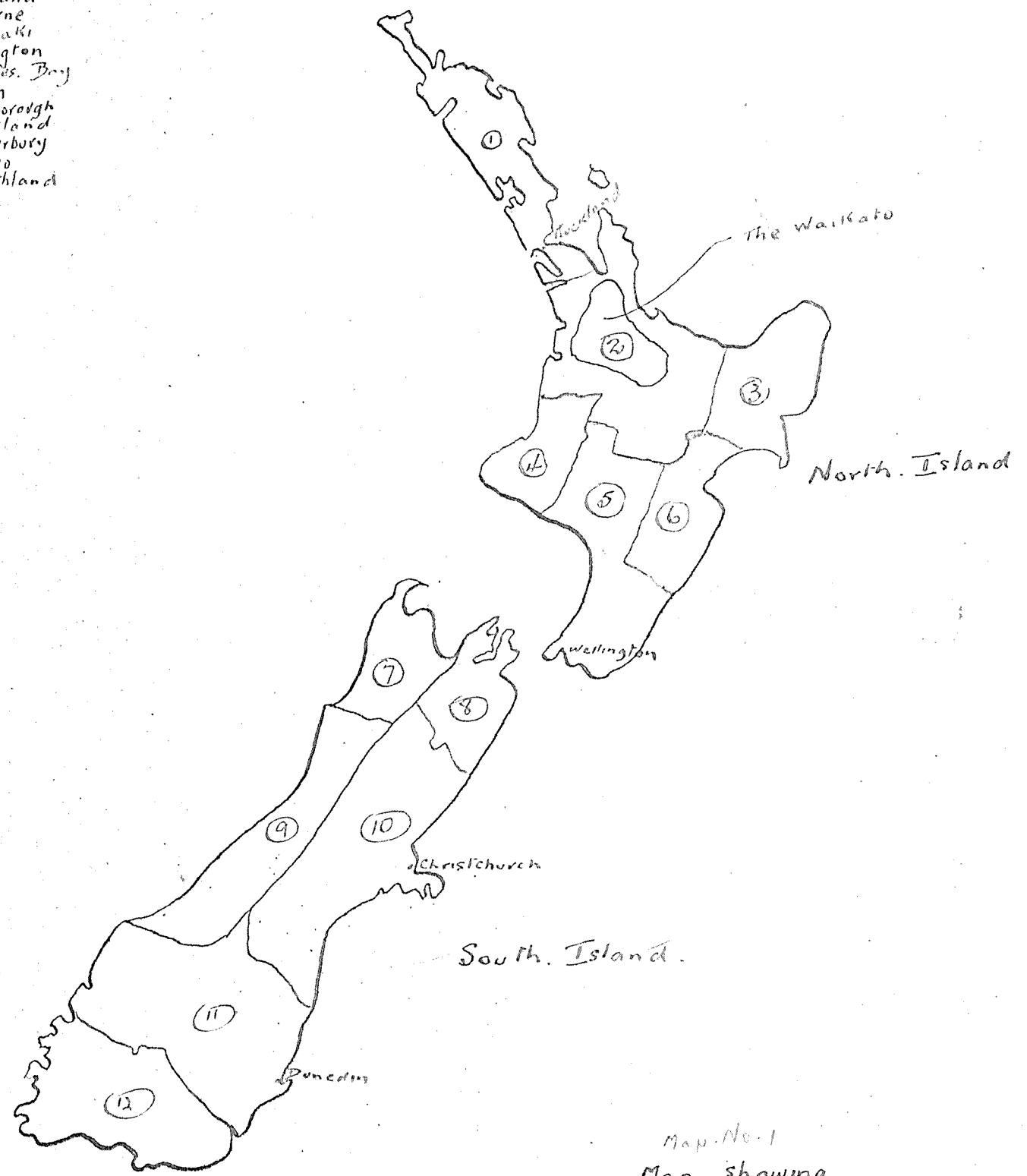
It should be noted that one factor intimately affecting efficiency of farm management other than such physical factors as carrying capacity and climate, is obviously the character of the farmer. While no particular statistical conclusions can be drawn from general observation of individual capacity, yet general observation of efficiency often explains baffling differences in returns. For instance in Farm No. 8., the farmer explained that he considered it more important to work till dark at a job which was important, rather than milk his cows at a regular hour at say 4 o'clock in the afternoon. As a consequence, cows were frequently not milked till 7 or 8 p.m. and even later. This irregularity must have affected returns. In farms Nos. 1 and 3, the owners, during the period, both had illnesses in the family which caused interruption and affected the results. In farms Nos 3 and 5, the owners were good managers, a fact which naturally effected returns.

The above is given to illustrate the fact that there are subjective as well as objective factors in discussing the question of farm management. Obviously the subjective factor

Part I Chapter III

Dairying in New Zealand

nd. Districts.
gth. Auckland
cKland
sborne
ranaKi
llington
wKes. Bay
lson
rlborough
estland
nterbury
tago
outhland



Map. No. 1
Map. showing.
New. Zealand. Land. Districts
and
The. Location. of. the Waikato.

DAIRYING IN NEW ZEALAND.

The economic developement of New Zealand is intimately bound up with transport facilities with other countries. This developement depends ~~not~~ only on faster travel by steel steamships, but on the installation of cold storage for the carriage of perishable animal products, such as meat and dairy produce, without deterioration.

"Exceedingly important, both in the social and economic effects were the new possibilities of transferring dairy produce such as butter and cheese from New Zealand, Australia, and Canada. Closer settlement became possible when small farms could be made an economic success - milk, butter, and cheese, that could now find a market in the Pacific or in England." (1).

Refrigeration was first a success in 1882, when a ship left Port Chalmers, N.Z. for England, with frozen carcases of mutton. Prior to that date, the chief exports of New Zealand were wool and gold. Certain shipments of cheese had been made to England, and a small trade in butter was carried on with Australia. (2).

~~Much~~ Such dairying as was carried out, was primarily for local purposes. Refrigeration changed the whole character of New Zealand. It enabled a much larger rural population to be supported, resulted in a greater physical productivity from a given area, and enabled New Zealand to support a larger total population. Refrigeration meant, not only the possibility of the developement of dairying, but also emphasised the value of double purpose sheep, which would produce both wool and mutton. Hitherto sheep had been practically valueless except for their wool and tallow.

The following table shows the quantity and value of the main exports decennially from 1869.

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(1). L. Knowles " Economic Developement of the Overseas Empire " page 19. written 1921.

(2). Belshaw "The Dairy Industry of New Zealand. P. 9

Table No 1 Table showing

Quantities and values of principal commodities exported from New Zealand. in 1869, 1880 and decennially thereafter.

Year	Wool		Frozen Meat		Butter		Cheese		Gold.	
	00000 000 omitted		000 000 omitted		000 000 omitted		000 000 omitted		000 000 omitted	
	lbs	£	cwts	£	cwts	£	cwts	£	ozs nwts	£
69	278	1371			(2705)	(14679)	(2331)	8040)	614	2363
80	668	3169			(2717)	(8350)	(717)	1983)	303	1220
90	1028	4150	898	1087	35	123	40	85	187	751
00	1407	4749	1844	2124	172	740	103	229	374	1439
10	2043	8308	2654	3851	356	1811	452	1195	478	1896
20	1623	11863	4629	11673	312	3022	1222	6161	213	884
30	2335	7664	4041	9542	1184	11854	1812	6438	134	551

Figures in brackets represent actual quantities.

Quantities of
Wool, Frozen Meat, and Butter and Cheese
exported from New Zealand
from 1880 – to – 1930

{Drawn to Logarithmic Scale}

—— Wool
—— Frozen Meat.
—— Butter and Cheese

Quantities
Wool in lbs. 000's omitted
Frozen Meat in Cwts
Butter and Cheese in Cwts

4000000
1000000
100000
10000
1000

Wool
Frozen Meat.
Butter and Cheese.

Years

The general purposes of the above tables are two, (1). To give some idea of the constitution of New Zealand's exports for the period under review. As might be expected, it shows unmistakably that New Zealand's foreign trade is dependant upon her export of primary products. A study of imports would show that imports were chiefly manufactured goods. Dairy produce, from being less than ~~15~~ 1% of exports in 1880, was in 1929 over 36%, while wool fell from over 49% to under 28% of the total exports.

(2). The second purpose of the above table can be further illustrated by grpphical methods. The attached graph is meant to show the rate of growth of the export of wool, frozen meat and dairy produce. Being drawn to logarithmic scale, the slope of the curves shows the rate of growth of the export of the various goods, Wool, as might be expected, shows the least slope over its entire length. Until 1899 the curve of the frozen meat was steeper than that for wool, but after that date is more or less parallel to that of wool. This is as might be expected. The growth of the frozen meat trade was rapid at first, but ultimately the production of frozen meat and wool were correlated. The rate of growth of dairy exports is over its entire length, much greater, and the curve steeper than either of the other curves. It is more or less parallel to the frozen meat curve from 1884 to 1889, thereafter it is much steeper.

The developement of the dairying industry has been phenomenal, not only in relation to other export industries, but also absolutely as is shown by the following table.

Table No. 2 TABLE SHOWING THE VALUE OF MANUFACTURES OF DAIRY PRODUCTS IN THE YEARS STATED.

Year.	Total value. £.	Corrected for price changes approximately.
1885	43,094	
1890	150,957	
1895	501,274	
1900	1,535,150	
1905	2,581,639	
1910	3.919.184	
1915/16 (x)	7,524,904	£ 5,570,000
1920/21	19,002,247	9,500,000
1925/26	19,798,499	13,650,000
1926/27	19,021,878	13,630,000
1927/28	21,857,276	16,000,000
1928/29	24,362,133	16,700,000

(x) Year of collection altered.
See Factory Production Statistics N.Z.

The uncorrected figures are quite striking, but the last column giving figures since 1914 corrected (to nearest 00000) for price changes gives a truer view of the progress. Despite falling prices the output of the industry has increased by over 70% since 1919.

A better gauge of the absolute increase in production would have been a figure showing quantities of products, but dairy produce includes, butter, whey, cheese, butter
casein, dried milk, condensed milk, and other minor products. Although most of the items are quoted in ~~cwts., a cwt. of~~ hundredweight, a hundredweight of
butter does not represent the same as a ~~cwt.~~ of cheese as far as actual production of milk is concerned, and hence the figures of each sub-group are not comparable.

The following table shows the number of livestock in New Zealand at quinquennial intervals since 1881 to 1921 and annually thereafter.

Table No. 3

TABLE SHOWING LIVESTOCK IN NEW ZEALAND.

Year.	Horses.	Total Cattle.	Dairy Cows.	Sheep.	Pigs.
1881	161736	698637		12190215	200083
1886	187382	853358		15174263	277901
1891	211040	788919		17865423	222553
1896	237418	1047901	276217	19138493	239779
1901	266245	1256680	372416	20233099	250975
1906	326537	1810936	517720	20108471	249727
1911	404248	2020171	633733	23996126	348754
1916	371331	2417491	750323	24788150	297501
1921	337259	3139223	1004666	23285031	349892
1928	332105	3323223	1137005	22222259	384333
1923	330818	3480694	1248643	23081439	400889
1924	330430	3563497	1312588	23775776	414271
1925	326830	3503744	1323432	24547955	440115
1926	314876	3452486	1303856	24904993	472534
1927	303713	3457729	1303225	25649016	520143
1928	307160	3273769	1352398	27133810	586898
1929	298986	2445790	n 1371063	29051382	556732
1930	297195	3765668	1440321	30841287	487793

The outstanding feature of the above table is the increase in the number of dairy cows in the past 35 years. The increase being over 500%. The real increase in the importance of the dairy animal is greater than the figure for dairy cows, as the column "total cattle" includes bulls, heifers and calves, for dairying purposes. Statistics are not available as to the exact number of cattle held for dairying purpose, but a conservative estimate for 1930, based on the details available, suggests that over 60% of the total cattle are for dairy purposes. That would leave approximately ~~1,5~~ 1,500,000 cattle for beef purposes, which is an increase of approximately 100% over 1891. In the same period, sheep have increased by only about 75%. Pigs, which are in the nature of a bye-product of dairying, have increased by over 100% during this period. The decline in the number of horses is largely due to the advent of motor transport. While no statistics are available, general observation would suggest that the number of farm draught horses rather than declining

has increased, due to the fact, that with the developement of dairying on a smaller scale as in New Zealand, has resulted in an increased demand for draught animals. (1).

Fawcett has constructed an index number of butterfat production which obviously reflects not only the effects of the area occupied, and the number of cows milked, but the general level of efficiency of management. (3).

INDEX OF EXPANSION OF BUTTERFAT PRODUCTION.

Year.	1913/14 = 100.	Year.	1913/14 = 100.
1901/2	44.1	1916/17	105.9
1902/3	48.1	1917/18	109.8
3/4	55.5	18/19	113.1
4/5	57.9	19/20	123.5
5/6	58.7	20/21	140.9
6/7	61.7	21/22	180.9
7/8	62.8	22/23	205.0
8/9	67.9	23/24	207.7
9/10	78.7	24/25	219.1
10/11	80.3	25/26	121.6
11/12	83.5	26/27	235.2
12/13	92.9	27/28	240.2
13/14	100.0	28/29	262.8
14/15	101.6	29/30	290.1
15/16	109.5		

The industry can be said to have had five well marked phases. (2).

1. Previous to 1882, whenproduction was practically limited to the demands of the local population.
2. From 1882 to 1895, when despite falling world prices and internal financial difficulties, production of dairy produce for export increased rapidly.
3. From 1895 to 1914, there was a rapid increase in the production of the industry.
4. The War period of 1914 - 1918, was a transition period which culminated in a dairying boom in the immediate post war years. Numerous returned soldiers took up dairy farms under the Discharged Soldiers Settlement Act, and consequently not only were large areas of new country opened up, but much land was converted from sheep to dairy farming. The figures of production and numbers of dairy cows given previously, show this particular movement.
5. The years from 1920, as a result of the post war boom, in dairying shew that the level of production has remained on a much higher level than in previous years, despite the fact, that with falling prices many farmers whose farms have fallen below the margin of profitable production of dairy produce, have been forced to abandon their farms which have been allowed to revert

(1). The general problem of horse labour will be discussed at length in Part II Chapter 5.
(2). See Belshaw, op cit. page 14. written in 1920.
(3) Fawcett. "Some factors affecting butterfat production in NZ." P.S

to an uncultivated state, or have reconverted to sheep farming. A comparison of the index number of butterfat production on page 21, with the table showing the number of dairy cows on page 20 suggests that the increase of practically 180% since 1919, is not to be accounted for wholly by an increase in the number of cows. That part of the increase which is not due to increase in the number of cows, is obviously due to an increase in the production per cow. This phase of the movement is particularly evident since 1927, and reflects the increased attention given to farm management in such particulars as fertilisers, herd testing, and rotational grazing. (1) & (2).

A further feature of the post war position has been the fact that when in immediate post war years, wool prices were very low, while dairy produce prices were stable, numerous of thesmaller sheep farmers transferred to dairying. With the fall in dairy prices, and the relatively higher prices for wool, there was a move in the opposite direction. These marginal farms often cover whole districts. Statistics of dairy cattle would suggest that something of this nature has occurred in Canterbury and Otago. From the writer's personal knowledge of the Waikato, there is a well defined area which is profitable for dairying only at a certain figure; with prices below that figure the farmer generally returns to sheep.

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(1). See Fawcett op cit loc cit.

(2) See Chapters 6 + 7. Part II ; ch. 5 Part III

The previous discussion leads up th an examination of:-

DISTRIBUTION OF THE INDUSTRY.

Dairying for commercial purposes is concentrated largely in countries with temperate climates, and in those particular parts of that zone where an adequate rainfall is fairly evenly distributed over the year. The reason of these two factors is that dairying being a pastoral industry is largely dependent on the growth of the grass throughout the lactation period. The point as to the distribution of rainfall is particularly important in such areas as the Waikato, where the light volcanic soils do not hold the moisture, and hence the necessity for a good distribution of the annual fall.

Several areas in New Zealand possess these characteristics of a temperate climate and an efficiency of rain well distributed throughout the year.

This question of growth of grass brings out the fact that in post war years there has been a remarkable developement in what is known as "grassland farming". Under this system which is now practically universal, the old method of renewing pastures every year or two has given place to permanent pastures with artificial fertilisers once or twice a year, and in which, growth is stimulated by constant harrowing of the pastures. (1).

The table on the following page, shows the mean temperatures, total fall of rain, and average number of days on which rain fell at the various observation points throughout New Zealand.

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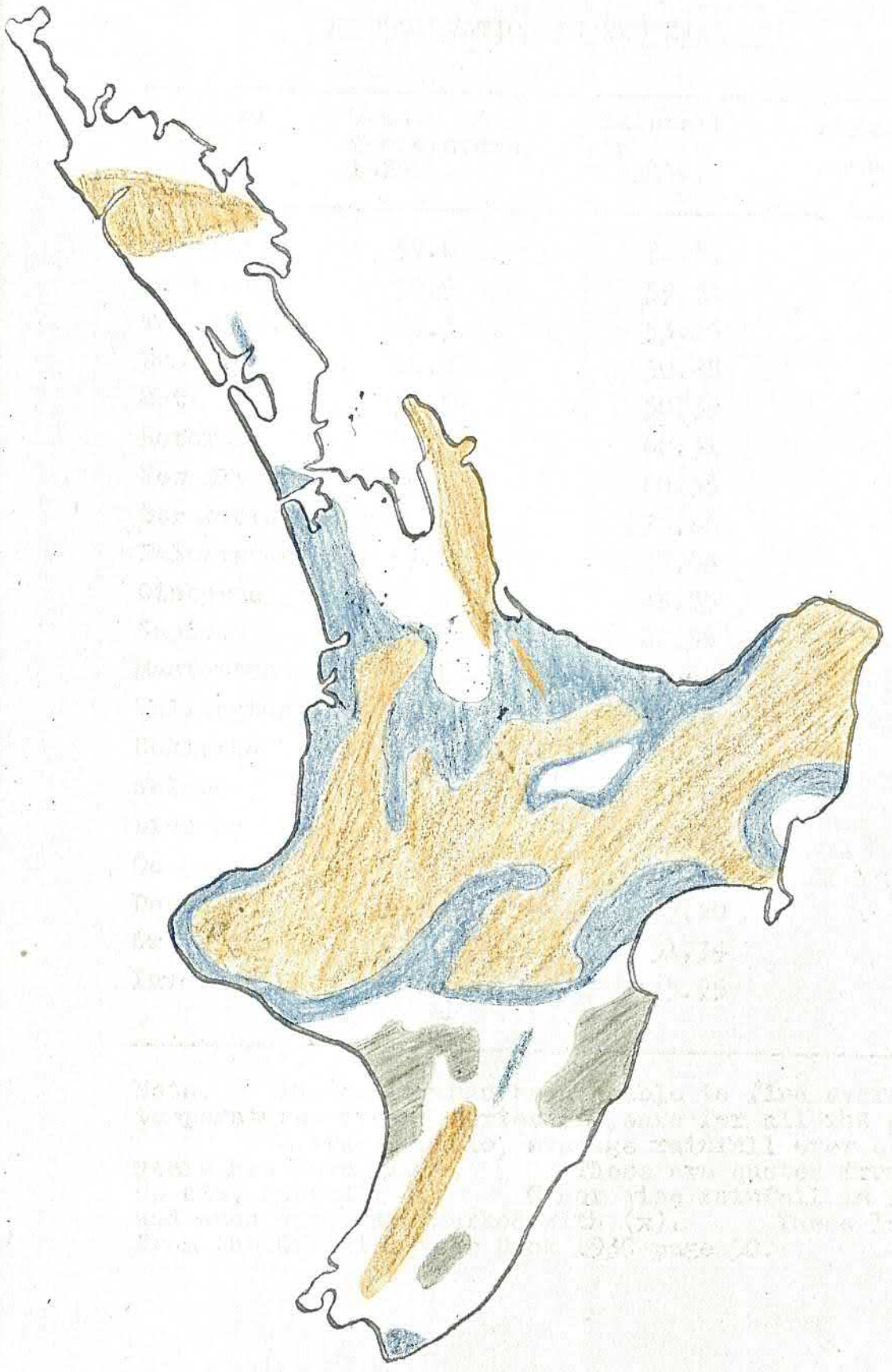
(1). See Chapter 6 page 19 Part II



Map. No2

Rainfall. Map. of
North. Island. of. New Zealand

Table. No. 5

TABLE SHOWING (a), MEAN TEMPERATURES, (b), TOTAL FALL OF RAIN, (c), AND AVERAGE NUMBER OF DAYS ON WHICH RAIN FELL IN THE VARIOUS POINTS OF OBSERVATION IN NEW ZEALAND.

Point of observation.	Mean Temperature. 1929.	Rainfall in inches.	Avge. over period number of days.
Auckland.	59.6	51.52	207 ×
Te Aroha.	58.9	59.01	149 ×
Tauranga.	55.3	53.10	146.9
Ruakura.	55.8	50.88	197 ×
Mata Mata.	55.5	50.39	144 ×
Rotorua	54.9	60.31	129 ×
New Plymouth	65.1	60.35	189.3
Stratford		78.86	174.8
Palmerston Nth.	57.4	37.68	151.9
Gisborne		45.85	149.5
Napier	56.6	28.58	134 ×
Masterton	54.1	51.69	183
Wellington	53.6	47.48	169 ×
Hokitika	52.5	109.97	197 ×
Nelson	54.9	48.61	116 ×
Lincoln	52.1	24.98	114 ×
Oamaru		22.18	100.6 ×
Dunedin	51	37.20	159.7
~~Cha~~ Gore		31.34	177.5
Invercargill	50.6	45.95	193.1

Note. The writer has been unable to find average mean temperatures over a series of years for all the places.

Where possible, average rainfall over a series of years has been given, These are quoted from Fawcett op cit, appendix 4. Other wise rainfall is for 1929 and such cases are marked with (x). These latter are from the Official Year Book 1930 page 30.

Map. No 3.

Map. of New Zealand showing Topography

Though There is a range of only 10 degrees Farrenheit in the mean temperatures of summer and winter in New Zealand, there is a wide divergence in the rainfall, and hence the distribution of the dairying industry is largely determined by the rainfall. The attached rainfall map, read in conjunction with the table under discussion delimitates the geographical distribution of the rainfall. From these sources it is obvious that the Canterbury, and Otago North plains and Hawkes Bay are relatively deficient in rainfall. In Canterbury there is a comparative advantage in arable farming and sheep raising, while Hawkes Bay specialises in sheep.

The map No.3 shows the topography of New Zealand, and as dairying to be successful requires heavy grass growth, which in turn requires continual management; the higher levels are not as suitable for dairy cattle as for grazing animals such as sheep and cattle for fattening. Hence, much of the interior is not used for dairying. This further limits the area used for dairying to the lower lying lands chiefly round the coast and in the river basins.

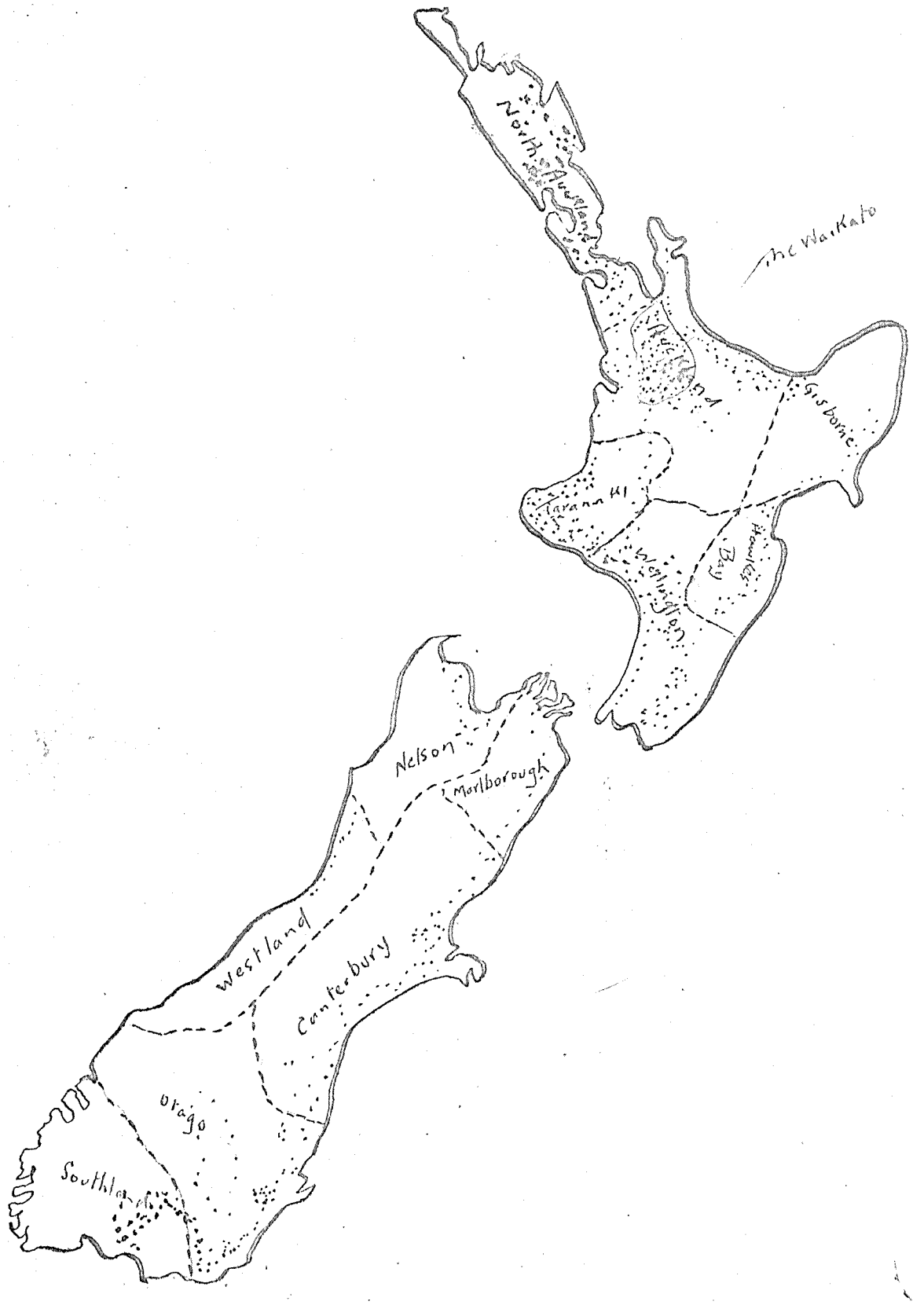
As a consequence, dairying is concentrated in areas where climate, rainfall, and topography are suitable. (1).

The following table shows the details of cattle in the Dominion as at January 31st. 1930.

Table No. 6 TABLE SHOWING DETAILS OF CATTLE IN THE DOMINION AS AT JANUARY 31st. 1931. (2).

District. including interior boroughs.	Cows and heifers two years old and over for dairying. In Milk.	Dry.
North Auckland.	237,022	7,667
Auckland	409,506	12,025
Gisborne	36,907	2,884
Hawke's Bay	49,742	2,483
Taranaki	209,163	7,091
Wellington	199,423	7,794
Nelson	26,436	1,472
Marlborough	15,273	828
Westland	12,082	740
Canterbury	72,867	2,089
Otago	54,335	2,873
Southland	69,116	3,503
Total, Dominion.	1,388,872	51,449

(1) For all this, see Fawcett, op cit, passim.
(2) Agricultural and Pastoral Statistics, 1929/30, page 34.



Map No 11

Map Showing

Distribution of Dairy Cattle.

in New Zealand.

Each dot = 1000 cattle.

Table No.6 shows the distribution of the number of dairy cows in the various land districts, and the table when read in conjunction with the supporting map illustrating the table, effectively delineates the main dairying areas. When compared with the previous maps nos.2 and 3, and table No.5, it will be seen that dairying is concentrated in the areas where rainfall is adequate and well distributed, and where topography is suitable. The main dairying areas are, the province of Taranaki, and that part of the South Auckland province, usually known as the Waikato. (1).

Between them, the Auckland and Taranaki provincial districts supplied 78% of the butter exported, and 59% of the cheese for the year ending March 31st. 1930, the respective figures being, Auckland, 67% butter and 16% cheese, Taranaki, 11% butter, and 43% cheese.

For the year ended 31st.July 1930 the eastern portion of the South Auckland land district, which is more or less co-terminal with the Waikato area, provided 31% of the butter, and 13% of the cheese; while the Taranaki land district provided 11% of the butter, and 42% of the cheese exported.

The following table shows the exports of butter and cheese according to the land districts. Provinces.

Table. No 7 Table showing amount of Butter and Cheese forwarded for export in the season 1929/30 from the various Provinces.

Provinces	Butter Tons	Cheese. Tons
Auckland	61247	13335
Hawkes Bay	4373	3447
Taranaki	10705	36369
Wellington	9721	13072
Nelson	1429	547
Marlborough	646	947
Westland	504	19
Canterbury	1243	2146
Otago and Southland	1559	14781
Totals	91467	84663

(1) For details as to the Waikato, see chapter

This table, when compared with that showing the distribution of dairy cattle, illustrates the predominance of the Auckland provincial area in butter manufacture, which is followed by Taranaki, and Wellington. In cheese manufacturing, Taranaki, with first place, was followed by Auckland, Wellington and Southland. While the Waikato and Taranaki are dairying areas par excellence, the counties of Hobson, Whangarei, and Bay of Islands, are large producers, while in the Bay of Plenty, there are small areas of dairying at Tauranga and Whakatane,; in Wellington province, the Manawatu and Wairarapa plains more of less specialise in dairying. In Nelson., dairying forms part of the mixed dairying - ~~stock~~ farms; in Canterbury, where there was a remarkable drift to dairying in post war years in certain localities centreing round Christchurch, there has of late been a drift away from dairying. In Otago proper, dairying is relatively concentrated ~~in~~ in the Taeiri and Maniatoto plains; and in Southland, ~~the~~ intensive dairying is again found.

SUMMARY.

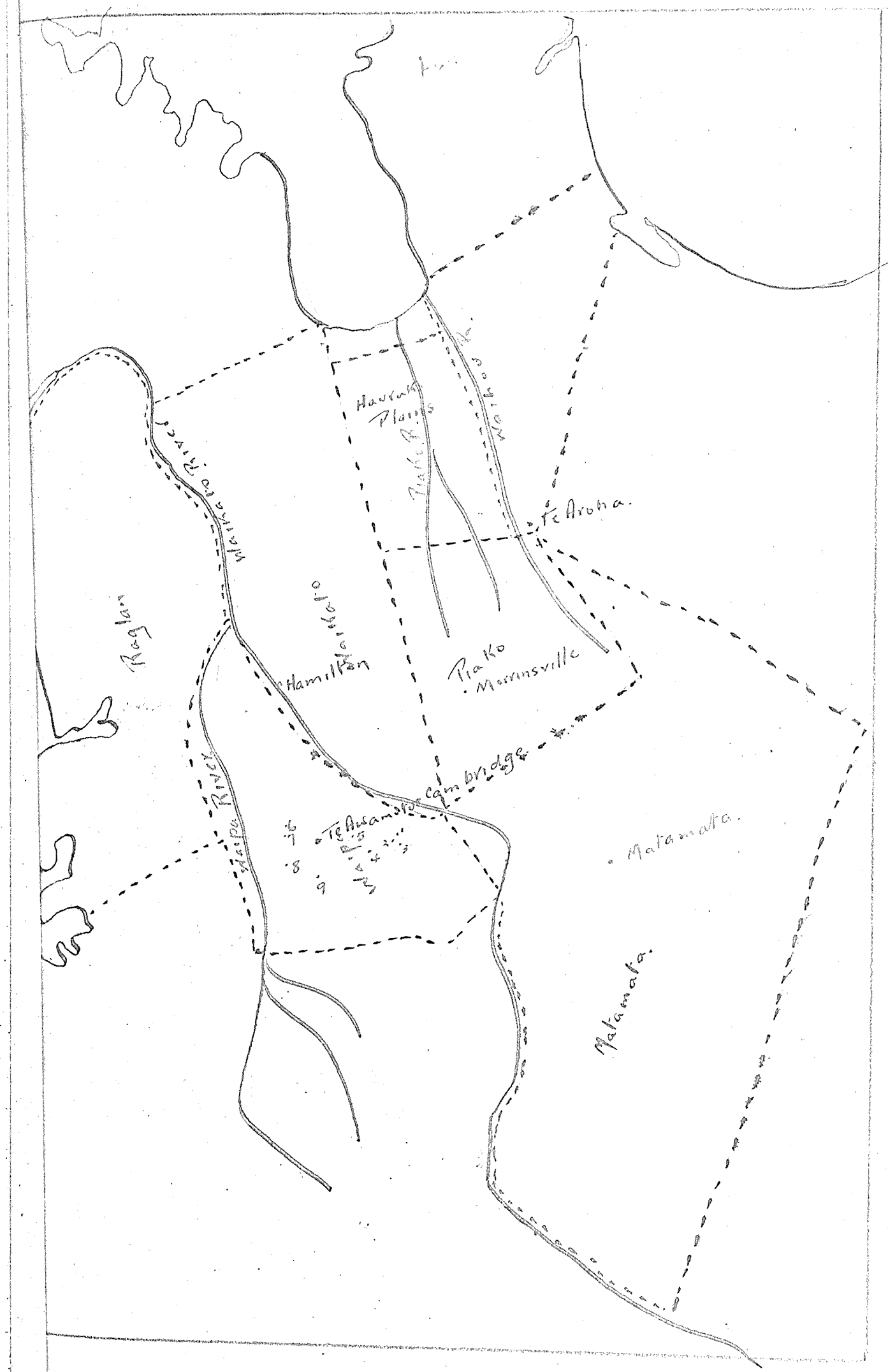
The general purpose of this section has been to give -

(1). A broad view of the relative importance of dairying in the economic life of the Dominion. Dairying in 1930, provided 42% of the value of total exports; while the dairy industry accounted for 26% of the total value of manufactured products in New Zealand.

(2). The second purpose has been to give in broad outline the geographical distribution of the industry throughout New Zealand. The Waikato, and Taranaki are the main dairying centres. In addition, there are other areas throughout New Zealand which carry on dairying. The main factor in determining the location of the industry in New Zealand was the adequacy and distribution of the annual rainfall.

Part I Chapter IV

The Waikato Area.



Location of 9 Farms as numbered.

Map No 5.

County Boundaries of the Waikato

Thames.

Piako River

Piako Valley R.

Paeroa.

Te Aroha.

Waikato R.

Ngaruawahia.

Hamilton

Te Rapa

Raglan

Cambridge

Waipa River

Te Awamutu

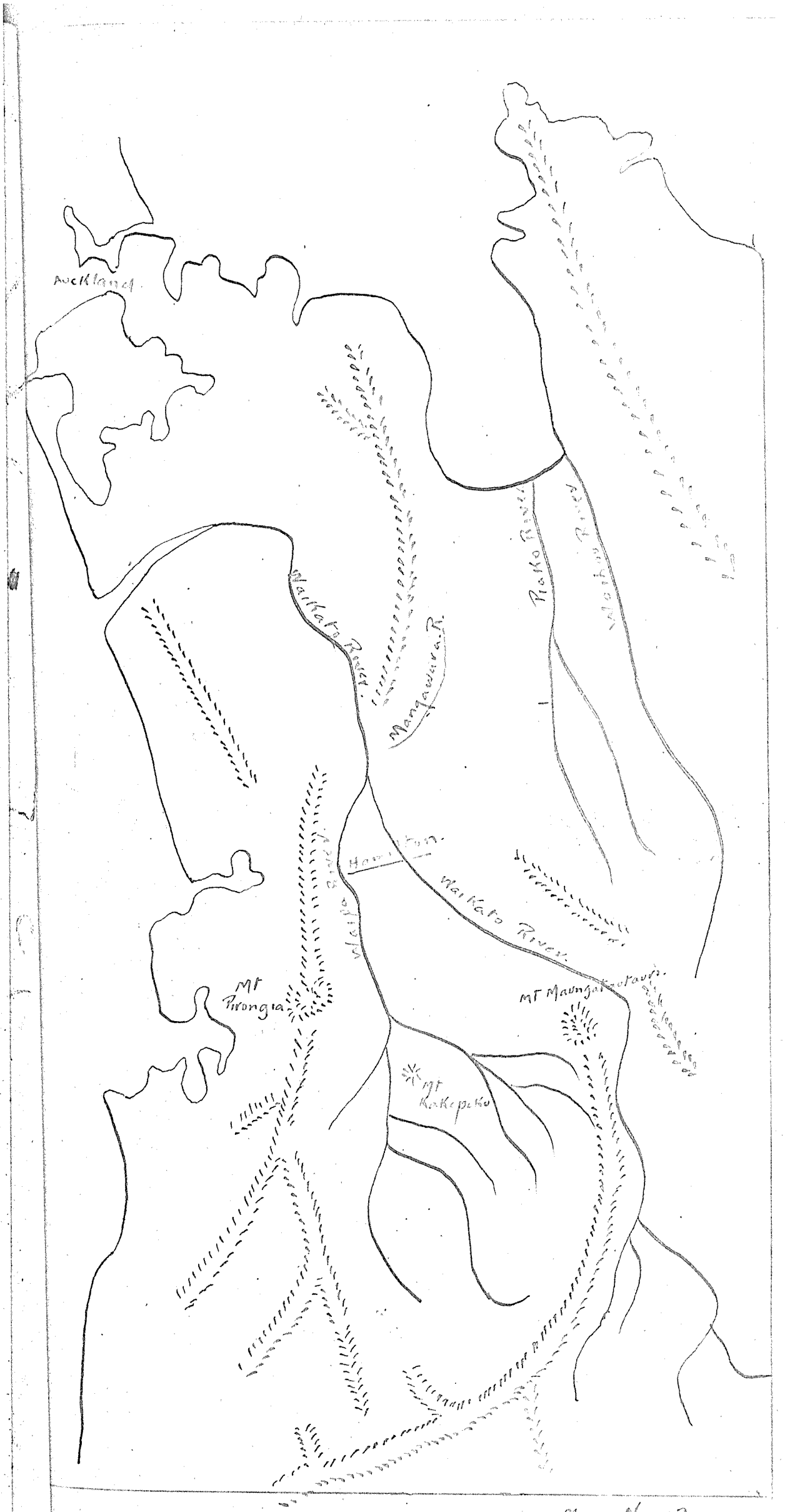
Waikato R.

Matamata.

Roads
Railways.

Map. No 6

Roads and Railways
of the Waikato



Map. No. 7

Physical Features of the Waikato

The following table shows the area of the various counties discussed above, ~~together with the area in grass in each county~~.

Table No. 8

TABLE SHOWING TOTAL AREA IN SQUARE MILES OF EACH COUNTY. (1)

County.	Total area in square miles.
Waikato	656
Waipa	441
Mata Mata	931
Piako	471
Hauraki Plains	232
Total	2731.

(1). From " Statistical report of population and buildings" 193) page 23.

The area of the geographic counties given which includes rural towns, boroughs, and other areas with separate administrative bodies.

~~NORTH ISLAND~~ SECTION 1 (a). THE WAIKATO AREA.

(a). THE AREA DELIMITATED.

The area usually termed the Waikato, when speaking in relation to the dairying industry, comprises the counties of Waipa, Waikato, Piako, and Hauraki Plains; and Mata Mata, together with the more northerly parts of Otorohanga, the easterly parts of Raglan, and the westerly parts of Rotorua. The counties of Waipa and Waikato comprise the middle basin, the Waikato River. Mata Mata, Piako, and the Hauraki Plains are in the basin of the Piako River, a river which follows an old course of the Waikato. Part of the nothern section of Raglan county is in the lower Waikato basin. Each of these areas comprise a separate geographic area. Although the soil structure in each case, except that of the lower Waikato basin, is practically identical.

The attached maps Nos 5,6 & 7 show the counties as discussed above, together with the major physical features.
See attached sheet

(b). TOPOGRAPHY AND SOIL TEXTURE.

The Waikato River rises in the central volcanic plateau of the North Island, and after flowing through 100 miles of pumice country, more or less mountainous in nature, emerges on to the plains at Cambridge. The deposits of pumice silt have built up these plains on which the soil is consequently of a very light nature. In earlier ages, the Waikato discharged into the Firth of Thames, and as a ~~xxxxxxxxx~~ consequence the plains comprised in Mata Mata, Piako, and the Hauraki Plains, are largely of the same nature as the Waikato.

No portion of the area is over 400 feet above sea level, and much of it is below 100 feet. This is particularly the case in regard to the Hauraki Plains, where swamps are very prevalent, and drainage consequently difficult. In this area, pumps are employed to assist drainage.
Both the counties of Piako and Hauraki Plains are very lowlying and as a consequence, the river fall is so slight that floods are common occurrences. Mata Mata is on higher ground.

The middle Waikato basin is higher than the basin of the Piako, and as the Waikato River runs through this area in a deep channel, the same being true of its main tributary, the Waipa, this land is not subject to floods. The whole of these areas, having light pumice soils, suffer considerably in dry weather. Such soils do not hold moisture readily, and as a consequence, even short dry spells mean considerable damage to pastures.

The middle Waikato basin is bounded on the West by the coastal ranges, on the Eastern side of which, Mount Pirongia, of 4000 feet, dominates the plains and very materially affects general conditions of rainfall. The southern boundary is marked by the Highlands in the centre of the Island. The Eastern boundary is marked by the Maungakawa mountains, which continue as rolling downs, from Morrinsville to Taupiri. This basin is almost triangular in shape, having its base line of 27 miles from Mt. Pirongia to Cambridge, and its apex at Taupiri, which is about 31 miles from Cambridge, and about 30 miles from Mt. Pirongia.

The Piako basin is more irregular in shape, and commences in the higher lands of the Mata Mata county, bounded by the Kaimai Range in the north, the Mamaku hills in the east and the Maungakawa mountains in the south. The west is bounded by the Piako county. The Piako River continues its course through the plain, which is approximately 40 miles across, and 48 miles long. It is bounded by the Ohinemuri Hills on the east, and the Pokeno hills on the West.

CLIMATE. The mean temperature of the district is be between 50 and 60 degrees Farrenheit, January being in general the hottest month, when the temperature averages between 65 abd 75 degrees, with extremes of up to 90. July is the coldest month, when temperatures range between 45 and 55 degs. Heavy frosts, occasionally up to 12 deggees occur during the period from May to August, while later frosts in September and October, frequently delay pasture growth. Pastures do not make much headway until September.

Probably the main factor in modern dairying is the question of rainfall. As dairying in the North Island of New Zealand depends on little other than grass crops, it is evident that rainfall sufficient to stimulate growth of grass is essential.

The rainfall of the Hauraki Plains and Piako counties is between 40 and 50 inches per annum, merging into 50 to 60 inches at Mata Mata, Waikato and Waipa.

The Rainfall map of New Zealand on page gives some idea of the general distribution of rainfall in the Waikato relative to the rest of the North Island.

The following table gives the rainfall at Cambridge and Hamilton. (1).

Table No. 9

TABLE SHOWING MEAN RAINFALL AT HAMILTON AND CAMBRIDGE AND DAYS ON WHICH RAIN FELL OVER A PERIOD OF YEARS.

Month.	Hamilton. Inches.	Days	Month.	Cambridge. Inches.	Days
January.	3.70	11.8	January.	2.97	9.3
February	2.97	10.8	February	2.49	9.6
March	3.99	14.2	March.	3.70	10.3
April	3.86	15.6	April	4.07	10.9
May	4.89	18.8	May	5.78	16.1
June	5.12	18.9	June	4.90	15.4
July	5.10	19.7	July	4.17	14.0
August	4.28	19.0	August	4.32	14.8
September	4.31	18	September	4.27	14.5
October	4.77	19.5	October	4.74	15.6
November	4.10	16.3	November	4.09	13.5
December	3.69	14.4	December	3.28	12.9
Totals.	50.88	197.0		47.78	154.9

(1). " Some economic factors controlling butterfat production in New Zealand." E.J.Fawcett M.A., appendix 4.

The wide discrepancy between Cambridge and Hamilton which are only 14 miles apart, in respect of number of days on which rain fell, is largely due to the general nature of the country. North Easterlies are probably the most frequent rain bearing winds, which come up the Hauraki Plains from the Firth of Thames.

The following table shows the density of the population in each county.

Table No.12 TABLE SHOWING DENSITY OF POPULATION IN EACH COUNTY IN 1930, SHOWING (A) THE ADMINISTRATIVE COUNTY and (B) THE GEOGRAPHIC COUNTY. (1).

County.	Administrative County.	Geographic County.
Waikato	14.39	42.96
Waipa	22.56	29.99
Mata Mata	7.77	9.81
Piako	16.24	24.61
Hauraki Plains	16.85	16.85
Totals.	13.84	24.53

See attached footnote

The distribution of the population is largely affected by the topography, which in turn affects the character of the use of the land. Dealing solely with the administrative county for the reasons explained in the note to the table on the Density of population; the Waipa county shows the greatest density. In this county there is little land not suitable for dairying, or at least, much less land not so suitable as in other counties. In the Piako and Hauraki Plains counties, there is considerable swamp as yet unreclaimed. In the Waikato, there is in the north and south considerable hill country where sheep runs are found, the country there not being suitable for dairying. The same is true, but to a greater degree of the Mata Mata county.

TRANSPORT FACILITIES.

Railway routes, are as indicated on the map on page In addition there are excellent arterial roads, which are being bituminised as funds permit. Speaking broadly, no part of the dairying area is inaccessible by motor car at any period of the year most of the roads are metalled or heavily sanded.

Footnote.

The more important figure in discussing farm organisation is of course the figure for the administrative county which includes all the larger urban areas, and although some villages are included, it is more truly representative of the distribution of the rural population.

SUMMARY.

To sum up this section, the Waikato dairying area as defined in this paper comprises an area of 2,751 square miles, and contains a population of 69,960, of whom 32,150 lived in rural towns, and 37,810 lived in the county proper in 1930. That is to say that the density of population in rural areas was 13.84 persons per square mile. The mean temperature at Hamilton was about 60 degrees Farenheit, with a range of from 45 degrees as a mean minimum to 66 degrees as a mean maximum. The mean rainfall at Hamilton was approximately 50" falling on the average of 197 days. The soil is of a light volcanic nature, and as a consequence, not capable of successfully standing considerable dry spells, hence the importance of abundant rainfall.

Part. II

Farm. Technical. Organisation.

Part II Chapter. I

Factors affecting to the Size of Farms

FACTORS RELATING TO THE SIZE OF FARMS.

It has already been pointed out that dairy farming is a small scale industry when compared with other types of farming in New Zealand. The major reason for this is that decreasing returns to management operate sooner in dairying than in other branches of rural industry. By the nature of the work required there is an optimum size of herd which can be handled in one shed and set of yards and hence in cases where ownership of land extends over an area capable of carrying a larger herd than this, it frequently happens that the surplus area, where sufficiently large is let to sharemilkers, so that while the ownership of land and herd may be very large the actual unit of management is much smaller. In one area in the Waikato there are nine or ten farms and necessary buildings all owned by one man but each farm managed by a separate individual. The result is that management is much more efficient in relation to the area as a whole than if it were possible to administer the area as one unit. In one questionnaire received there appeared 700 cows to 600 acres with a very high butterfat per cow. When this case was investigated it was found to represent 8 farms let to sharemilkers.

The following table extracted from the Agricultural and Pastoral Statistics for 1929/30 shown the size of the holdings in various counties in the Waikato.

Table No. 13

SIZE OF HOLDINGS

Table showing average area of holdings in the various counties in the Waikato in 1929/30.

County.	No. of holdings	Total area occupied	Av. area of holdings.
Raipa	1511	304,193	194.17
Waikato	1560	232,81[illegible]	154.8[illegible]
Piako	1337	232,016	174.48
Hauraki Plains	789	109,344	138.59
Hautamata	1[illegible]4	5[illegible],922	541.53
Franklin	2354	288,159	122.41

The above table includes all classes of holdings As has been pointed out earlier, there are in each county considerable areas of land which are submarginal as far as dairying is concerned and sheep are usually found in those cases, where land is not entirely uncultivable. In the original subdivision there were considerable areas not suitable for cutting up into smallholdings and in some cases these were given as endowments to educational institutions. In nearly every case these areas are suitable for sheep runs and are so used. The Auckland University College has several endowments which have been cut up into sheep farms each with an area of 2000 acres, in the Northern Part of the Waikato County.

In the case of Matamata the existence of sheep runs makes the average holding much larger than the other counties. Franklin which is relatively suburban to Auckland city reveals this in the smallness of the average holding because of the fact that considerable areas are used for market gardening.

However taking Waipa as a typical dairying county and comparing it with Waipawa a typical sheep farm county in the Hawkes Bay province, and with Geraldine an arable farm county in the Canterbury province, the average size of the holdings are 154, 493 and 383 acres respectively.(1) The sheep counties in the South Island where runs are much larger, show much larger average holdings.

So much for the point of the smallness of dairy farms relative to other types of farming.

~~The following tables shows the result of the investigation relative to the size of dairy farms in the Waikato~~

(1). See Agricultural and Pastoral Statistics 1929/30.

The following table based on the questionnaires collected groups the farms investigated according to area. The distribution may be regarded as being very typical of the Waikato as the sample is very large.

Table No. 14

AREA OF F.A.S.

Table showing grouping of Dairy farms in the Waikato according to acreage.

Size acres.	No. of Farms		Percentage of total	
- - 19	2	17	.21	1.75
20 - 29	15		1.54	
30 - 39	18	63	1.85	6.48
40 - 49	45		4.63	
50 - 59	88	157	9.05	16.15
60 - 69	69		7.10	
70 - 79	73	156	7.51	16.05
80 - 89	83		8.54	
90 - 99	72	202	7.41	20.78
100 -109	130		13.37	
110 -119	30	118	3.09	9. 6
120 -129	58		5.97	
130 -139	44	83	4.53	8.54
140 -149	37		4.01	
150 -159	56	80	5.76	8.23
160 -169	24		2.47	
170 -179	16	35	1.64	3.60
180 -189	19		1.96	
190 -199	11	37	1.13	3.70
200 -209	25		2.57	
210 -219	5	11	.51	1.13
220 -229	6		.62	
230 -239	3	9	.31	.93
240 -249	6		.62	
250 -259	5	8	.51	.82
260 -269	3		.31	
270 -279	1	7	.10	.72
280 -289	6		.62	
290 -299	-		-	
300 -399	15	15	1.54	1.54
400 -499	3	3	.31	.31
500 and over	2	2	.21	.21

The diagram on ~~the next~~ page 62. illustrates the above table graphically.

If the farms be classified in 10 acre groups the 100 -109 acre group is the modal group. The mean farm is also, in this group being the 21st farm. The interquartile range is from 70 to 150 acres. The arithmetic average of the farms is 113 acres but if the farms of 300 acres and over are omitted the average is 108 acres.

Fawcett in a study of 2694 farms situated in the North Island arrives at results slightly different from the above; but as his survey was over the North Island it would probably include farms situated in Taranaki and Manawatu and hence the result is not necessarily contradictory to the present investigation. The following table shows Fawcett's result compared with the results of this study.

Table No 15. Table showing results of Fawcett's investigation compared with those of the present investigation.(1)

Group Range acres	Fawcett's figures percentage of total	figures in this investigation percentage of total
- - 19	.42	.21
2. - 39	4.00	3.38
40 - 59	11.55	13.68
60 - 79	14.70	14.61
80 - 99	12.75	15.35
1 - 119	12.11	10.46
120- 139	8.46	10.50
140- 159	7.44	9.77
160- 179	4.78	4.11
180- 199	4.64	3.19
200- 219	5.02	3.08
220-239	1.92	.25
240- 259	1.87	1.13
260- 279	1.03	.41
280- 299	.85	.62
300- 399	2.84	1.54
400- 499	1.51	.31
500 and over	.24	.21

(Fawcett's figures indicate that 75% of the total fall between 40 and 160 acres and 55% between 40 and 120 acres. (2) The results in this investigation from the same groups are 55% and 61% respectively.

The general conclusion is that dairy farms in the Waikato are probably smaller than similar farms in other parts of the North Island although it is possible that an investigation covering as many farms as Fawcett's would have revealed results differing less

(1) Fawcett "Economic Factors controlling Internal production in New Zealand." Unpublished M.A.B. Thesis Department of Agriculture.
(2) Fawcett op.cit., loc. cit.

"When the Waipa County was first settled ..... the most fertile land..... which was confiscated from the rebellious natives was cut up into 50 acre sections. Each private soldier and each militiaman was given a 50 acre section..... To this day 50 acre sections and multiples of 50 acres are still important size units for farms."(1)

The general conclusions drawn from this analysis may be stated asfollows.- Dairy farming is a small scale industry; the size of the farm being largely determined by the managerial capacity of one man in relation to shed and yard accomodation and field work. The most representative farms are in the group 90 to 110 acres which group contains approximately one third of the farms.

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(1) Smallfield. Op. cit. p.56

Part II Chapter. II

The Tenure of Farms

THE TENURE OF FARMS.

FREEHOLD. Freehold tenure predominates in the Waikato as in practically all other parts of New Zealand. The Freehold is usually vested in the tenant, subject to a transfer byway of mortgage. Statistics suggest that over 80% of the unimproved value of the farms of 75 - 100 acres is covered by Registered Mortgage; and as the unimproved value is about , of the capital value, Registered Mortgages are about 50% of the Capital Value. (1)

LEASEHOLD. Private Leasehold as distinct from share-milking is uncommon, but various types of Crown Leases are very frequently found. Large areas were acquired under the Discharged Soldiers' Settlement Act, and are held as Crown Leases. The usual procedure may best be described by way of example. In the Waipa County the Puahue district was till 1919 held by one man as a sheep run. The Government acquired this in 1919. It was cut up into about 20 farms of approximately 100 acres, and then offered to returned soldiers. The actual selection of tenants was made by ballot. The tenants received only a leasehold, the great bulk of the cost of the leasehold being advanced to the settlers by the Government. In addition to this capital advance which was secured by way of mortgage over the land, there was also advanced working capital to cover costs of stock, fencing, and buildings. For the whole sum advanced the Government held a general mortgage over land and stock. This advance was repayable over a 36 year period by way of half-yearly instalments which included interest and sinking fund. In addition the annual rental of the lease had to be paid.

A very large number of returned soldiers were thus settled on Dairy farms after the War, and these now

(1) Official Year Book 1930 page 752.

because of the fact that they were mostly city [illegible] and had a wide commercial as well as [illegible]ar experience, have naturally been more receptive of new ideas than the older generation of farmers, [illegible]uch of the progress in the technique of dairying has been due to these men who are prepared to take risks and experiment with new ideas in a way which would not have been possible without their presence. Returned Soldiers are prominent in Farmers' organisations as those who are foremost in promulgating new ideas. The writer in his investigations into dairying, as well as in his work as W.E.A. tutor in the district was much struck by the contrast in social as well as the purely farming outlooks between districts which were old settlements, and those occupied by Returned Soldiers.

Other areas of Crown Land have been opened up from time to time and offered for settlement, the actual selection of settlers being made by ballot. The general principle is that of leasehold, although in some cases, option to purchase is included.

A more recent development is the purchase by by the Crown of improved areas for sub-division and there are various provisions which even enable the initiative to be taken by prospective settlers. Crown Leaseholds again are the forms of tenancy.

One other form of tenancy is in evidence in some parts. At the conclusion of the Maori Wars in the 3rd ~~decade~~ quarter of last century, certain areas were set apart to the natives. The ownership of these lands was vested in the natives, subject to control by the Native Land Courts. As settlement advanced it was evident there would be a demand for these lands for general farming. In early times the natives were forbidden to sell their land, and "native" leases were adopted. These leases had to be sanctioned by the Native Land Courts. At a later stage, alienation was permitted subject to very rigid control by the Land Court. Whole districts are held as Native leases although alienation is now proceeding

at a steady rate. Part of one of the nine farms in which the financial affairs were investigated, was held on a Native lease which was during the year, converted into freehold. All Crown or Native leases are for long periods.

No details are available for the areas in the various counties held under different tenures, but the following table shows the percentage distribution of tenures throughout New Zealand in 1930. It should be noted however that freehold is much more prominent in the Waikato, and Crown leases less prominent.

Table No. 16a. TENURE OF LAND.

Table showing percentages of total occupied area held under various forms of tenure in 1930.

	percentage
Freehold	48
Leased from private individuals	4
Leased from Public Bodies	2
Leased from Maoris	3
Crown Leases	43
Total occupied area	100

Crown Leases are much more prominent in the light lands, and semi-developed lands in the South Island, and also in the Central part of North Island.

SHARE-MILKING. The only other form of tenancy is that usually known as share-milking. Two major forms are:—

In the first case, the land, buildings, and plant are owned by the landlord; while the herd and all labour is supplied by the tenant. The usual form of rent in this case is, one third of the receipts from the sale of butterfat. There is frequently a provision that a proportion of other revenue receipts, such as from pigs, shall also go to the landlord. The landlord generally undertakes to provide some proportion of the costs of fertilizers. There are a wider variety of covenants by and in favor of both landlord and tenant.

In the other case, the landlord supplies all the capital including land, buildings, plant, and herd. In this case the usual provisions are two thirds of the revenue receipts to the landlord who also provides a considerable portion of the labor of harvesting of hay and ensilage.

Both these forms have, in the past, been associated with optional or compulsory purchasing clauses. The one form which is so held in the group of nine farms investigated is

held with compulsory purchasing clause. However it is the opinion of the writer, that this provision is becoming less common that formerly, and that share-milkers are being recognised as a regular class who for some reason do not aspire to land-ownership.

As might be expected, the standard of farming hereunder is less efficient than either in freehold or leasehold where the farmer has an interest in the maintainance of the effectiveness of the capital equipment. The general criticisms of metayer tenancies ~~tendencies~~ of which share-milking is a form are well stated by Marshall, and apply very generally to share farming in this country, -"when the cultivator has to give his landlord half of his returns to each dose of capital and labor, it will not be to his interest to apply any dose, the returns to which is less than twice enough to reward him." (1) Consequently the fixed capital is apt to deteriorate, and this is particularly in regard to grasslands, and unless strict covenants are entered into, it is not to the Sharemilker's interest to fertilize in the Autumn unless he proposes to carry on the tenancy the next year. Consequently though rent is high, much of the money rent is really earnings of management. (2)

Share-milking tenancies arise from two causes.

First, a farmer retires or leaves the district, and being unable to sell his farm as a going concern lets it to a share-milker. This form is usually associated with a compulsory purchasing clause, and there is often a provision that an additional amount will be paid over the share of revenue receipts which shall accrue till it forms a determined amount when the freehold will be transferred, subject to mortgage. This form is not common in the Waikato at present, although it was common in other dairying areas at an earlier date. (3)

The other form is as noted above, when a landowner owns an area more than sufficient for one farm. The balance is then let to share-milkers. One instance of this was at Puahue in the Waipa county where one estate was divided into three farms

(1) Marshall "Principles" 8th ed. p.644
(2) see Belshaw "The Dairy Industry of N.Z. p.69
(3) Belshaw, op. cit, op.cit.

one worked by the Owner, and the other two by share-milkers in this case, the herds were all owned by the landowner, but cases where the herd is provided by the tenant are just as common. In the case referred to in the previous chapter, the whole estate forms a self-contained area, with its own Dairy Factory. To sum up,—in the opinion of the writer, although purely as a result of observation, and not of statistical investigation,—~~that~~ share-milking as a stepping-stone to ownership - as noted by Belshaw - is not prominent in the Waikato today, but there is arising a definite share-milking class.

SUMMARY. It is probable that over 75% of the area of the Waikato is held in fee simple, subject to mortgage. Of the remainder, four fifths is held in some form of Crown Lease, chiefly under the Discharged Soldiers Settlement Acts. The remainder is held under Native lease, private lease, and under share-milking agreements.

The freehold tenancy affords greatest incentive to effort, although the liberality of the ~~Crown~~ own lease, and the provision for reimbursement for capital improvements, and for extension of lease are such, that in the point of incentive to efficiency there is little difference between Crown leases and freeholds. Private leases, if of short duration; and particularly share-milking agreements, provide the least incentive to long term efficiency, and make for a tendency to the depreciation of fixed assets including grasslands.

Table. No. 17

TABLE SHOWING NUMBER OF DAIRY COWS PER 1000 ACRES IN EACH OF THE DISTRICTS ENUMERATED.

District.	1920.	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.	1929.	1930.
North Auckland.	41·44	46·40	54·78	60·32	64·22	66·68	66·95	69·59	74·11	74·77	81·13
Auckland.	47·58	52·67	59·79	70·73	75·60	78·18	78·62	80·04	87·59	91·08	100·02
Taranaki.	91·29	99·33	108·15	115·61	117·16	117·25	117·90	119·77	122·39	122·10	127·26

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Part II Chapter III

Stocking of Dairy Farms

Chapter III

Stocking of Dairy Farms.

Dairy Cows. The very rapid strides made in the Auckland Province in dairying in Post War years, can be seen by the following table, which shows by comparison with the Taranaki Province, the number of dairy cows carried per 1000 acres. For reasons stated in Chapter I Part II on the size of farms, the carrying capacity of dairy farms is much higher than this figure but this table is useful for comparative purposes.

Table. No. 17

TABLE SHOWING NUMBER OF DAIRY COWS PER 1000 ACRES IN EACH OF THE DISTRICTS ENUMERATED.

District.	1920.	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.	1929.	1930.
North Auckland.	41·44	46·40	54·78	60·32	64·22	66·68	66·95	69·59	74·11	74·77	81·13
Auckland.	47·58	52·67	59·79	70·73	75·60	78·18	78·62	80·04	87·59	91·08	100·02
Taranaki.	91·29	99·33	108·15	115·61	117·16	117·25	117·90	119·77	122·39	122·10	127·26

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The Auckland land district includes all the Waikato area, and the increase of practically 100% in the carrying of stock is an indication of the progress of dairying in this area. This progress can be further illustrated by taking typical dairying counties and giving similar figures therefor.

Table No. 18

TABLE SHOWING DAIRY COWS PER 1000 ACRES IN CERTAIN SELECTED WAIKATO COUNTIES.

	1919	1924	1927	1930
Waikato	97·13	145·47	152·57	176·73
Waipa	138·72	162·12	189·91	229·76
Piako	125·93	224·64	246·91	293·67

This development can also be illustrated by the fact that the average supply of the biggest Dairy Company in the Waikato, with over 8000 suppliers, increased from about 4500 lbs to about 7000 lbs of butterfat per supplier per annum. from 1921/2 to 1929/30 The above, coupled with the fact that the uncultivated area has hardly increased at all, and that the number of holdings has been practically constant, reinforces the above conclusions that one of the factors in increased production is the increased carrying of stock.

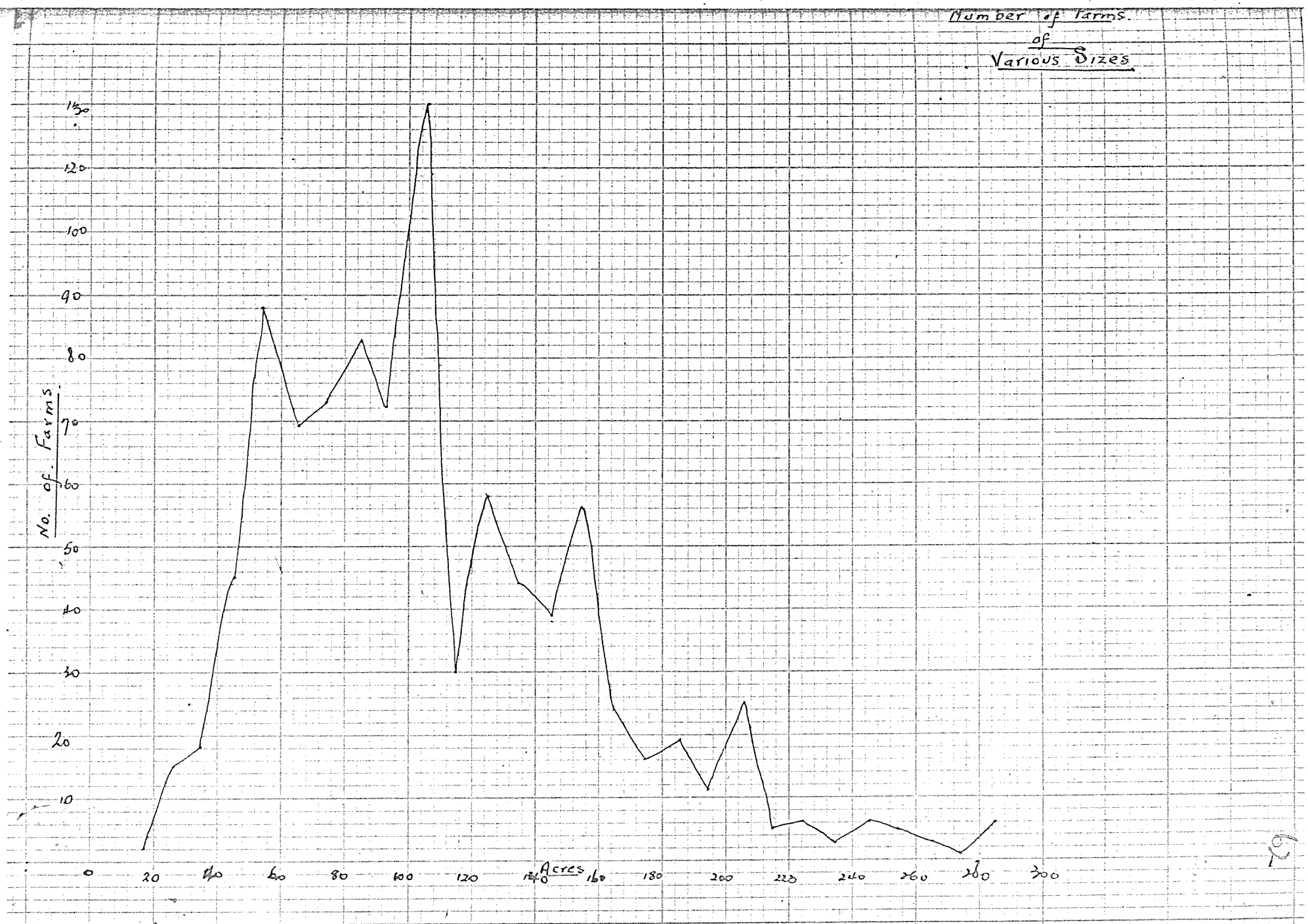
The next tables show the results, of the writers investigation into the actual carrying capacity of farms in the Waikato in 1931. The first table shows the average carrying of farms grouped according to acreage.

Table. No 19 STOCKING OF FARMS. 61

Table showing carrying capacity of farms grouped according to acreage.

Acreage	av. no. of cows.	av. acs. per cow.	av. cows per 100 acres	av. acreage.	no. of farms.
19	6	2·4	43	14	2
20 – 29	17	1·5	67	26	15
30 – 39	21	1·7	60	34	12
40 – 49	25	1·8	56	46	45
50 – 59	29	1·8	56	52	88
60 – 69	35	1·8	56	63	69
70 – 79	42	1·7	60	73	73
80 – 89	43	1·9	53	82	83
90 – 99	49	1·9	53	94	72
100 – 109	51	2·0	50	101	120
110 – 119	57	2·0	50	114	30
120 – 129	59	2·1	48	121	58
130 – 139	65	2·0	50	132	44
140 – 149	64	2·2	45	142	39
150 – 159	69	2·2	45	151	56
160 – 169	74	2·2	45	162	24
170 – 179	86	2·0	50	173	16
180 – 189	77	2·3	43	181	19
190 – 199	73	2·6	40	191	11
200 – 209	88	2·3	43	200	25
210 – 219	79	2·7	37	211	5
220 – 229	93	2·4	42	221	6
230 – 239	98	2·4	42	233	3
240 – 249	109	2·2	45	241	6
250 – 259	98	2·6	40	250	5
260 – 269	86	3·0	33	261	3
270 – 279	77	3·5	29	270	1
280 – 289	82	3·4	29	280	6
290 – 299	–	–	–	–	–
300 – 399	119	2·7	37	318	19
400 – 499	103	4·5	22	471	3
500 & over	65	9·0	11	585	2

Number of Farms of Various Sizes



Average cows per 100 Acres on farms of various sizes.

Omitting the first case of farms under 20 acres, which are obviously not farms where dairying is the sole source of livelihood, the striking fact about the foregoing table is the regular progress in the size of the herds, and the more or less regular increase of acres per cow (or conversely, decrease of cows per 100 acres), as the size of the farm increase.
This is graphically represented in Graph No.
Assuming a given level of fertility of land - which of course is not a justifiable assumption - except for this purpose - that smaller acreages are associated with more intensive farming owing to the necessity of extracting a larger proportionate return from the smaller area, if the smaller area is to provide a means of support to the farmer. Onethe other hand, the higher carrying capacity of the smaller farms can frequently be accounted for by the greater fertility of those farms. and Hence the greater possibility of carrying more stock.
That is to say that the density of stocking decreases as the size of the farm increases, and as butterfat production per acre is affected directly by density of stocking (vide Chap. Part III), it follows that smaller farms tend to have a higher butterfat per acre (vide Chap. Part III).

The next table showing farms grouped according to the size of the herd, gives another view of the stocking of farms.

SIZE OF HERDS.

Table No. 20

TABLE SHOWING ACREAGE OF FARMS WITH DIFFERENT SIZE HERDS, ALSO THE AVERAGE ACRES PER COW IN EACH GROUP.

No. of Cows	Avge. acreage.	Acs. pr. cow.	Cows pr. ac.	Avge. cows per farm.	No. of farms.	% of farms in each group.
10	25	4·2	·24	6	4	·42
11– 20	39	2·2	·45	18	46	4.00
21– 30	63	2·9	·34	22	155	14·00
31– 40	81	2·3	·43	35	171	17·80
41– 50	99	2·2	·45	45	170	17.60
51– 60	117	2·1	·48	55	141	14·80
61 – 70	131	2·1	·48	63	90	9· 3
71– 80	154	2·0	·50	75	73	7· 6
81– 90	164	1·9	·52	85	58	6·0
91–100	188	2·0	·50	95	26	2·7
101–110	192	1·8	·56	105	28	2·9
111–120	259	2·1	·48	115	14	1·5
121–130	255	2·0	·50	126	4	·4
131–140	200	1·5	·67	132	1	·1
141–150	–	–	–	–	–	–
151–160	272	1·7	·56	154	4	
161–170	330	2·1	·48	170	1	

The modal group here is the conjoint group of farms having from 30 – 50 cows, there being practically no difference in the number having 31 – 40, and 41 – 50 cows.

These two groups have between them over 35 of the total cows. The average acreage of these two groups is 81 and 99 respectively.

In farms grouped accordingly to acreage the modal group of 100 – 109 had an average acreage of 101 with an average carrying capacity of 51 cows, agreeing approximately with the 40 – 50 group above.

Farms having from 21 – 70 cows are over 72 of the total, the interquartile range covering the same groups.

It will be noticed that the acres per cow decrease as the size of the herd increases.

This is not at variance with the previous conclusion based on an acreage classification, but while that classification indicated more intensive dairying on smaller areas, this

indicates that larger herds are up to a point, associated with heavier carrying of stocks per 100 acres.

This point is largely bound up with that of labor ~~and~~ supply.

The present investigation does not give sufficient ~~data~~ data for a statistical enquiry into this point, but observation suggests that the man with 21 - 30 cows on an average of 63 acres does not usually require help in milking; the man with 31 - 40 cows on 81 acres, has a boy, 41 - 50 cows. on 99 acres, a youth; 51 - 60 cows, a man; over 60, two helpers. That is to say the size of the herd xx in relation to acreage is determined inter alia by labor requirement necessary to cope with a herd of a given size.

The question of the relation of the relative density of stocking to production of butterfat is discussed Chap. 3. Part III

The next table illustrates the frequencies of the various densities of stock carrying.

Table No. 21 COWS PER 100 ACRES.

Table showing farms grouped according to cows per 100 acres

Cows per 100 acres.	No. of farms.	Average acreage.
11 - 20	10	245
21 - 30	61	172·4
31 - 40	160	127·8
41 - 50	253	106·1
51 - 60	252	99·9
61 - 70	149	86·0
71 - 80	46	85·2
81 - 90	18	72·9
91 - 100	11	53·3

The modal groups here are those between 41 - 60 cows. per. acre acres which have 50% of the cows carried. The striking ~~fact~~ fact of the much heavier stocking on smaller areas is also seen in this table where there is a steady fall of acreage as density of carrying ~~increases~~ increases.

The modal group represents one cow to two acres.

The following table gives the position of the nine farms in the 80 square area of which a more intensive survey was made.

Table No. 22 TABLE SHOWING STOCKING OF THE NINE FARMS IN THE 80 SQUARE MILES.

Farm No.	Area.	Cows.	Acres per cow.	Cows per 100 acres.
1	299	102	2·9	x34
2	208	64	3·2	x31
3	107	45	2·4	x42
4	101	47	2·2	x45
5	101	45	2·2	x45
6	92	52	1·8	x56
7	92	41	2·2	x45
8	80	48	1·4	x71
9	67	20	3·3	x30

The above results agree fairly closely with those from the wider investigation. The average area of the farms from 80 - 107 acres, is 96 acres, and the average stocking being 46 cows or equivalent to one cow to 2·1 acres or 48 cows to 100 acres.

SUMMARY. The smaller the area the heavier the stocking of dairy cows due to the fact that more intensive dairying is necessary for supporting the farmer on a smaller area, and this tends to relatively greater fertility on the smaller farms.

The larger the herd up to a point, the heavier the stocking, and it is suggested that this reflects labor requirements for milking herds of various sizes.

No third of the farms investigated had herds between 31 and 50 cows, while over 72 had between 20 and 70 cows. The modal size of farm was between 100 and 109 acres, and farms of this size had an average of 51 cows being approximately one cow to two acres.

Farms grouped according to cows carried per 100 acres give approximately the same result.

Other Cattle ~~OTHER CATTLE~~.

(xxv) The previous discussion has been in terms of Dairy cows, but it will be obvious that a complete discussion of stocking involves some consideration of the carrying of young stock, bulls, other cattle, sheep, pigs, and horses.
Horses being practically farm machinery, will be reserved for later sections.

(xxvi) YOUNG STOCK. The general question of the carrying of young Dairy stock and Dairy bulls is intimately bound up with that of herd replacement, and increase of the size of the herd. Information was obtained in regard to yearling heifers only, that is, of calves from the previous season
Information on the question of rising two year old heifers in calf would have been valuable, but was not asked for.
However some idea of the replacement and increase of herds can be obtained from the following two tables which show:-
(a). Yearlings carried to cows on farms grouped according to acreage, and (b). Yearlings to cows carried on farms grouped according to the size of the herd.

Table No. 22

YEARLINGS ON FARMS OF VARIOUS ACREAGES.

Table showing number of yearlings per cow carried on farms grouped according to acreage.

Acreage.	no. of farms.	avge. cows carrd.	avge. year-lings.	year-lings per cow carried.	cows per yearling
- - 19	2	6	1	·17	6
20 - 29	15	17	3	·18	6·1
30 - 39	18	21	5	·25	4·0
40 - 49	43	25	6	·23	4·3
50 - 59	88	29	5	·16	6·0
60 - 69	69	35	6	·16	6·0
70 - 79	73	42	8	·18	5·6
80 - 89	83	43	10	·22	5·1
90 - 99	72	49	10	·20	5·1
100 -109	130	51	10	·20	5·2
110 -119	30	57	10	·17	5·8
120 -129	58	59	13	·22	4·6
130 -139	44	65	12	·18	5·5
140 -149	39	64	12	·19	5·2
150 -159	56	69	16	·23	4·4
160 -169	24	74	12	·17	6·0
170 -179	16	86	18	·22	4·6
180 -189	19	77	10	·13	8·0
190 -199	11	73	24	·32	3·1
200 - 209	25	88	21	·23	4·3
210 -219	5	79	23	·29	3·4
220 -229	6	93	23	·24	4·1
230 -239	3	98	23	·23	4·4
240 -249	6	109	16	·16	6·2
250 -259	5	98	26	·27	3·7
260 -269	3	86	26	·29	3·4
270 -279	1	77	28	·26	2·9
280 -289	6	82	17	·21	4·8
290 -299	-	-	-	-	-
300 - 399	15	119.	23	·19	5·2
400 -499	3	103	13	·13	7·9
500 -	2	65	20	·30	3·3

NOTE. Col.4 is merely the reciprocal of Col.5.

Table No. 24

YEARLINGS ON FARMS OF VARIOUS SIZED HERDS.

Table showing number of cows per yearling, and yearlings per cow on farms grouped according to cows carried.

Size of Herd.	No. of Farms.	avge. no. cows.	avge. no. Ylgs.	Ylgs. to Cows.	Cows to Ylgs.
+ 10	4	6	3	·42	2·2
11- 20	46	18	5	·25	4·0
21- 30	125	22	6	·22	4·5
31- 40	171	35	7	·19	5·5
41- 50	170	45	10	·21	4·7
51- 60	141	55	11	·19	5·2
61- 70	90	63	13	·21	4·7
71- 80	73	75	15	·20	5·1
81- 90	58	85	17	·21	4·8
91- 100	20	95	17	·19	5·4
101- 110	28	105	20	·19	5·2
111- 120	14	115	18	·16	6·2
121- 130	4	126	23	·18	5·5
131- 140	1	132	20	·15	6·6
141- 150	-	-	-	-	-
151- 160	4	154	34	·22	4·6
161- 170	1	170	27	·16	6·3

The general tenor of both the foregoing tables is the same. Broadly it may be said that there is a general tendency towards the higher carrying of yearlings as the size of the farm increases, and as the herd increases. Taking the farms of from 40 to 179 acres - typical dairy farms - the average stocking of yearlings is about 1 yearling to 5·2 cows, or approximately 20 yearlings to 100 cows. Similarly taking a herd of from 20 to 100 cows, as embracing the more typical dairy farms, the same result appears, namely, 1 yearling to 5 cows, or 20 yearlings per 100 cows.
This result is in striking agreement with that of Fawcett (1) who states that his figure of 22 per 100 represents the average over the whole of New Zealand.

The fact that on the smaller farms, say up to 69 acres, the average yearlings per cows is less than on higher acreage reinforces the point made earlier that on the smaller farms, the higher carrying of dairy cows is associated with more intensive dairying; the object being to get the maximum present return.

Table No showing cows per 100 acres in farms classified according to size of herds when compared with table No in this chapter showing yearlings per cow on farms similarly classified, shows that as the number of cows per herd increases, the number of cows per acre increases; while the number of yearlings per cow tends to decrease slightly. This could suggest that the larger the herd the greater the tendency to supply replacements to the herd by purchase rather than by rearing, which of course is in the early months, associated with considerable extra labor feeding calves.

As no data was collected by the writer regarding heifers rising two years old, Fawcett's figures mentioned above are used as an approximation to the position.

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(1). "Some Economic Factors Controlling Butterfat Production in New Zealand" Fawcett. P.57

As one would expect, the normal number of heifers rising two years old ~~were~~ are approximately equal to those rising one year old, which would suggest that 20 per 100 as the relation of heifers rising two years old to dairy cows on the basis of this investigation.

Fawcett's figures are:-

Heifers rising two years old.....20 } per cows
Heifer calves.....22 }

The relative merits of rearing young stock as opposed to buying in cows requires to be investigated and the question of relative profitableness involves a discussion on cost of cows, current and prospective returns to butterfat, labor supply, and land values. One interesting experiment was brought to the writer's notice where a progressive farmer sent his weaned calves to £3 per acre land where they were kept for 18 months during which period they were got into calf, and returned to the farmer just before calving. In the interim, the farm, which was worth at least £40 per acre was fully stocked with cows in production. It is obvious that the higher the carrying of young stock, the less cows producing revenue can be carried, besides the fact that calves not only involve extra labor, but actually involve a reduction in the butterfat supplied while being fed on whole milk.

The particulars of the nine farms in the Te Awamutu district as to yearlings are as under. No data is given for the number of heifers rising two years old, as the date of collection of the data being 1st. August, in each case the heifers had then been drafted to the herd.

Table. No. 25

TABLE SHOWING NUMBER OF YEARLING CALVES, AND THE NUMBER OF COWS PER YEARLING CALF, ON EACH OF THE NINE FARMS IN THE TE AAMUTU DISTRICT.

Farm No.	No. Cows.	No. Yrlgs.	Yrlgs. to Cows.	Cows to Yrlgs.
1	110	24	.22	4.6
2	76	19	.25	4.0
3	57	22	.38	2.6
4	47	9	.19	5.2
5	50	14	.33	3
6	52	11	.22	4.6
7	46	12	.26	3.8
8	50	6	.12	8.3
9	25	6	.24	4.2
	Group Average		.24	4.2

The figures given above represent the average of the two years, and are roughly in agreement with the figures from the wider investigation.

Farm No.3 was rearing young stock for sale,; No.5. was endeavouring to naturally increase his herd; while No.8 was relatively overstocked with cows. With those exceptions the ratio of yearlings to cows in this group was practically identical with that in the larger investigation

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NOTE. The general problem of herd replacement and herd increase will be discussed in Chap.

BULLS. No details were collected as to bulls carried in relation to dairy cows, but the Official Statistics show a relation of one bull of two years and over to 28·3 dairy cows, or 3·5 bulls per 100 cows, over the whole of New Zealand. In the Auckland land district, which includes the Waikato area, the relationship is one bull to 30·2 cows or 3·3 bulls per 100 cows. (1).

THE FOLLOWING TABLE SHOWS THE BULLS CARRIED ON THE NINE TE AWAMUTU DAIRY FARMS.

BULLS

Table showing bulls (a). over two years old, and (b) bulls under two years old on the nine Te Awamutu dairy farms.

Farm No.	Bulls over two	Bulls under two	Cows per bull over two	Cows per bull under two	Bulls per 100 Cows over two	Bulls per 100 Cows under two
1.	3		37		2·7	
2	2·5	5	30·4	152	3·3	·7
3	1	1	57	57	1·8	1·8
4	1		47		2·1	
5	1·5		33·3		3	
6	1		52		1·9	
7	1		46		2·2	
8	1	1	50	50	2	2
9	1		25		4	
	Group average.		39·5		2·5	
	Average of 5 farms from 80 - 101 acres		46·5		2·1	

It is suggested that the most representative relationship is one bull to between 40 and 50 cows, and that the Official Statistics, because they include bulls held by pedigree breeders for stud purposes and for sale are not adequate to give a picture of the representative dairy farms. For the same reason it is suggested that Fawcett's figures of 3·5 bulls per 100 cows, derived apparently from the same source, is an overstatement.

(1). see agricultural and pastoral statistics 1929/30 page 3d.

No deduction as to young bulls can be made from the foregoing table as there was no policy in regard to young bulls on the farms, and consequently the sample is too small to suggest any relationship.

Fawcett's figure of one young bull to two fully grown animals is probably correct for the whole field including pedigree breeders, but it is not typical of the dairy farmer proper.

OTHER BEEF CATTLE. On the farms investigated it is broadly true to say that there were no other cattle carried. The total other cattle carried on all the farms investigated was 868 or less that one per farm on an average. The following table shows the totals of all cattle and dairy cows in January 1930 in certain selected dairy Counties in the Waikato.

Table. No. 27 TOTAL CATTLE

Table showing (a) Total all cattle
(b) Total dairy cows (included in (a))

County	All Cattle	Dairy Cows
Waikato	98862	52753
Waipa	97100	53490
Hauraki Plains	46676	29029
Piako	112304	68137
	354942	204408

All "cattle" are to "dairy cattle" as 173 to 100.

All cattle include bulls, heifer and bull calves, and rising two year old heifers and bulls, which from a previous discussion we saw to total between 45% and 48% of dairy cows. This would leave the total of all other beef cattle at about say 25% of dairy cows or 17% of all dairy animals.

While not absolutely unimportant, cattle farming is relatively unimportant in the Waikato, as may be seen from the fact that in the Waipa county there were 863 dairy farms and only 31 cattle fattening farms in 1927. (1.

(1). Smallfield op.cit. pp 56 and 66.

It sums up the position to say that the dairy farmer does not keep other than dairy animals.

SHEEP. There has been a steady tendency apparent of late years for dairy farmers to carry some sheep for fattening although there has been a considerable amount of educational work, in the nature of showing that in scientific rotational grazing, sheep are valuable for cleaning paddocks after the cows have eaten all they can get, thus causing a steady, even, growth of grass, subsequently, the sheep forming a source of additional revenue at little extra cost.

Old sheep are drafted from the sheep runs of the Highlands in the centre of the North Island, and from the runs from the East Coast about January of each year. They are bought in by the farmers of the plains, where the more succulent grass enables them to thrive although too old for the hills. They bear a lamb in the following Spring and then the lambs are sold as fat. The sheep are also sold.

The practice of carrying some sheep on dairy farms has been growing of later years. It should be noted that this discussion concerns only sheep on dairy farms, but as has been pointed out in Chap. 4. Part I there is a fairly well defined area devoted to sheep farming. The following table includes only farms which are obviously dairy farms, and omits those where dairying is subordinated to sheep farming.

One probable explanation of the large maximum number of sheep carried is, that about from January 1931, the price of sheep fell very low, good ewes bringing only five or six shillings per head. Consequently there has probably been some speculation in sheep in an endeavour to counteract the low prices of butterfat, and again, farmers may have kept their lambs, not desiring to sell at low prices. On the other hand farmers might have taken advantage of the low prices ruling, to purchase sheep for the purpose of rotational grazing as noted above.

Table No. 28

SHEEP

TABLE SHOWING NUMBER OF SHEEP CARRIED DURING THE SEASON 1930/31 ON FARMS

CLASSIFIED ACCORDING TO ACREAGE.

Acreage.	No. of farms investigated.	No. of farms with sheep.	% carrying sheep.	Sheep pr. ac. max.	Sheep pr. ac. min.	Sheep pr. ac. sold.	Avge. sheep to cows. max.	Avge. sheep to cows. min.	Avge. sheep to cows. sold.
- - 19	2	-	-	-	-	-	-	-	-
20 - 29	15	-	-	-	-	-	-	-	-
30 - 39	18	-	-	-	-	-	-	-	-
40 - 49	45	11	24	.8	-	.2	1.4	-	.4
50 - 59	88	29	33	.6	.1	.3	1.0	.1	.6
60 - 69	69	19	28	.6	.2	.2	1.0	.4	.3
70 - 79	71	24	34	.6	.1	.2	1.0	.2	.3
80 - 89	83	19	23	.4	.3	.0	.8	.5	.0
90 - 99	71	34	48	.5	.1	.2	10	2	3
100 - 109	129	51	39	.6	.2	.2	1.2	.5	.5
110 - 119	30	11	37	.4	.1	.1	.8	.2	.2
120 - 129	56	22	36	.6	.3	.1	1.2	.5	.3
130 - 139	42	21	50	.7	.3	.3	1.4	.6	.5
140 - 149	38	20	53	.5	.1	.1	1.1	.3	.4
150 - 159	56	21	38	.5	.1	.1	1.1	.2	.3
160 - 169	20	16	35	.4	.1	.1	.7	.2	.3
170 - 179	13	7	54	.4	.0	.1	.7	.1	.2
180 - 189	17	9	55	.3	.1	.0	.7	.4	.1
190 - 199	10	6	60	.5	.2	.1	1.3	.4	.5
200 - 209	22	12	48	.6	.2	.1	1.3	.5	.3
210 - 219	4	4	100	.8	.6	.3	.2	.2	.1
220 - 229	6	5	83	.8	.5	.1	.2	.1	-
230 - 239	3	3	100	.4	.1	.1	1	.3	.2
240 - 249	4	4	100	.2	.0	-	.4	.1	.0
250 259	4	2	50	.1	.1	.1	.4	.3	.2
260 - 269	2	1	50	.0	-	-	.2	.0	.0
270 - 279	1	0	-	-	-	-	-	-	-
280 - 289	6	3	50	.8	.7	.2	3	3	1
290 - 299)									
300 - 399)	Details not reliable.								
400 - 499))									
500)									

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As a consequence it is suggested that the sheep carried as shown by this return, are greater in number than has previously been the case, but whether it is a permanent move or not, can not be said at present.

The only deduction of any value from the table above appears to be that the percentage of farms carrying sheep increases as the size of the farm increases. This is particularly noticeable after 130 acres is reached, at which size the average herd is 65 cows.
Farmers endeavour to avoid (a). the necessity of hiring more labor, and (b).diminishing returns to management, by increasing the number of sheep relative to cattle. However this is merely ventured as an opinion.

In farms which are definitely dairying - say from 40 to 179 acres -there are 58% carrying sheep.
In these cases the mean sheep to the acre was .9.
The nine farms investigated in the Te Awamutu district area carried no sheep in the 1929/30 season.

PIGS. Pig raising is the most important subsidiary Industry to dairy farming. In a few very isolated instances Pig Farms are kept but in those cases there is generally an arrangement for the supply of buttermilk from a factory to be available.

Pig raising is subsidiary to dairying, and forms an efficient way in which to use what would otherwise be the waste products of skim milk in the case where cream is supplied to the factory; or of whey, when whole milk is supplied for cheese making. In the first case where cream is supplied, the developement of home separation has resulted in large supplies of skim milk being available on the farm, night and morning, without any expense of carting from the factory such as is present in the case of whey from a cheese factory.

The association of pig raising with dairying is indicated in the following table.

Table No. 29

TABLE SHOWING DAIRY COWS AND PIGS.
Percentage in each district of total in 1928.

	Dairy Cows per cent	Pigs per cent
North Auckland	16·36	15·45
Auckland	27·69	30·79
Taranaki	15·32	11·07
Wellington	14·65	13·31
	74·02	70·62 (1).

The next table shows the changes in the number of pigs held.

(1). Callaghan's "The pig industry in New Zealand" article in the "Bulletin" NO.17. Department of Scientific and Industrial Research.

Table No. 30 PIGS.

Table showing number of pigs per 100 Dairy cattle since 1895.

Year	Dairy Cows 000 omitted.	Pigs 000 omitted.	Ratio per 100 Dairy cows.
1895	257	240	87
1900	355	251	69
1905	498	251	48
1908 (x)	541	245	46
1920	893	267	30
1921	1005	350	35
1922	1137	384	33
1923	1249	401	32
1924	1313	414	32
1925	1325	440	34
1926	1304	472	36
1927	1303	520	40
1928	1352	587	43

(x) 1910 not available

There appears from the table to be a definite increase in pig raising over the last few years, but its permanence is probably bound up with the net returns to butterfat. If butterfat returns rise, it is probable pig raising will fall off, as pigs are kept as a source of income supplementary to dairy cows, and when the farmer is getting sufficient to live comfortably from cows, he tends to turn from pigs.

The following table gives similar figures for the four counties of Waipa, Waikato, Piako, and Hauraki Plains in 1928.

Table No. 31 DAIRY COW/PIG. RATIO 1928. (1)

County	Dairy Cows 000omitted	Pigs 000 omitted,	Pigs per 100 Dairy Cows
Waipa	500	251	50
Waikato	485	239	49
Piako	619	256	41
Hauraki Plain	222	131	59

(1) adapted from Callaghan op cit.

All these counties except Piako, are over the Dominion average, but the fact that there is a very large dried milk factory in the Piako county, from which there is no waste product, would make pig-raising suppliers of that factory less common.

The following two tables on the next page relative to the 960 farms investigated are unsatisfactory, as it is fairly obvious that a classification as "pigs" includes, "Boars, Sows, Stores, and Weaners." This defect will affect the maximum figure seriously.

The minimum figure will represent boars, sows, and stores kept over winter. The number sold will likewise be affected by weaners and stores. However with this warning, the tables will give some idea of the relative importance of pigs in the Waikato.

Broadly there are three systems of pig-raising in practice:-

1. Rearing pigs from birth till ready for slaughtering
2. Rearing pigs to be sold when weaned as "weaners". to others who buy them for fattening.
3. Buying in weaners for fattening.

Table No. 32 TABLE SHOWING (a) NUMBER OF FARMS WITH PIGS, and (b) NUMBER OF PIGS PER 100 COWS, IN FARMS IN FARMS GROUPED ACCORDING TO ACREAGE.

Acreage.	No. of Farms with pigs.	No. of farms investigated.	% farms carrying pigs.	avge. no. of cows	Average Pigs. maximum.	Average Pigs. minimum.	Average Pigs. sold.	Pigs to cows. maximum.	Pigs to cows. minimum.	Pigs to cows. sold.
- 19	1	2	50	6	1	1	-	.2	.2	-
20 - 29	14	15	93	17	8	2	8	.4	.1	.4
30 - 39	8	18	44	17	12	2	14	.7	.1	.8
40 - 49	30	45	67	23	18	41	17	.7	.2	.7
50 - 59	59	88	67	29	20	6	27	.7	.2	.9
60 - 69	55	69	80	33	24	7	32	.7	.2	.9
70 - 79	50	73	69	42	34	8	35	.8	.2	.9
80 - 89	61	83	73	41	26	7	23	.6	.2	.6
90 - 99	56	72	77	49	38	11	38	.7	.2	.9
100 - 109	93	130	71	52	31	10	31	.6	.2	.6
110 - 119	24	30	80	56	48	18	46	.9	.3	.8
120 - 129	43	58	74	57	33	11	29	.6	.2	.5
130 - 139	31	44	70	65	40	14	35	.6	.2	.5
140 - 149	30	39	77	65	43	14	40	.6	.2	.6
150 - 159	46	56	82	60	39	14	30	.6	.2	.5
160 - 169	16	24	67	71	40	14	41	.6	.2	.7
170 - 179	13	16	81	90	56	25	49	.6	.3	.6
180 - 189	17	19	90	78	55	18	48	.7.	.2	.6
190 - 199	9	11	82	72	40	11	31	.6	.1	.4
200 - 209	17	25	68	86	57	20	47	.7	.2	.6
210 - 219	5	5	100	79	41	13	42	.5	.2	.5
220 - 229	6	6	100	93	65	26	52	.7	.3	.6
230 - 239	3	3	100	98	73	23	54	.8	.2	.5
240 - 249	4	6	67	103	52	17	29	.5	.2	.3
250 - 259	4.	5	80	90	64	18	57	.7	.2	.6
260 - 269	5	3	100	86	49	18	28	.6	.2	.4

Contd.

TABLE CONTINUED.

Acreage.	No.of farms with pigs.	No.of farms investigated.	% farms carrying pigs.	Average no.of cows.	Average Pigs.			Pigs to cows.		
					maximum.	minimum.	sold.	maximum.	minimum.	sold.
270 - 279	-	1	-	-	-	-	-	-	-	-
280 - 289	4	6	67	89	54	11	52	.5	.1	.6
290 - 299	-	-	-	-	-	-	-	-	-	-
300	16	20	80	111	64	22	51	.6	.2	.5

Table. No. 33

TABLE SHOWING NUMBER OF FARMS WITH PIGS, NUMBER OF PIGS TO 100 DAIRY COWS ON FARMS GROUPED ACCORDING TO SIZE OF HERD.

))))

Size of herd.	No. of farms with pigs.	Total farms.	% carrying pigs	Average cows.	Average Pigs.			Pigs to cows.		
					Maximum.	minimum.	sold.	maximum.	minimum.	sold.
- 10	1.	4	25	6	2	2	2	.2	.2	.2
11 - 20	31	46	67	18	11	2	1	.5	.2	.5
21 - 30	92	135	68	24	21	6	19	.9	.2	.8
31 - 40	128	171	75	36	24	7	26	.7	.2	.7
41 - 50	146	170	86	46	28	8	26	.6	.2	.6
51 - 60	109	121	77	56	36	12	34	.6	.2	.6
61 - 70	70	90	78	65	44	13	42	.7	.2	.7
71 - 80	56	73	77	74	55	17	40	.6	.2	.5
81 - 90	45	58	74	86	63	24	52	.7	.3	.6
91 - 100	18	26	69	95	50	14	40	.5	.1	.4
101 - 110	19	28	68	106	69	26	64	.6	.2	.6
111 - 120	11	14	79	116	93	34	77	.8	.3	.7
121 - 130	2	4	50	125	90	17	75	.7	.1	.6
131 - 140	1	1	100	132	100	30	71	.8	.2	.5
141 - 150	-	-	-	-	-	-	-	-	-	-
151 - 160	2	4	50	158	155	30	170	.5	.1	.5
161 - 170	1	1	100	170	70	30	40	.4	.2	.2

Both tables illustrate the same points which may be enumerated as follows:-

(1). As the size of the farm and the size of the herd increases, so does the percentage of farms carrying pigs increase. This is probably related to the larger supplies of waste products available.

(2). As the size of the farm and the size of the herd increases, the number of pigs per farm and per ~~head~~ cow. tend to increase.

(3). The average maximum pigs per cow on farms classified according to acreage is fairly stable, indicating a fairly definite relation of available skim milk to pigs carried. ·6 pigs per cow seems a fairly general maximum. The minimum of ·2 pigs per cow is also stable, and represents not only breeding stock, but also the stock carried over the Winter. The number sold per cow shows a steady falling off as the size of the farm increases indicating a more intensive farming on the smaller areas from say 30 to 99 acres.

(4). In The average maximum and average sold pigs per cow in farms grouped according to the size of herd, the group 21 to 30 cows shows a large maximum of ·) pigs per cow, the farmers here probably endeavouring to augment their income from pigs. Over the remainder of the table the variations are fairly small, indicating that there is probably a direct connection between cows or rather cow bye-products, and the number of pigs carried.

The following table relative to the nine farms, gives the form of pig raising on these farms. Farms which bought weaners, were obviously farms which fattened stock. Farm No.1. which sold weaners, also sold fattened pigs. This farm, as well as farms Nos. 2, 4, 5, and 6, raised their own pigs for fattening. The others practically all bought weaners, and fattened them from the skim milk during the ~~first~~ flush. of the season.

Table No 34

PIGS BOUGHT AND SOLD.

Pigs bought and sold on the nine farms 1929/30 indicating the class.

Farm No.	BOUGHT Weaners	Stores	SOLD Weaners	Fat.
1	—	—	40	44
2	—	—	—	26
3	20	—	—	27
4	—	—	6	44
5	—	—	—	35
6	14	—	—	19
7	22	—	—	29
8	—	2	—	19
9	14	—	6	15

NOTE. Stores, are older pigs bought for fattening

It will be seen that four farms did not rear their own pigs. Four reared and fattened their own pigs, while one farm reared and fattened his own pigs as well as selling weaners.

As stated above no information is available from the investigations conducted by the writer as to Sows and Boars, but the following table adapted from Parcett in " Some Economic Factors controlling Butterfat production in New Zealand " page 70, shows the relations of sows to slaughterings.

Table No 35 TABLE SHOWING SLAUGHTERING OF PIGS PER SOW.

1921/22	5·12
1922/23	5·65
1923/24	5·76
1924/25	7·22
1925/26	6·45
1926/27	6·46
1927/28	6·05
1928/29	6·99
1929/30	8·87

Even allowing for the fact that the heavy 1929/30 figure was accounted for by extra heavy slaughterings, and that that figure will not be maintained, the steady increase of slaughterings per sow together with the very marked

increase in total pigs and of pigs per sow (vide table 30) suggests that a marked upward movements in pig raising is in progress. (1).

It will be seen that the average carrying of pigs is very small relative to that of Denmark, where upward of 246 pigs per 100 cows are carried, being over six times the number carried per 100 cows in New Zealand.

The reasons are fairly obvious. First, the fact that pigs are not pleasant to deal with on account of dirt and mud. Secondly, skim milk alone, and particularly whey alone is not sufficient for fattening. Concentrates have to be used, and these are costly. Grain feeds are very high on account of tariffs, and high transportation charges. (2).

Consequently though a much higher production of pigs is possible, there are certain psychological and political difficulties to overcome. It should be noted that as pointed out in Chap 4 Part II supplementary root crops are seldom grown. It is of interest that such root crops as were returned in the questionnaires were generally stated to be for pigs. However root crops are an exception largely on account of the labor requirement, and this again militates against pig raising. Danish pig raising is closely associated with root crops for feeding.

Pigs, except when they are being finally fattened, are usually allowed to graze in small paddocks in which open sties are kept. Pigs being fattened are usually kept in sties. Skim milk is fed at least twice a day being conveyed to the sties by means of the skim milk pump (vide Chap 4 Part II) .

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(1). vide Callaghan op cit.
(2). see Fawcett op cit. loc cit.

The general relation of pigs to returns is discussed in Chap. 4. Part IV

In conclusion it is evident that pig raising has not been exploited to its fullest capacity, and lower prices for butterfat are tending to encourage pig raising as a means of supplementing financial returns.

POULTRY.

Another minor subsidiary industry is that of poultry keeping, which while not of great financial importance is found in practically every farm in the whole district.

The poultry are usually under the control of the housewife, surplus eggs over the domestic needs being sold to the local grocer. There is little real scientific tending of fowls, and the number of poultry kept is usually not sufficient to warrant the expense of effective pens.

The following details taken from the Census Statistics of 1926, vol XVI. show the position in New Zealand as a whole, and in the four undermentioned counties in the Waikato.

Table No 36

POULTRY.

Table showing number of poultry held by households in 1926.

Area.	No. of Households keeping poultry.	Total no. of poultry:	Fowls	Ducks	Geese	Turkeys
New Zld.	158856	3781145	3308384	352030	13879	76852
Waikato	1500	40350	32255	6131	294	1670
Waipa	1423	35193	28222	2763	435	1773
Piako	1209	29687	22753	4218	276	2440
Hauraki Plains	617	16447	11546	3696	107	1098
			94776	16808	1112	6981

The above table shows that in New Zealand there are approximately 24 poultry to each household keeping poultry, and 26 on the average of the four Waikato counties.

The percentage distribution of the various types is shown in the following table.

Table No. 37

TABLE SHOWING PERCENTAGE DISTRIBUTION OF VARIOUS TYPES OF POULTRY IN COUNTIES OF WAIKATO, WAIPA PIAKO AND HAURAKI PRAINS

Type of poultry.	Percentage.
Fowls	78
Ducks	15
Geese	1
Turkeys	6
Total	100

The predominance of fowls is marked in the above table. The next table shows the size of the flocks of fowls in the counties of the Waikato.

Table No. 38

SIZE OF FLOCKS.

Table showing size of flocks of fowls in the counties of Waikato, Waipa, Piako, and Hauraki Plains

Size of flock.	No. of cases.	Percentage.
12	1234	28
12 - 24	2277	49
25 - 49	944	20
50 - 74	138	3
75 - 99	19	0
101 - 149	14	0
150 - 199	5	0
200 - 299	7	0
201 - 299	1	0
400 - 499	-	-
500 - 749	-	-
750 - 999	1	0
1000 -	-	-
Total	4632	

Average size of flocks 19.9

The importance of this table is to show the predominance of the small flock. It emphasises the point that poultry keeping is on a small scale and very subsidiary to dairying.

Part II. Chapter III

Layout of Farms

LAYOUT OF FARMS.

As a general principle it can be said that efficient pasture management consists of the most effective use of the greatest possible growth of grass. As a consequence three factors are important in connection with the utilisation of pastures.

(1). Type of cover.
(2). Fertilising.
(3). Size of paddocks.

The general question of fertilising will be discussed at length in Chap 6 Part III, and the present section will give a description of the type of cover and a general discussion of the size of paddocks.

Cover.

" Grassland farming ", as it is called, is almost universal in the Waikato area. Permanent pastures are laid down and maintained in condition by regular fertilising mowing, and harrowing. In passing it should be noticed that ~~quite apart from grassland farming~~, the Waikato soils produce a growth of grass so poor if fertilisers are not used, even if the pastures are frequently renewed, that dairying is impossible. The most common type of cover laid down as a permanent ~~ley~~ pasture. consists of a mixture in which perennial rye grass and white clover predominate although wide variations are evident.

Paddocks

With a given grass growth there is obviously an optimum size of paddocks which will provide ample feed for the cattle, and at the same time will enable the greatest use to be made of a given area. If that optimum size is obtained, there is also of necessity the maximum growing period left to the remaining area. Hence with the advent of greater manuring, and the consequent stimulation of grass growth the optimum size of paddocks for any given herd tended to be smaller, and it is generally admitted today that a paddock of five acres under proper management should provide feed for a herd of at least 40 to 50 cows for three or four feeds.

The contrast between the old method and the more modern, is very sharp.

The use of large paddocks, grazed in haphazard fashion, is much less efficient than small paddocks and the rotational grazing which these small paddocks involve.

This latter feature has received a considerable amount of attention of late, but in reality it is a necessary consequence of small paddocks if the maximum advantage is to be taken of the grass growth. In some cases the principle is carried ever further, in that the paddocks are lightly manured and/or harrowed, at very frequent intervals.

With the smaller paddocks, the problem of the layout of the paddocks to prevent unnecessary delay in yarding and paddocking the herd is important. The plan on the next page of one of the farms in the Te Awamutu group indicates a frequent method of attacking the problem.

It will be noted that the cows come out of the milking sheds straight into the centre race. The gate into the paddock to be grazed is left open when the cows are brought in, and hence the cows find their own way down with a minimum of trouble. This plan is not, as yet, very common, but the more progressive farmers are so organising as opportunity permits. As an indication of this movement it is worth noting that though the farm instanced above was the only one so laid out, at the beginning of the year's investigation, two others commenced such reorganisation during the year.

Belshaw, in the work quoted above which was written in 1919, states, " The most common size of field is less than five acres." (1). Such statements have been very widely made since, and there is a general impression that such is the case. The following table shows the results of an investigation into the size of paddocks.

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(1). Belshaw, op cit. page 53.

Plan. No 1

Plan of a well-laid out Farm with centre race.

(Farm No. 8. Te Hiawatu group.

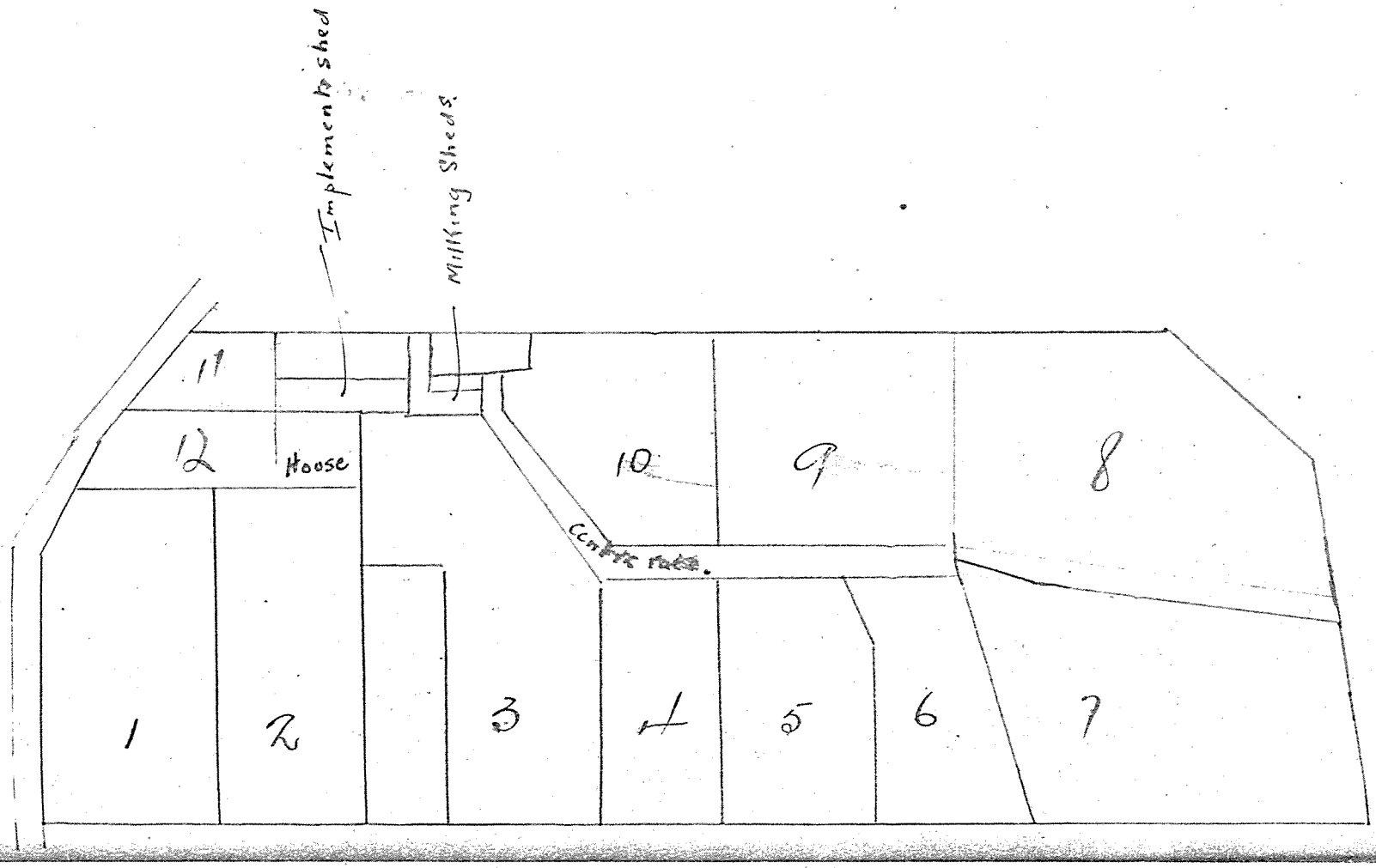

TABLE SHOWING THE NUMBER OF PADDOCKS OF EACH SIZE IN FARMS GROUPED ACCORDING TO ACREAGE.

Acreage.	No.of farms.	Avge. total no.of padd-ocks.	Average number of paddocks in acres.					Average size of paddocks.	% of paddocks of various sizes.				
			5.	6-10.	11-15.	16-20.	over 20.		5.	6-10.	11-15.	16-20.	over20.
- 19	2	7	7	-	-	-	-	2.1	100	-	-	-	-
20 - 29	15	7.9	3.4	4.5	.1	-	-	3.2	43	56	1	-	-
30 - 39	17	8.5	6.4	1.9	.1	.1	-	3.9	75	23	1	1	-
40 - 49	40	10.2	6.2	3.8	.2	-	-	4.2	60	37	2	-	1
50 - 59	71	10.2	5.2	4.5	.3	.1	.1	5.0	51	45	3	-	1
60 - 69	59	10.6	1.7	8.0	.6	.2	.1	6.0	16	75	6	2	1
70 - 79	61	11.8	2.2	8.6	.8	.2	.0	6.2	18	73	7	2	-
80 - 89	71	11.9	2.3	7.7	1.6	.2	.1	7.0	20	65	13	1	1
90 - 99	65	12.2	2.4	7.4	1.7	.4	.3	7.9	20	62	13	3	2
100 - 109	97	13.1	1.3	9.1	1.9	.4	.4	7.8	9	71	14	3	3
110 - 119	25	14.2	.6	9.6	3.2	.6	.2	8.0	4	69	22	4	1
120 - 129	46	13.7	.4	8.7	3.3	.8	.5	9.1	3	64	21	6	3
130 - 139	37	13.5	.5	7.1	3.9	1.1	.9	9.8	4	53	29	8	6
140 - 149	35	14	.5	8.2	3.6	1.1	.6	10.2	4	58	25	8	5
150 - 159	44	13.9	.2	8.1	3.3	1.3	1.0	10.8	1	60	23	9	7
160 - 169	20	16.0	.6	9.7	3.2	1.6	.9	10.1	4	61	20	10	5
170 - 179	14	15.1	-	8.7	3.6	1.7	1.1	11.5	-	55	28	11	8
180 - 189	18	14.3	.1	5.9	5.7	1.9	.7	12.6	1	41	40	13	6
190 - 199	10	15.9	-	5.8	7.4	2.2	.5	12	-	36	47	14	3
200 - 209	18	15.4	.4	6.4	4.8	211	1.7	13	3	41	31	14	11
210 - 219	5	14.2	.6	4.4	3.6	3.8	1.8	14.8	4	31	25	26	4
220 - 229	6	17.0	-	6.5	7.2	2.3	1	13.0	6	38	42	14	6
230 - 239	3	14.6	-	1.6	5.0	4	4	15.9	-	11	34	28	27
240 - 249	6	16.0	-	3.8	3.7	4	4.5	15.1	-	24	23	25	28
250 -259	5	16.6	-	9	3.6	2.6	1.4	15.1	-	54	22	15	9
260 - 269	3	19	-	7.7	4.7	4.3	.3	13.8		44	25	23	12
270 - 279	-	-	-	-	-	-	-	-		-	-	-	-

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TABLE CONTINUED.

Acreage.	No.of farms.	Avge. total no.cf paddocks.	Average number of paddocks in acres. 5.	6-10.	11-15.	16-20.	over 20.	Average size of paddock.	% of paddocks of various sizes. 5.	6-10.	11-15.	16-20.	over 20
280 - 289	6	16	-	5.8	4.3	3.6	2.3	16.5	-	37	27	22	14
290 -299	-	-	-	-	-	-	-	-	-	-	-	-	-
300 - 399	15	21.1	-	7.3	3.3	3.7	4.8	15.3	-	44	16	18	22
400 - 499	2	16	-	2.5	3.5	3	7	27.5	-	16	22	19	43
500 - 599	1	17	1	1.2	2	-	2	31.8	1	70	12	-	12
over 600	1	16	-	5	1.1	-	1	37.5	-	32	63	-	5

The general conclusions from this table, are that the farms of up to 60 acres, have paddocks under five acres predominating . Thereafter the majority of the paddocks are of acreage from five to nine acres, and this is particularly noticeable up to 180 acres.
The result is in harmony with that noted earlier in relation to carrying capacity, namely, thatvfarms of smaller acreages were, in general, more intensively farmed.

Another interesting feature of the table is the steady and regular growth in the average size of the paddock as the size of the farm increases. While reflecting the point made at the end of the previous papagraph, it probably also is in some way connected with the question of the finance of the greater subdivision of pastures.

The following table shows the distribution of paddocks on the nine farms in the Te Awamutu area.

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Table No. 20

TABLE SHOWING THE DISTRIBUTION OF PADDOCKS IN THE NINE TE AWAMUTU FARMS.

Farm. No.	Acreage.	Total no.of paddocks.	Paddocks in area.					Avge. area of paddocks.	% of paddocks.				
			6 - 5	6-10.	11-15.	16-20.	Over 20.		0-5.	6.10.	11-15.	16-20.	over20
1.	299	16	-	4	5	5	2	18.8	-	25	31.5	31.5	12.5
2.	208	19	3	10	2	-	4	11.0	16	53	11	-	20
3.	107	19	11	8	-	-	-	5.6	58	42	-	-	-
4.	101	11	3	6	2	-	-	9.2	27	55	18	--	-
5.	101	14	3	9	2	-	-	7.2	23	64	13	-	-
6.	92	18	14	4	-	-	-	5.1	77	23	-	-	-
7.	92	12	6	5	-	1	-	8.4	50	42	-	-	8
8.	80	14	8	5	1	-	-	5.7	57	36	-	-	7
9.	67	8	4	2	1	-	1	8.4	50	25	13	-	12.

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As might be expected, there are wide individual divergencies, but the sub-group of farms from 80 to 107 acres agrees fairly closely with a similar group in the wider investigation. The arithmetic average of the size of the paddocks was 6·5 acres, the mean being 7·2 acres

The arithmetic average of the similar group in the wider investigation was 7·6 acres.

Farms 3, 6, 7, and 8, show the developement of the movement towards smaller paddocks, while farm No.1. - a rented farm - shows the other tendency.

SUMMARY. Permanent pastures with a cover consisting mainly of perennial rye and white clover, subject to frequent manuring, formthe cover of Waikato Dairy Farms. There is a tendency towards smaller paddocks, consequent on the increased efficiency of grass production, and the desire for effective grazing of all available grass. However the tendency to very small paddocks of under 5 acres is not so marked as is generally supposed.

The most frequent size of paddock is between six and ten acres.

Efficient dairying requires an adequate water supply for stock for drinking purposes, for the sheds for cleaning purposes, and for the house. Consequently practically no farms depend on rain water for supply. On the smaller farms a bore is put down, and the farm reticulated from the supply from that bore. Troughs, usually today of concrete, although formerly of wood, are made to serve two paddocks, by being placed on the boundary line.

The older system which still persists in many farms, is for the water to be raised by means of a windmill, and then to find its way by gravitation to other parts of the farm. Today there is a tendency to do away with the windmill, and to instal an electric pump which raises the water and pumps it over the farm.

In six of the Te Awamutu farms the pump was electrically driven, in three cases wind driven. In only one case where the pump was wind driven was electricity used in the sheds.

As a consequence of the above, and particularly in the case of the electrically driven pumps, the stock are better able to withstand droughts which frequently visit the area in February and March.

THE LAYOUT OF FARM BUILDINGS

THE MILKING SHEDS.

The ideal location of the milking shed in relation to the farm as a whole is such a position as to minimise distance to the paddocks and to maximise convenience in handling cream. The old system of haphazard laying out of paddocks, frequently involved the crossing of several paddocks both to and from the sheds. The following plan of an actual farm illustrates the point and gives some idea of the loss of time involved in opening and shutting gates, and redirecting the cows to the paddocks required.

See next page

In this case, to get into Paddock No. 6., four other paddocks have to be crossed. Contrast this with the plan shown on page and the advantage both as to labor, time, and grass growth will be obvious.

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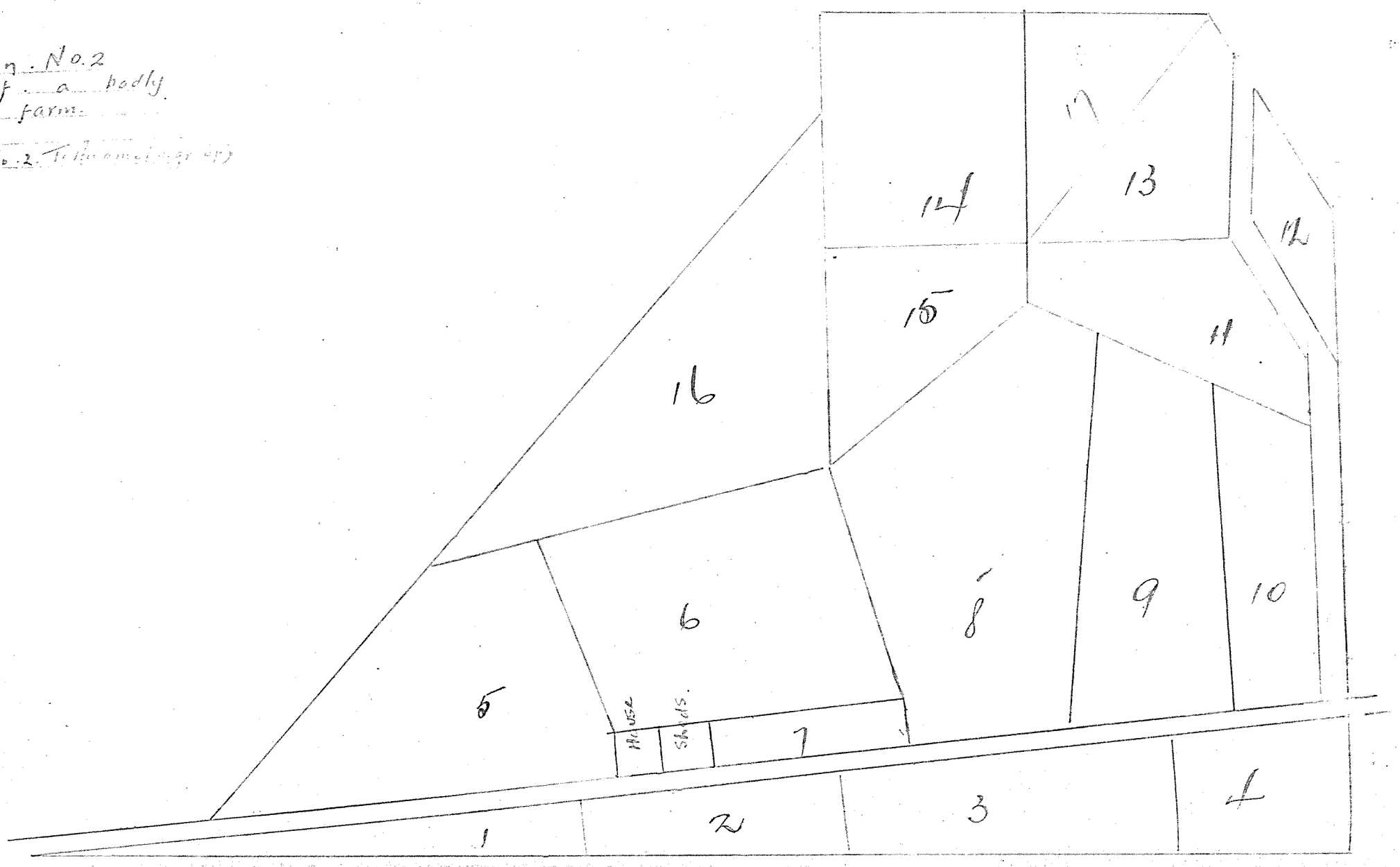
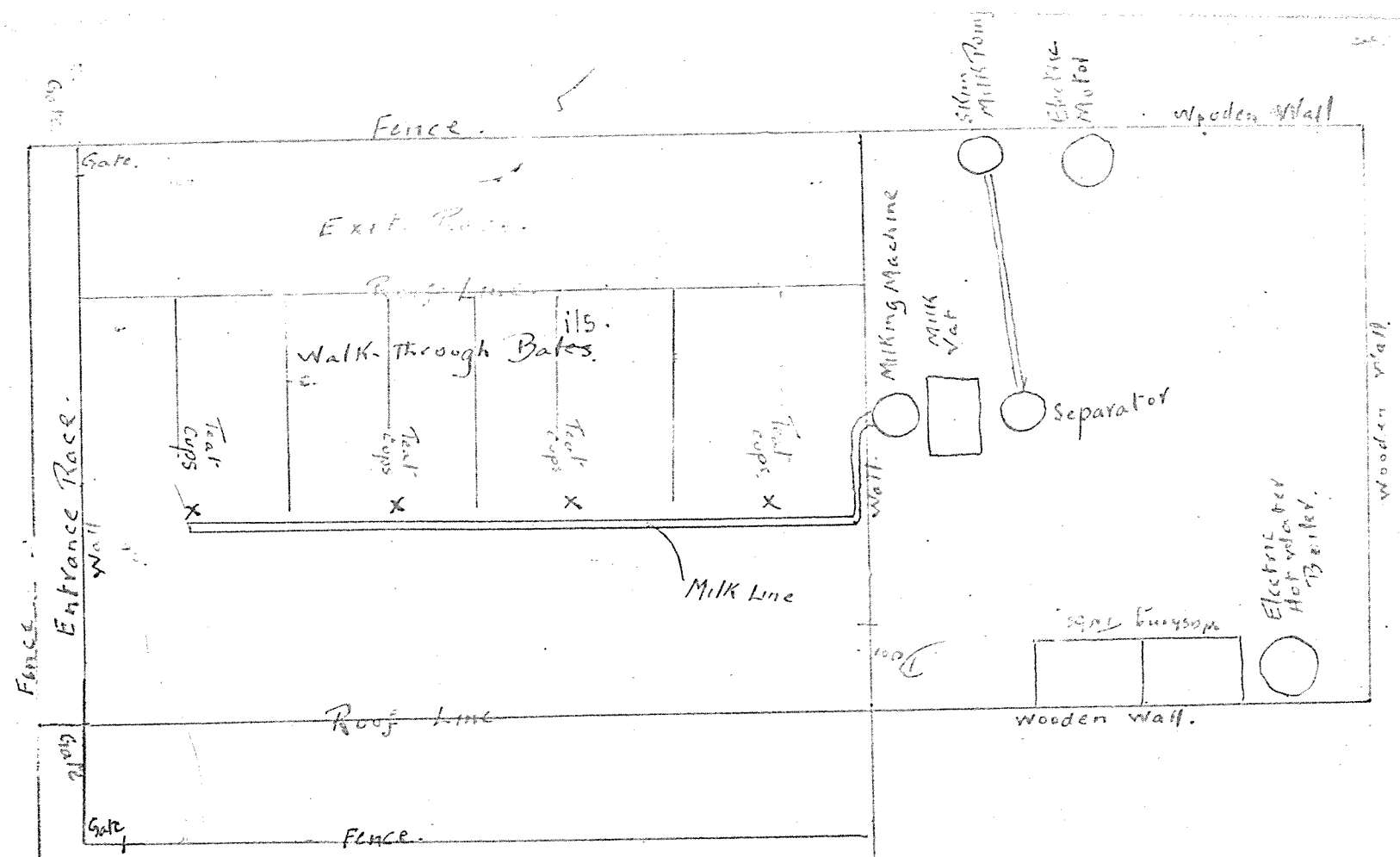
Plan. No. 2
Plan. of a badly
laid-out farm.

(Farm. No. 2. To be arranged by [illegible])





Yards.

Plan. No. 3.

Plan. of well-ordered Milking Sheds.

(Farm No 3. Te Hiwa mutu group).

The more efficient farmers ~~some~~ have not only the shed itself with concrete floor, but also the yards This avoids unpleasant conditions of mud when this is not done. Concreting is progressing very steadily, the pace being conditioned by finance.

In two of the farms in the Te Awamutu district extensive concreting of yards was in progress in 1929/30.

The farm with a herd of over 35 cows has on the average eight bales in the shed. The bales are of the " walk through " type, the door being opened in front by the cow when it is milked. This avoids confusion, and aids efficiency.

MILKING MACHINES. The milking machine is almost universal today on all farms with 20 cows or over. With a herd from 20 to about 35 cows, the plant can milk two cows at a time, but the more common type can milk four cows at a time. The usual procedure is to strip four cows, and bale and wash four ~~other~~ more cows, while the machines are milking four other cows. By this time the ~~first~~ four are probably milked, and the machines are transferred to the newly baled and washed cows. By this means, two people can handle an 8 bale shed, and at the same time can attend to the machine, separator, and skim milk pump.

Some idea of the extensiveness of the use of milking machines can be gained from the following two tables.

Table No. 11 TABLE SHOWING THE NUMBER OF MILKING MACHINES IN THE AUCKLAND LAND DISTRICT FOR THE PAST DECADE. (1)

1919	2192	1925	4600
1920	2474	1926	4976
1921	2939	1927	5313
1922	3566	1928	5758
1923	3895	1929	6149
1924	4282	1930	6490

(1) A & P. Statistics. 1919 - 1930

Table No 42

RELATION OF MILKING MACHINES TO COWS CARRIED. (1)

Table showing:- 1. Number of milking machines
2. Cows in milk on holdings employing milking machines.
3. Total dairy cows.

County.	No. of Plants.	No. Cows milked.	Total Dairy cows.
Waipa	877	46373	53490
Waikato	932	47471	52753
Piako	1046	63301	68137
Hauraki Plains	540	27825	29028
	3395	184970	203408

If from the above total of dairy cows are deducted say 3% for dry cows, it will be seen that about 94% of the total cows in the Province are milked by machine. The above figures when compared with the number of holdings in the Auckland Land district shows that, allowing one machine to each farm, there were machines on 50% of the farms in the Province.

The average capacity of each plant in the above cases is about 3·6 cows to one plant at one time, this bearing out the earlier suggestion, that the four cow plant was the most common in the Waikato area. In the nine farms in the Te Awamutu area, eight had 4 cow plants, and one a 2 cow plant.

The milk is conveyed by the milking machine to a vat which feeds a separator driven off the same shaft as the milking machine, and regulated to the correct speed. The cream is conveyed to cans, and the skim milk to a barrell, or frequently is conveyed to the pig yards by a pump driven by the same shaft.

Thus the milk is not handled from the time it leaves the cows till it reaches the cans as cream, and the pigs as skim milk. (2)

Buttermaking from home separated cream was ~~prominent~~ pioneered in the Waikato, by the Waikato Co-operative

(1) A + P. Stats 1929/30
(2) Except for "strippings"

Dairy Co. Ltd. in 1909. Prior to this date, it had been the custom to open a creamery wherever a supply from 250 cows was guaranteed. (1).

" What the home separation movement, made possible by pasteurisation and neutralisation, did at one step, was to double and treble the area which could profitable be used for dairying. Distance in a practical sense, ceased to exist. Cream could be transported 50 or even 100 miles for that matter, and still make good butter." (2).

The devopement of the industry when whole milk had to be carted to the creamery, was seriously hampered and consequently the developement of home separation has been coincident with, if not a primary cause, of the expansion of the area that could be profitably devoted to dairying.

The following table shows the number of cream separators in use in the Auckland land district, over the past ten years.

Table. No. 43

CREAM SEPARATORS. (3)

Table showing number of cream separators in the South Auckland Province in the last decade.

Year.	No.	Year.	No.
1919.....	3477	1925.....	6607
1920.....	3764	1926.....	7302
1921.....	4580	1927.....	7390
1922.....	6587	1928.....	7598
1923.....	6270	1929.....	8218
1924.....	6544	1930.....	7924

The total number of holdings of all kinds in the Auckland land district is 12885, so that the above figure for 1930 shows that, allowing one cream separator for each farm, ~~and~~ over 61% of the farms in the district have cream separators. Allowing for holdings of other kinds it is probable that if statistics were available they would show an average of atleast one separator to every Dairy farm.

The separator is usually power driven off the milking machine power unit, although hand machines are common.

(1). See "Empire Dairy Farms" N.Z. Co-op. Dairy Co. Ltd. p.12
(2). ibid Page 14.
(3) A + P Stats 1919-1930

In the nine Te Awamutu farms all had power drives separatoes except one, who supplied whole milk for cheese in the summer, and supplied cream only in the winter months. This man had a hand power machine.

The following table shows the capacity of the separators compared with the number of cows carried on each of the nine farms.

Table No. 44

TABLE SHOWING CAPACITY OF SEPARATORS IN GALLONS PER HOUR COMPARED WITH COWS CARRIED ON THE NINE TE AWAMUTU DAIRY FARMS.

Farm No.	Capacity of separator	Cows Carried.
1	90	102
2	40 (hand)	64
3	90	45
4	95	47
5	65	45
6	90	52
7	65	41
8	90	48
9	65	20

This table would suggest no relation between size of separators and size of herd.

Various Official regualtions have been issued governing conditions in the milking sheds, the chief of which aim to guarantee the purity of the milk, and the protection of the cream from contamination.

One interesting regualtion is the requirement of provision of boiling water for cleaning purposes, and the most common types of heaters are electric boilers, from which continual supplies of hot water are available for washing utensils. Six of the Te Awamutu farms have electric hot water supply.

The skim milk pump, as a means of transferring skim milk to pigs has already been mentioned. It is not by any means unusual, but very common. Six of the nine Te Awamutu farms have such a pump installed

POWER SUPPLY. In the early part of the last decade, the most prominent form of power unit was the internal combustion engine, but through the spread of electric power, the internal combustion engine is giving place to electric motors as power units.

Seven of the nine Te Awamutu farms have electric power. In at least one other case power is not available at present. The other two farms have internal combustion engines.

The following table shows the developement of electric motors in relation to stationary engines on agricultural holdings in the Auckland land district over the past decade.

Table No 15

INTERNAL COMBUSTION ENGINES AND ELECTRIC MOTORS.

Table showing the number of stationary internal combustion engines and electric motors on agricultural holdings in the Auckland land district in the past decade.

Year.	Internal Combustion.	Electric Motors.
1919	2523	—
1920	2928	—
1921	3317	47
1922	3888	181
1923	3791	706
1924	3502	1507
1925	3495	1924
1926	3316	2723
1927	3138	3325
1928	2978	3918
1929	3215	4456
1930	3256	5273.

In the counties enumerated previously the position in 1930 was as follows:-

Table No 16

TABLE SHOWING NUMBER OF INTERNAL COMBUSTION ENGINES AND ELECTRIC MOTORS IN CERTAIN SELECTED DAIRYING COUNTIES IN THE WAIKATO IN 1930.

County.	Internal Combustion.	Electric Motors.
Waikato	393	833
Waipa	279	970
Hauraki Plains	172	421
Piako	287	988
	1131	3212

This table shows in a more outstanding way the predominance of the electric motor in the dairying counties today.

(1) A & P Stats 1919/30

FARM LAYOUT.

OTHER FARM BUILDINGS.

The extent to which artificial manures are used, has rendered almost imperative the provision of some permanent store. The manure shed in general has a floor raised well off the ground to allow a free passage of air, and prevent dampness. In five of the nine Te Awamutu farms there was a specially constructed manure shed.

The implement shed is frequently open at one end, and also frequently merely a verandah on the end of another shed.

Most houses are constructed of wood, and are generally of one storey.

Part. II Chapter. IV

Farm. Machinery

FARM MACHINERY.

FARM FIELD IMPLEMENTS. On the nine farms, an endeavour was made to ascertain the length of time fields had been under the present grass cover. The average of all the fields on all the farms was seven years; but that result is not reliable because in a large number of cases the only information available was, that the paddocks had been under the present cover when the farm was taken over.

On one farm where more accurate information was available, the average of all the fields was over thirteen years, and although in this case, some of the pastures appeared to be worn out and rather rank with weed, the writer is inclined to think that this reflects on a management factor rather than that the pastures could not have been maintained for that time. In only three paddocks out of a total of 121 in all the farms, were the fields lying fallow. In the larger investigation only 34 acres out of a total of 42435 acres were fallow. The point of this discussion is to show that not only is permanent pasture practically universal, but that as a consequence there is practically no demand for ploughmen and those implements common to arable farming.

A survey of the New Zealand Herald - Auckland's daily morning paper, and the Waikato Times, shows a relatively small demand for ploughmen, and interviews with Registry Office proprietors showed that a knowledge of ploughing was seldom required from applicants for positions on dairy farms.

The point of the above discussion has been to show that field cultivation as practised in older countries, and which is still more frequent in the South Island dairying lands than in the North Island, is practically non existent, and that such cultivation as is practised is involved in maintainence of permanent pastures in an effective condition.

The term "grassland farming" is usually applied to this class of cultivation. Broadly this latter involves the distribution of fertilisers, the keeping the ground open to allow the fertilisers to penetrate to the roots of the grass, the elimination of weeds, and the conservation of growth in the flush months for feed in the months of little growth.

The whole of course, is bound up with the question of the management of the grazing by the cows.

The following table giving the implements on the nine farms in the Te Awamutu area, shows the general type of implements necessary for the above purposes of grassland farming.

Table No. 47

FIELD IMPLEMENTS.

Table showing Implements on the nine farms in the Te Awamutu District.

Cultivating Implements.	Farm No. 1.	2.	3.	4.	5.	6.	7.	8.	9.
Ploughs:-									
Single Furrow	1	1	1	1	–	1	1	1	1
Double Furrow		1							
Moulding		1							
Harrows:-									
Disc	1	1	1	1	–	1	–	–	1
Chain & Tripod	1	1	1	1	1	1	1	1	1
Swamp	1	–	–	1	–	–	–	–	–
Tine	1	1	–	–	–	–	1	1	1
Drills:-	1	1	1	1	1	1	1	1	
Haymowers	1	1	1	1	1	–	1	1	1
do Swamp	1	–	1	–	–	1	1	1	–
do Rakes	1	1	1	1	1	–	–	–	–
do Stacker.	–	–	1	–	–	–	–	1	–
Ensilage Sweep.	1	–	–	–	–	–	–	–	–
Roller.	–	1	–	–	–	–	–	–	–
Cultivator.	–	1	1	–	–	1	2	–	–
Vehicles.									
Waggon	1	1	–	1	1	–	–	–	–
Spring Cart	–	–	1	–	–	1	–	1	–
Sledge	1	2	–	1	1	1	1	–	1
Hand Cart	–	–	1	–	–	–	1	1	–
Tractor	–	–	–	–	–	–	–	–	1
Motor Truck	–	1	–	–	–	–	–	–	–

Enquiry showed that the ploughs and discs had not been used in a number of cases for several years. The case of the double furrow plough was one where the farmer was breaking in a great deal of new land.
The fertiliser is distributed by drills, similar to seed drills, which distribute it evenly and regularly. These drill can be regulated to feed out whatever quantity per acre is required.. It is then further spread by chain harrows, to which are attached tripod harrows to open the ground. Tine harrows are in very wide use for keeping the soil open and clearing the ground of weeds. The mowers, rakes, sweeps, and stackers, are used in the harvesting of grass for storage, as hay or ensilage.
The general problem of supplementary feeding is dealt with in Chap? Part II

One interesting feature is the element of co-operation which is apparent in the ownership of harvesting implements. This is complementary to the co-operation in the actual harvesting operations. Farms Nos. 3, 6, and 7, are adjacent, and it will be noticed that the hay-sweep is jointly owned by the three farmers. This practice is very wide spread, but with the growing importance of ensilage, the making of which takes a much longer time, and is not dependant on weather conditions, as is hay-making, and in which as a consequence, fewer men are employed at a time, there is a growing tendency to independent ownership because these implements are required on most of the farms about the same time.

Mowing is also occasionally done apart from harvesting to clear the ground from rough growth.

In harvesting, the grass is cut, and the hay left to mature for a day or two, raked into rows by a horse rake, and if hay, turned over at least once, to ensure an even condition; then the sweep, drawn by two or more horses proceeds down the rows automatically collecting the crop as it proceeds, ultimately depositing it at the stack without being handled by man power at all. This is obviously a vast improvement over the old method of forking into a dray. Sweeps differ in design but the principle is the same in all. The stacker is usually a crane-like machine worked by a horse which lifts the hay or ensilage on to the stack where it is spread by manual labor. This machine era in harvesting represents a great saving in labor costs at harvesting time. The labor required being confined to the driver of the sweep, the person in charge of the horse driving the stacker, one man attending to the hay at the foot of the stack, and a stacker and one or two assistants on the stack.

As a consequence of this mechanisation, a much greater amount of supplementary feed is conserved than would be possible with available labour supply, which, even now

in normal times is scarce relative to the demand at harvest times

Hay is stacked in the usual fashion.

Ensilage which is cut and stacked is conserved in three ways:- (1). In Stacks. (2). In pits (1) excavated from the side of a hill,- the advantage of this form of conservation, besides technical factors as to the quality of ensilage which are definitely superior in this form owing to the greater preservation of juices than in the stack, is that there is considerably greater ease in feeding into the pit and loading from the pit, and the dray or sledge used for distribution can draw up at the mouth of the pit and can easily be loaded.

(3). The third form is the wood or concrete silo which technically makes the best ensilage, as practically all juices are conserved.

The vehicles are not frequently used today except for manure carting, but even this ~~today~~ is being increasingly performed by motor carriers, particularly where the farms are any distance from the rail head. In 6 of the nine farms manure carting - in fact all carting -- was done by the carrier. In one other case the farmer had a motor truck. In the other two cases, the distance from the rail head was short and the carrying was done by the farmers themselves.

Practically the only use to which the waggons and spring carts were put, except as noted above, is for the distribution of hay and ensilage. However even in this case the home made sledge frequently is used.

The sledge or hand cart is used to take cream from the shed to the road gate where it is picked up by the cream carriers

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(1). See Chap? Part II for a discussion of supplementary feed.

TRACTIVE MACHINERY.

Farm tractive power may take two forms namely, tractor or horses. Because of the relatively little ploughing which is done, tractors are unimportant.

The following table shows the number of tractors in the Auckland land distract as a whole, compared with a similar figure for Canterbury – the grain growing province of New Zealand. The difference in the number of tractors reflects the difference in the types of farming.

Table No. 48 TABLE SHOWING NUMBER OF TRACTORS IN AREAS MENTIONED IN 1930.

Area.	No.
Waikato County.....	54
Waipa County.....	40
Hauraki Plains County.....	43
Piako County.....	21
Total Auckland District.....	254
Total Canterbury District.....	1625

The horse is still the usual mode of traction.

The following table shows the number of horses – all draught or light draught – carried on the nine farms.

HORSES.

Table No. 49. TABLE SHOWING NUMBER OF FARM HORSES CARRIED ON NINE FARMS IN TE AWAMUTU DISTRICT IN 1929/30.

Farm No.	Acreage.	Light Draught.	Heavy Draught.	Total
1.	299	5		5
2.	208	2	1	3
3.	107		4	4
4.	101		3	3 ✓
5.	101		2	2
6.	92	1	2	3 (a)
7.	92		2	2
8.	80		2	2
9.	67			– (x)

(x) This farm has a tractor
(Ø) This farmer informed the writer he was carrying a horse more that necessary.
(a) One horse not working.

Two draught horses are in general the maximum requirements for farm field work. In only two cases in the above group was a riding horse carried; the almost complete absence being due to the advent of the motor car.

Riding or harness horses show a steady falling off in number during the past decade.

In passing, it should be noticed that the motor car has almost completely superceded the horse conveyance.

Practically every holding has some sort of motor conveyance.

Part II Chapter. 5

Fertilising

#9120

FERTILISING.

The object of this section is to discuss the technique of fertilising rather that the relationship of fertilising to butterfat production.

Not only is adequate fertilising a prerequisitt of grassland farming as already described, but it is particularly important as far as the Waikato is concerned where the light pumice soils were definitely classed as third grade, and unfit for intensive dairying, prior to the beginning of artificial fertilising, thirty years ago.(1

The table on page 17 shows for the Auckland land (2 district an increase of cows carried per 1000 acres to be about 92% in the last ten years. This is associated with a practically stationary number of holdings, and a practically stationary average area of holdings.

That is to say, the increase is definitely associated with the greater carrying capacity, rather that with the increased acreage devoted to dairying.

In addition the following table shows the increase in the production of butterfat in the last ten years.

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(1). Smalfield, op cit. pages 36/7 states as follows:- " Previous to the advent of topdressing, pastures soon deteriorated, and after being down for four or five years they were ploughed up, the land cropped with cereal and fodder crops, and then sown down to grass again." He quotes (footnote to p.37), " The following extract from the anual report of the Department of Agriculture for 1,04 regarding the state of the pastures in the Waikato, is of interest. One of the most, if not the most. disappointing aspects of agriculture in this district is the absence of profitable permanent pastures, except on lands of the most fertile description ------ (then after dealing with the effect of phosphate fertilisers on pastures the report proceeds) ------This would lead up to the idea, that in place of the usual routine of roots, grain, and peas, for a few years, and the process again repeated, the grassland should be laid down in the best condition, and having sown the grass, conserve it with judicious topdressing.'"

(2). Table showing "Cows per 1000 acres in the Auckland Land district.

Table No 50

TABLE SHOWING THE INDEX NUMBER OF TOTAL BUTTERFAT PRODUCED, AND BUTTERFAT PER COW -- CALCULATED WITH 1913/14 SEASON ON THE BASE PERIOD SEASON 1913/14 = 100.

Season.	Total Butterfat Produced.	Butterfat per cow.
1920/21	140.9	98.5
1921/22	180.9	111.8
1922/23	205.0	115.4
1923/24	207.7	111.2
1924/25	219.1	116.3
1925/26	212. 6	114.6
1926/27	235.2	126.8
1927/28	240.2	124.8
1928/29	262.8	134.7
1929/30	290.1	139.3

Extracted from Table No.16. "Statistics of main features of Primary Industries of New Zealand ", as issued by the Economic section of the Department of Agriculture.

The above table supports the view held by most authorities, that the increase in butterfat production has been due primarily to the two factors of increased cows carried on a given area, and increased production per cow.

The following table shows the fertiliser imports into New Zealand over the same period.

Table No 51

TABLE SHOWING THE IMPORTS OF ALL ARTIFICIAL FERTILISERS IN TONS. (1).

Year.	Tons. all fert-ilisers.	Tons super and rock phosphates.	Tons all phosphates.	% all phosphates.
1920	80883	54703	79759	97
1921	142357	110939	138045	97.7
1922	72300	49096	67241	93.0
1923	99483	69591	91893	92.4
1924	135383	76772	126608	93.2
1925	174761	108173	165233	94.6
1926	167462	98008	154753	92.4
1927	257870	161156	244644	94.9
1928	254299	175577	245408	96.5
1929	324145	179094	305792	94.3
1930	267087		245604	92.0

Note. The falling off in 1930 is a reflection of the current depression. No figure for super and rock phosphates for 1930 , are available.

(1). McCaskill, " Fertilisers in New Zealand ", pp 21 & 57 and monthly abstract of Statistics, January 1931.

In 1929 over 35% of the total tonnage of manures imported into New Zealand were landed at Auckland, and by (2) the nature of the product in relation to transport, this amount would be used chiefly in the Auckland province.

Hence, although no deduction is warranted from the above taken alone, this discussion taken in conjunction with the discussion in Chap.3 Part III on the relationship between manuring and butterfatpproduction per cow and per acre does warrant the deduction that much of the increase in total production, and production per cow, is due to the increase in the use of artificial fertilisers.

The table below shows the fertilisers used on the farms in the Te Awamutu area in the 1929/30 season.

Table No. 52 TABLE SHOWING AVERAGE FERTILISERS PER CULTIVATED ACRE - ALL SUPERPHOSPHATE - USED ON THE NINE TE AWAMUTU FARMS IN THE SEASON 1929/30.

Farm No.	No. Cows per 100 acres.	cwt. per acre	Average. per Cow.	No. of times dressed per year.
1.	41	1.7	4.1	1
2.	- 51	3.0	6.0	2
3.	46	3.2	7.1	2
4.	55	5.8	10.1	2
5.	49	3.7	7.5	2
6.	56	2.2	3.8	2
7.	44	1.3	3.9	1
8.	60	3.2	5.3	2
9.	35	1.4	4.0	1
	Average of group.			1.6

Note. Cultivated area exincludes swamp, ti-tree, and uncultivable land.

In an official investigation in 1926/27, the mean of the application of fertilisers per acre and per cow respectively were 2.34 cwt, and 5.8 cwt., on farms grouped according to acreage; while application on farms of from 40 - 55 cows per 100 acres agrees approximately with the above. (2)

(1). McCaskill op cit. page 62.
(2). Fawcett " Dairy Farm Management " pp. 27 & 30.

The present result, allowing for the increased application over the past few years, is in approximate accordance with the result of the official investigation.

The following tables adapted from McCaskill and brought up to date, give a broad picture of manurial practice in the Auckland district.

Table No 53 — Table showing (a) Relation of Topdressed to total area (b) Types of Fertilisers used.

	1926/7	1927/8	1928/9	1929/30
Area sown Grass & Lucerne	2096050	2149667	2235414	2211158
Area topdressed	638922	756456	886996	948043
% land topdressed	34	~~35~~	~~39~~	~~43~~
Av. weight per acre of topdressed land.	2.6	~~3.5~~ 2.7	~~3.9~~ 2.8	~~4.3~~ 2.9
% of superphosphate to total fertiliser	77	81	72	69
% of basic slag to total fertiliser	10	9	16	12
% of other fertiliser	13	10	12	19

NOTE. See McCaskill op cit for 1926/7, 1927/8. The figures for 1928/0 & 1929/30 are from the A.&.P Statistics.

The following table shows the results of the wider investigation conducted by the present writer covering the season 1930/31.

Table. No. 54

TABLE SHOWING FERTILISERS AND LIME IN CWTS. PER COW & PER ACRE ON FARMS GROUPED ACCORDIUG TO SIZE.

Acres.	Phosphate. per acre.	Phosphate. per cow.	Lime. per acre.	Lime. per cow.
- 19	2	5	2.0	5.0
20 - 29	3	5.6	1.6	2.4
30 - 39	2.4	4	2.2	3.6
40 - 49	2.6	4.6	1.8	3.0
50 - 59	2.8	5.2	1.0	1.6
60 - 69	2.8	4.8	1.8	2.4
70 - 79	2.6	4.6	1.4	2.4
80 - 89	2.6	4.8	1.4	2.6
90 - 99	2.6	5.0	1.4	2.6
100 - 109	2.6	5.0	1.2	2.4
110 - 119	2.2	4.4	1.8	3.4
120 - 129	2.2	4.6	1.0	2.0
130 - 139	2.4	5.0	1.2	2.2
140 - 149	2.2	5.2	1.6	2.6
150 - 159	2.0	5.2	.6	1.6
160 - 169	2.2	4.8	1.0	2.4
170 - 179	2.4	4.8	1.2	2.4
180 - 189	1.8	4.2	.6	1.6
190 - 199	2.2	5.4	1.0	2.2
200 - 209	1.8	4.2	1.0	2.2
210 - 219	1.2	3.6	.8	2.4
220 - 229	2.2	5.4	1.2	2.8
230 - 239	2.6	6.2	1.4	3.4
240 - 249	1.6	3.4	1.0	2.2
250 - 259	2.2	5.6	1.0	2.6
260 - 269	2.4	7.6	2.6	7.6
270 - 279	1.4	5.4	1.4	5.4
280 - 289	1.0	3.6	.4	1.8
290 - 299	-	-	-	-
300 - 399	1.8	5.0	.8	2.0
400 - 499	.4	2.0	.0	.0
500	.4	-	-	-

Table No 55

TABLE SHOWING AMOUNT OF FERTILISER IN CWTS. PER ACRE AND PER COW ON FARMS GROUPED ACCORDING TO COWS CARRIED.

Cows Carried.	Phosphate. per acre.	Phosphate. per cow.	Lime. per acre.	Lime. per cow.
- 10	1.0	3.8	.6	2.4
11 - 20	2.8	6.4	1.2	2.8
21 - 30	2.2	5.4	.8	1.0
31 - 40	2.4	5.4	1	2.6
41 - 50	2.4	5.2	.8	2.4
51 - 60	2.2	4.6	1.4	1.8
61 - 70	2.6	5.6	1.4	2.8
71 - 80	2.4	4.6	1.2	2.6
81 - 90	2.4	4.6	1.2	2.4
91 - 100	1.6	3.0	1.2	2
101 - 110	2.4	4.4	1.8	3.4
111 - 120	1.8	3.6	.6	1.6
121 - 130	2.4	4.8	1.2	2.4
131 - 140	2.0	5.0	3.0	4.6
141 - 150	-	-	-	-
151 - 160	2.8	4.8	1.2	2.0
161 - 170	1.0	1.8	.6	1.2
171 - 180	-	-	-	-

The tables showing imports of fertilisers (see p.21) and also that showing total acreage topdressed, and the application per acre in the Auckland land district, all suggest a steady increase in the acreage topdressed, and application per acre over the years 1926/7 to 1929/30, there being an increase from 34% to 43% of the total cultivated topdressed, and from 2.6 cwt. to 2.9 cwt, per acre, The tables No.53 and No.54 showing the result, of the writer's investigation covering the 1930/31 season, show a sharp decline in the applications per acre and per cow. (1).

The A. & P. statistics for 1930/31 are not yet available, but it is well known that consequent in the heavy fall in price for dairy produce experienced during the season, farmers restricted the applications of fertilisers in an attempt to cut losses. The decline in fertiliser application has caused considerable anxiety to the Government and the leaders of the dairying industry, and one of the recommendations of a dairy conference called by the Government was to the effect that credit facilities should be very liberally granted to enable normal fertilising to go on.

(1). The decline is not so great as the tables would indicate, as the information is based on phosphates alone, but even allowing phosphates as 75% of the total manure used, there is a decline.

Hence the temporary falling off will not affect the general deductions from the figures given, ~~as~~ to the increasing use of fertilisers, both as to the area covered, and the applications per unit of area.

Summing up so far it can be said that present day pasture topdressing with artificial fertiliser on Waikato dairy farms approximates 3cwt. per acre, and 6 cwt. per cow.

Types of Fertilisers used

In the above, none other than the incidental mention was made of the types of fertilisers used.

From Table No. 51 on page 121 showing imports of fertilisers in the Auckland district, the predominance of phosphatic manures, particularly superphosphates, will be apparent. Phosphates were 92% of total imports in 1930, and superphosphates represented 69% of fertilisers used in the Auckland land district.

" ——The functions of phosphates in plant life, were to stimulate root growth, and thereby enable the plant to search the ground more thoroughly for food, and to encourage the tillering of cereals and grass. ——"

"Plants treated with superphosphates are able to live on drier ground that plants not so treated." (1)

(1) Annet. D.Sc. "Lectures on Artificial Fertilisers " delivered in Hamilton pps. 16 and 17.

"The fact that most New Zealand soils are naturally low is phosphates, makes phosphate fertilising of first consideration." (2)

(2) A.H.Cockayne. "The evolution of grassland farming in N.Z." Article in the N.Z. Journal of Agriculture, April 1930. page 223.

The above quotations are given, first to show the functions of phosphates in the soil, and secondly, to show that such phosphates are deficient in New Zealand soils as a whole.

This deficiency is most marked in the Waikato area, hence the importance of phosphates ~~in this area~~ there. The light pumice soils do not hold moisture like the heavier clay soils and consequently in the dryer seasons, say from January to March, the larger root development consequent on phosphate fertilising, enables soils treated therewith, to maintain a better grass growth than soils not so treated. This of course, is in addition to the general stimulation of grass growth at all periods.

" Phosphate," to use the words of Annet again (1) ——" is still today, probably, the most important of all our manures"

(1) Annet op cit. Page 18

Superphosphate containing " soluable phosphate equivalent to 44 to 46% tricalcic phosphate " has for years been almost the sole fertiliser used, the usual application being about 3 cwt. to the acre; but the table on page 123 showing the percentage of superphosphate used over the past four seasons shows a fairly steady falling off from approximately 80% in 1926/27 and 1927/28 to approximately 70% in 1928/29, and 1929/30

The decline has been conicident with a marked increase of nitrogenous manure, the pioneering work of which was done in Germany. "Nitrogenous manures increasing the developement of leafy growth" (1)

Considerable experimental work has been done by the Department of Agriculture, but it is owing to the experimental work carried out by Dr. Annet on his own and other farms, and to his educational and propagandist work, that these manures have become prominent in the Waikato. This manure is not applied ~~solid~~ alone, but in conjunction with superphosphates.

Nitrogenous fertilisers, being relatively quick acting are used in addition to general purposes, for the stimulation of Winter and early Spring growths, as well as to increase leafage in paddocks shut up for hay and ensilage.

(1). "Spring grass production on superphosphated land can be greatly stimulated by topdressing in the inter with such a fertiliser as Sulphate of Ammonia,

(2). Dairy farmers with early calving herds, should topdress several phosphated paddocks with not less than 1 cwt. of sulphate of ammonia in June or early July, and compare the milk producing results with other grassland.

(3). Controlled, or rotational grazing, is an essential practice, wherever management conditions are directed towards an increase of herbage products." (2).

It cannot be said that nitrogenous fertilisers are at present widely used, but their use is increasing.

The most common form is sulphate of ammonia. On the nine farms in the Te Awamutu area in three cases sulphate of ammonia at the rate of 1 cwt. per acre was used on three small paddocks. It is anticipated that nitrogenous manures will be widely used in the future in conjunction with rotational

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(1). Annet op cit page 8
(2) McCaskill, op cit. p.138 quoting " Dairy Farmer" March 1929.

grazing, when the value of the short young grass is valued as a milk producing feed, ~~and appreciated as such~~ is more fully realised.

The two manures, superphosphate, and sulphate of ammonia, are the major artificial fertilisers used on farms in the Waikato area, but a reference to tables Nos. 54 & 55 and on pages and shows that liming is very prevalent. Lime cannot strictly be called a fertiliser. It is a "condition ev of the soil", and of course is necessary (1). for bone developement. The tables referred to above would suggest that in the years under review, the quantity of lime was about half that of phosphatic manures. The usual form inwwhich it is applied, is a ground limestone which is commonly mixed with super, and the two sown together. However it must be remembered that superphosphate contains its own weight of sup sulphate of lime.

On one of the nine farms, ~~one of~~ the topdressings was all lime at the rate of 3 cwt, to the acre; on another, super and lime in equal quantities, the total weight being 3 cwt. to the acre; and on a third about half the paddocks were topdressed with a mixture of 3cwt of super and 5 cwt. of lime. (2)

In summing up this sub-section it can be said that superphosphate is easily the most prominent in the Waikato area today, the anual topdressing approximating 3 cwt. per acre of all land used for dairying. This pre-eminence is due in part to the deficiency of New Zealand soils in general and of Waikato soils in particular, in phosphate.

Nitrogenous fertilisers, particularly sulphate of ammonia, are rapidly growing in importance as being supplementary to superphosphate, the object being to stimulate growth at particular periods of the year. Liming is also very prominent, and will probably grow in importance as the carrying of dairy stock increases. Lime is usually mixed superphosphate in application. Thesusual amount applied is about half that of superphosphate.

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(1). Annet. op. cit. p. 4
(2). op cit. Cockayne art cit. atates that the proportion of superphosphate to lime is as 4 to 1.

Method of Application.

The actual field implements, and the method of their use, have been indicated in the chapter on Farm Implements. It remains to discuss the periodicity of application.

Earlier practice was to concentrate application to late Winter and early Spring, but more recent developement has been to supplament this by an application in the Autumn to stimulate Winter growth.

The most recent practice has been in the direction of frequent application throughout the year, particularly of nitrogenous fertilisers just prior to periods when greater leaf growth is required. On one farm where rotational grazing is most scientifically carried out, the practice has been to give a light topdressing after the field had been grazed; the field would then be shut up for from 10 to 14 days.

On the nine farms, the annual frequency of applications is shown on table No. 52 on page 122. In these cases, six out nine farms topdressed twice a year, the remainder only once a year.

Part II Chapter VI

Supplementary Feed.

SUPPLEMENTARY FEED.

The change which " field cultivation of turnips" (1) in enabling an enormous increase in annual production, to say nothing of the increased efficiency of the cultivation of the soil, made possible in England, may be compared to the change which is at present working itself out in New Zealand as a whole, and in the Waikato in particular, in regard to the foraging of stock. New Zealand's practice was broadly that of England up to a few years ago with the exception that stalling of cattle was not necessary on account of the mildness of the weather. However root crops were very familiar for Winter months and early Spring feed.

The aim of dairy farmers today is to make the grass pastures alone the sole source of stock food. The whole problem has been bound up very closely with artificial fertilising, and the consequent stimulation of grass growth.

Rainfall in the Waikato is abundant in the Winter, Spring, and early Summer, with a tendency to dry conditions in the late Summer and early Autumn. Correlative to this phenomenon, is the grass growth, which is dormant in the Winter and early Spring, and very heavy in October, November and December,. There is therefore a far greater carrying capacity in this latter period than say in the later Summer and Winter. In fact grass growth is then much greater than can be consumed by the stock carried. Efficient field management aims at conserving surplus growth in the flush months for the months of minimum growth, and so not only maintaining the milk supply and the condition of the animals at a higher level that otherwise, but also increasing the average carrying capacity of the land.

As a further consequence of this periodicity of grass growth there is a general practice that cows should all calve so that in the period of flushness of grass growth they should also be in the flush of milk production. That is to say efficient management involves not only proper fertilising

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(1) Ernle "English Farming Past and Present"

rotational grazing, and conservation of foodstuffs for periods of relative scarcity, but also control of stock in such a way as to correlate the condition of the stock relative to lactation periods with the conditions of pasture.

This fact of the seasonal nature of grass growth shows its effect in butterfat production which is also very seasonal.

The graph on the next page shows the percentage distribution of the butterfat supplied to the New Zealand Co-op. Dairy Co. Ltd. for the season from August 1st. 1929 to July 31st. 1930. This Company has 8000 suppliers. There is also shown on the same diagram a graph of the average of the nine farms in the Te Awamutu area.

The contour of these two graphs is almost identical.

The general import of these two graphs relative to lactation periods will be discussed in chap? Part III, under Stock management, but are interpolated here to illustrate the the point as to correlation between grass growth and butterfat production. The flush months as shown by this graph are October, November, December, and January in which months over 50% of the butterfat was produced.

The following table shows the amount of green fodder, turnips and mangolds grown in the counties enumerated.

Monthly Percentage of Annual Butter Supplies

—— Average of 8000 suppliers of N.Z. Co-op Dairy.

—— Average of 9 Te Awamutu Farms.

Table No 56

SUPPLEMENTARY FODDER.

TABLE SHOWING, AREA IN ACRES, (a) GREEN FODDER, (b) TURNIPS, (c) MANGOLDS, IN THE UNDERMENTIONED COUNTIES FOR THE SEASON 1925/26 to 1929/30.

Years.	GREEN FODDER.					TURNIPS.					MANGOLDS.				
	Waikato,	Waipa,	Hauraki Plns.	Piako,	Total.	Waikato.	Waipa,	Hauraki Plns.	Piako.	Total.	Waikato.	Waipa.	Hauraki.	Piako.	Total.
1925/26	2297	3814	1031	1812	9594	4707	3816	366	6672	15661	392	438	42	291	1163
1926/27	1566	2881	967	1085	6499	4290	4115	351	6065	14821	265	488	181	245	1279
1927/28	1633	2202	475	824	5184	2643	2733	167	4671	11514	178	289	-	140	607
1928/29	1675	1729	411	729	4544	2261	3241	587	4571	10760	175	175	24	106	480
1929/30	350	310	617	151	1428	2558	2769	630	1967	7924	119	147	7	17	290

A. & P. Statistics

The striking falling off in all cases is most remarkable. The area in green fodder has fallen approximately 85%, in turnips approximately 50%, and in mangolds about 75%. This is not a mere chance result for not only do the figures show a regular and unbroken decline over the whole five years but figures for a longer period would show even a greater decline.

Contrast with ~~that~~ the above following tables showing the areas used for hay and ensilage, and the change in farming practice relative to supplementary feed will be more or less apparent.

Table No. 57

TABLE SHOWING AREA IN ACRES IN GRASSES, CLOVER, & LUCERNE, CUT FOR ENSILAGE IN THE UNDERMENTIONED COUNTIES FOR THE SEASON 1925/6 - 1929/30.

Seasons.	Grass Clover & Lucerne Waikato, Waipa, Hauraki Plains,	Piako.	Total.	Lucerne. Waikato,	Waipa,	Hauraki Plains,	Piako.	Total.
1925/26	10074 12692 3334	15337	39457					
1926/27	12508 15560 3697	17000	48855					
1927/28	10835 14444 2552	15495	47182	222	299	-	44	765
1928/29	15792 19200 4230	18950	58172	468	484	16	117	1085
1929/30	19805 24237 5857	27538	77437	244	744	18	97	1103

A. and P. Stats

While the area in root and green fodder crops have fallen off very considerably the area in hay and ensilage has risen nearly 100% over the same period as shown be the above tables.

The increase in the past two seasons is most marked and though statistical information is not available, it is known that the bulk of the increase is in ensilage. Writing in May 1925 Russell and Macklin said, " silage as a feed is quite generally neglected" (1).

Smallfield, writing in 1927 says, " grass ensilage is now being made to a limited extent." (2).

Writing in early 1930 Cockayne said " another developement that is just making itself felt -------- is the conservation of surplus herbage as ensilage." (3).

Writing in July of this year, (1931) Fawcett said, "Three years ago, silage was not made extensively, but during the past two seasons it has become the most popular form to conserve surplus grass". (4).

The general import of the above quotations is that ensilage making has developed remarkably in the very short space of time of two years, prior to which it was the exception

Today its importance in point of quantity is probably greater that that of ~~then~~ hay

An example of the developement, seen in the fact that in 1929, none of the nine Te Awamutu farms made ensilage, but all made hay. Seven of the nine made ensilage in 1930. Five of the seven made hay as well. Of the two who made no ensilage, one made hay, and the other had a surplus of hay from the last season.

The general purposes of hay and ensilage is the conservation of grass when it is in superabundance, ~~and~~ to provide feed when grass is scarce. The general reasons which have caused the change from hay to ensilage may be summed up best by giving a precis of an Official bulletin issued by the Department of Agriculture.

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1. H.L.Russell & Theodore Macklin. "Intensive dairying in N.Z. and Wisconsin. Bulletin of the Agricultural Experimental Station The University of Wisconsin, Madison.
(2). Smallfield op cit. p.47. (3) Cockayne art cit. p223.
3.Fawcett "Some economic factors controlling butterfat production in N.Z."

(1) Weather does not interfere with ensilage making as it does with hay making.

(2). Provides a means of removal of surplus grass and ensures fresh green pastures by allowing clover and fresh grass to come away, and form a dense green covering.

(3). Good succulent fodder in non-growing periods also enables a greater number of stock to be carried with a consequent relation to amount of butterfat.

(4) For feeding in dry spell in summer, for autumn, winter , and spring, silage is excellent. The yield from silage fed cows is equal to that of cows fed on green crops.

(5). Coarse grass plants, which have little value when made into hay, make very useful ensilage.

(6). Silage may be used as soon as it is saved, or properly made it may be kept for a number of years.

(7). Cows fed on silage and hay come into profit in better condition that cows fed on hay and roots or hay alone. (1).

There has been a developement in the technique of ensilage making, in that the recognition that young grass has a higher feed value that more mature grass. This has resulted in cutting earlier that previously.

The mechanical implements needed in hay and ensilage making, and their manner of use has been described in chap. 5 Part II

It remains to discuss briefly the technique as to the materials themselves.

Fields to be used for hay and ensilage are shut up as soon as the grass begins to come away in late September and early October, and generally topdressed. Ensilage is cut in November or December, and hay in December and January. Ensilage in early November, and hay from the same paddock in January is quite common. The common practice is to use the same paddock for several years, the deciding factors being the quality of the grass and the general suitability of the paddocks to harvesting operations.

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(1). Bulletin No. 146 Department of Agriculture "Ensilage on the Farm" by W.J.Deem, Director of Fields division.

Ensilage is cut green and stacked green, (as noted previously, stacks predominate),. Stacks are covered with a heavy covering of earth, to cause even settling, and to conserve the heat which enables the grass to be cured and so to form good ensilage. The temperature in the centre of the stack rises to 120 to 130 degrees farenheit, at which point thebest ensilage is made. Salt is also frequently added for the double purpose of improving the quality of the silage, and as a means of feeding salt to the stock.

At present, both hay and ensilage are used chiefly in the late Winter and early spring.

Having discussed hay and ensilage, it remains to repeat that the supplementary crops are of little importance. Turnips and mangolds are the most prominent and are used chiefly in the winter and early spring.

Green feed crops, as shown in table 56 on page 155 are used chiefly in feeding lambs for fattening. It should be noted that some of the root crops are used for pigs, and also for sheep.

SUMMARY. Dairy farmers endeavour so to manage their grass growth by rotational grazing and the conservation of surplus so as to make the grass production of the farm sufficient for the whole year without any other supplementary feed.

The ultimate aim of this proceedure is to increase the average anual carrying capacity. The economic advantage of effective utilisation of all grass growth, and so offsetting the effects of seasonal growth of grass, is very evident.

The making of ensilage, rathervthan hay, has been the most remarkable developement in the last two years.

Finally root crops are of very little importance.

Part II Chapter. VII

Labour Supply

THE LABOUR SUPPLY.

LABOUR REQUIREMENTS ON DAIRY FARMS. The mechanisation of the dairying industry, particularly in regard to milking, has been the cause of a change, not only in the requirements as to the number of labourers, but also to the qualifications and age of the labourers required.

The two major functions of the operating dairy farm may be classified into shed work and field work.

With the emergence of the milking machine, manual labour in the milking shed has been reduced to a minimum.

The actual operations consist of adjusting the teat cups to the cow, and " stripping " the cow for milk which the machine will not remove. (1).

In a four cow milking plant at least two persons are necessary in the shed itself to keep pace with the machines.

A frequent arrangement in moderate sized herds, is a youth to wash the cow's udder and teats, and fit the cups, and a man to strip. In larger herds, two or more men do the above work between them. No information was collected as to the actual labour on the farms in the Waikato other than on the nine farms mentioned. Before giving the details of those farms the following table adapted from Paton's " Dairy farm labour, and its relation to butterfat production" is of interest. The study refers mainly to Taranaki, but is broadly true of the Waikato also.

The investigation covered 816 farms.

Table No. 58 TABLE SHOWING LABOUR REQUIRED FOR DAIRY FARMS WITH HERDS OF SIZES INDICATED. (2)

Labour group male.	female	Total no. hands	average no. cows.	average cows per unit of labor
1	0	1	36.3	36.3
11	1	2	39.2	19.6
2	0	2	52.5	26.2
1	2	3	53.5	17.8
2	1	3	52.1	17.4
33	0	3	71.1	24.0
2	2	4	60.3	15.1
3	1	4	65.6	16.4
4	0	4	72.0	18.0
3	2	5	76.3	15.3

(1). "stripping" - a very important operation, because investigation has proved that the strippings are higher in "fat" content that the previous milk.
(2)Paton op cit page4.

The general conclusion from the foregoing table will be obvious, namely, that the labour supply necessary is relative to the cows milked, for in general the size of the farm varies or the number of the herd.

Fawcett's study on Dairy Farm management, a document already cited, gives some interesting statistics illustrating the relationship between butterfat production and labor utilised.

The only facts from that study which are relevant to the present section are those relative to the cows milked per labour unit where an adult male, a female adult, a child as a hired hand are each reckoned as one unit. He shows on pages 33 and 34, four tables which group farms, according to butterfat per acre, cows carried per 100 acres, butterfat per cow, and area of farms, respectively.

These tables show that the range of cows milked per unit 15 from 12.8 to 24.6. The mean is approximately 17.0 cows per man, the arithmetic average being 17.6, while 70% of the results are between 16.0 and 18.3 cows per man.

In his table No.12 page 34, where farms are grouped according to acreage, and converting labour units per 100 acres to total labour units, the following is the result :-.

Table No. 59

TABLE SHOWING IN FARMS GROUPED ACCORDING TO AREA, THE AVERAGE LABOUR AVAILABLE, AND COWS MILKED PER UNIT.

Area of farm. ACRES.	No. of farms.	Labour available.	Cows milked per unit.	Total cows milked.
200 - 249	15	3.1	24. 6	78
175 - 199	17	3.6	20. 5	74
150 - 174	10	2.8	20. 7	61
130 - 149	13	2.5	18. 3	46
110 - 129	19	2.5	16. 8	42
90 - 109	45	2.3	17. 4	40
70 - 89	37	2.0	16. 5	33
50 - 69	50	2.0	12. 8	27

NOTE. The conversions have been made on the assumption that the average area of the farms classified as above, are as in table 4 page 15, op cit., where farms are similarly classified for another purpose.

Taking into consideration (a). the difference in size of the sample - 206 in Fawcett's as against 816 in Paton's, and (b).the fact that Fawcett's investigation covered part of the Waikato, and part of Taranaki, the results agree fairly closely, particularly as Paton's tables give a fairly high percentage of females, suggesting that he enquired carefully into family help, which facts are not evident in Fawcett's results.

As the principal work of labour is relative to milking it will be of interest to summarise Fawcett's results as to the relation between labour supply and the quantity of production.

(1). " High labour utilisation is associated with high per acre production"

(2). "Labour available, drops with the number of cows carried."

(3). " High production per cow is associated with high availability of labour."

(4). "The smaller the farm, the more labour there is available"(relative to size) , and he draws the conclusion " labour is not fully exploited on the smaller family farms." (1

The points raised in Fawcett's study are of considerable importance, relative to the optimum exploitation of labour, but must be left, as the present investigator did not touch this point.

Generally from the above extracts, and from experience, the following is probably a close approximation to average conditions. Up to 40 cows the milking is done by the farmer and family help, between 40 and 60 cows, there is usually one hired labourer, in addition to the farmer and assistance from the family, in farms of over 60 cows, there are usually 2 hired labourers, the actual hired lhhourers being a man and a youth. In all cases, family help is important.

Fawcett. op cit. pages 32/35.

The figures for the nine farms in the Te Awamutu area are as follows:-

Table No. 60

TABLE SHOWING LABOUR AVAILABLE ON THE NINE FARMS.

Farm No.	Cows.	Employer.	Hired. men.	Hired. youths.	Family.	Total.
1.	102	1	-	2	-	3
2.	64	1	1	1	-	3
3.	45	1	1	-	-	2
4.	47	1	-	1	1 (a)	3
5.	45	1	-	1	-	2
6.	52	1	-	1	-	2
7.	41	1	-	1	-	2
8.	48	1	-	1	-	2
9.	20	1	-	-	-	1

(a) a boy attending school.

Broadly, the above table corresponds to the foregoing analysis. Taking the herds of farms Nos. 3 to 8, which range from 41 to 52 cows, five out of the six have one hired helper. In Farm No . 4 where there is additional help of one schoolboy, the hired helper is another youth, younger than the average, so that the two additional helpers are really only equivalent to one.

The foregoing discussion has been concerned solely with permanent labour, and has taken no account of temporary labour for harvesting etc.

~~The sheds are washed out every morning, and the machines, after every milking.~~

The average time taken over a herd of say from 40 - 50 cows, is two to three hours in the flush of the season. This includes all time occupied in milking and cleaning up, being approximately 8 minutes per cow. This was the average over the nine farms.

That is to say, by starting at 5.30 a.m. which is an average starting time, the farmer has milked, cleaned up the shed, and is ready for breakfast by about 8.30 a.m. — allowing say 20 minutes for calf feeding.

Cows are generally " got in " about 3.30 p.m. preparatory to milking at 4 p.m., so that the evening milking is over approximately at 7 p.m.

It should be stated that the above discussion relates to the period of from say September, (earlier in earlier calving herds), to the end of March. In the other months when thheherds are either drying off, or are dry, milking does not start so early in the morning, and finishes earlier at night.

It will be seen that, allowing about 45 minutes for breakfatt, one hour for dinner, and 15 minutes for afternoon tea, prior to milking, there remain practically five hours for field work. The relatively short time for field work has reacted as another factor in encouraging grassland farming. Field work broadly consists of topdressing pastures, harvesting, feeding out supplementary crops, and maintaining fences and other field assets.

GENERAL CONSTITUTION OFTHE LABOUR SUPPLY.

It has been pointed out earlier that the general structure of the industry is best described as "family farms" with a minimum of hired labour. This statement is broadly true of the whole of New Zealand, and the following information which relates generally to the whole of New Zealand, will not warrant deductions as to the conditions in the Waikato area.

The table on the next page is given to show the distribution of employees on farms throughout the last decade.

Table No. 61

FARM LABOUR SUPPLY.

TABLE SHOWING NUMBER OF PERSONS EMPLOYED ON FARMS IN THE DOMINION FOR ALL OCCUPIED HOLDINGS OF ONE ACRE OR MORE, INCLUDING BOROUGHS, MAORI LAND HELD UNDER COMMUNAL SYSTEM & UNOCCUPIED CROWN LAND.

Season.	Principally Agricultural.		Principally Dairying.		Principally Pastoral.		Total.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
1919/20	12806	3384	37263	18423	49616	10784	99685	32564
1920/21	14561	3144	42043	18908	44960	9853	101355	31905
1921/22	15114	3295	47298	21363	39427	8898	101839	33556
1922/23	14823	3394	53230	25335	39897	9502	107950	38430
1923/24	12047	2785	53540	24605	41351	10830	106938	38220
1924/25	11298	2577	52606	24370	41297	10494	105301	37441
1925/26	11265	2428	50576	22794	40930	9458	102771	34680
1926/27	11330	2143	49713	20088	41292	8333	102335	30461
1927/28	12615	1289	53539	17034	40495	4509	106649	22832
1928/29	12427	1721	56825	17861	45633	6142	112885	25724
1929/30 (x)	-	-	-	-	-	-	119321	18800

(x) Details not available, Official Year Book 1931, page.422.

The method of tabulation was altered in 1930, hence details are not available for that year.

However the general position in the last 10 years is fairly apparent, in that approximately 50% of the males have been employed in dairying, while in regard to females, although there has been a fall in the absolute number engaged, and the number relative to males, the fall in dairying has been less than in the other rural ~~districts~~ industries.

The following table shows a similar classification for the Auckland land ~~districts~~ district industries.

Table No 62

TABLE SHOWING FOR THE AUCKLAND LAND DISTRICT THE NUMBER OF PERSONS ORDINARILY EMPLOYED ON HOLDINGS OF ONE ACRE OR OVER.

Seasons.	Agricultural.		Dairying.		Pastoral & others.		Total.	
	males.	females.	males.	females.	males.	females.	males.	females.
1925/26.	328	33	12974	5258	3173	453	16475	5741
1926/27.	490	60	13345	4816	3291	512	17126	5388
1927/28.	1001	116	14483	4430	3224	231	18708	4777
1928/29.	1045	108	15832	4281	3389	264	20266	4653

1930, not available. Agricultural & Pastoral Statistics.

Table No. 63

TABLE SHOWING PERCENTAGE OF MALES AND FEMALES ENGAGED IN DAIRYING, TO TOTAL FARMS EMPLOYEES IN THE SOUTH AUCKLAND DISTRICT. (1).

Season.	% Males.	% Females.
1925/6	78	92
1926/7	77	89
1927/8	72	93
1928/9	78	92
1929/30	not available.	

The above figures show the predominance of dairy farming in the South Auckland district which embraces the Waikato, relative to the rest of New Zealand, in that 75% in this area, as compared with 50% for New Zealand as a whole, are engaged in the dairying industry.

Taking the four Counties, which are more typically dairying counties, the following table shows the position there.

Table No. 64

TABLE SHOWING: (a). PERSONS ENGAGED IN DAIRYING AND (b). PERCENTAGE OF PERSONS SO ENGAGED IN ALL FARMS, IN THE COUNTIES OF WAIKATO, WAIPA, HAURAKI PLAINS AND PIAKO FOR THE YEARS 1925/6 to 1928/9.

Season.	Persons engaged in Dairying, (x) Males.	Females	Percentage of persons engaged in dairying to total farms. (x) Males.	Females.
1925/26	6541	2756	89	96
1926/27	6607	2376	88	96
1927/28	7263	2217	89	97
1928/29	7674	1951	90	98

This last table shows that 90% of the males in this district are engaged in dairying, while to say that all the females engaged, are occupied in dairying is approximately correct.

In the Census of 1926, classification was given of grades of workers, distinguishing inter alia employers, working on own account employing no labour, relatives assisting, and hired labourers, while a somewhat similar classification is given

(1). Agricultural and Pastoral Statistics.
(x). do do do

in the 1929/30 Agricultural and Pastoral statistics.

Hence having arrived at the percentage of persons engaged in dairying in the Auckland land district, and also in the representative dairy counties we can with a minimum of error;-arrive at a conclusion as to the constitution of the labour supply in the Waikato today. (1).

Table No 65

TABLE SHOWING GRADES OF OCCUPATIONS OF PERSONS ENGAGED ON DAIRY FARMS IN N.Z. IN APRIL 1926.

Grade.	Males.	% of total.	Females.	% of total.
Employer of labour.	5694	21	299	24
Working on own account.	11480	41	499	39
Relative assisting.	2871	10	215	17
Labourers Hired.	7502	28	247	20
Others.	125	-	1	-
Totals.	27682	100	1261	100

Extracted from Census of 1926, Vol IX. Page 41.

NOTE. The above group does not include all dairy farmers, because in the classification in the census, the mixed farming group includes numerous cases of pure dairy farming, but the above are pure dairy farms, and the group an unbiassed sample, representing over 50% of all those employed in dairy farming. (2).

The predominance of the group of farmers working on their own account is of particular interest as substantiating the statement made earlier that New Zealand dairying is predominantly on a " one man " farm. A further fact of interest is that hired labour is represented by a little more that one hired labourer to each employer. In other words the average dairy farmer employing labour, has only one hired labourer.

(1). Error will be present, but it will be less than 1%.

(2). cf. figures -- Agricultural and Pastoral statistics 1925/26.

The result obtained from transferring these conclusions to the Waikato area, will contain possibly a large absolute error, but the general trend will be approximately correct.

In the following discussion, the figures are not strictly comparable with the above, being collected under a different and not so thorough a system, and the tabulation is different.

Table No. 66 TABLE SHOWING NUMBER OF PERSONS ENGAGED IN FARMING CLASSIFIED (1). ACCORDING TO INDUSTRIAL GRADE.

(2) ACCORDING TO AGE, IN THE COUNTIES OF WAIKATO, WAIPA, HAURAKI PLAINS, AND PIAKO FOR THE YEAR 1929/1930.

Classification	Males under 15.	Males over 15.	Females under 15.	Females over 15.
Occupiers and their families.	244	6408	79	647
Other.	38	2412	9	233

NOTE. Occupiers and their families includes only those who are engaged in farm work.

The total holding in the counties mentioned, are 5187, and allowing on the average, one working occupier for every holding, further allowing a ratio of 28/21, (see table No 65 ppage No. 152 as representing the proportion of other workers to employers, (which observation would suggest as fairly accurate), we get the following table if we use the census (on page 152) results to elaborate the figures from the A. & P. statistics ~~on the previous~~ above page. (1)

Table No. 67 TABLE SHOWING PERSONS ENGAGED IN THE FARM IN THE COUNTIES OF WAIKATO, WAIPA, HAURAKI PLAINS, AND PIAKO IN 1929/30.

Employers	1837
Working on own account	3350
Relatives assisting	1465
Other (hired) labourers	2459

NOTE. (1). in above tables, relatives in receipt of wages are classified as hired.
(2). The figures above include all farms, but as shown in table no 64 page no 151 persons engaged in dairying are 90% of the total, hence the error is small.

(1). Agricultural and Pastoral Statistics, 1930, page 28.

Even allowing a wide margin of error, the following conclusions are apparent.

(1). The predominance of the one man farm.
(2). The importance of the family farm.
(3). The relatively less importance of the farms employing hired labour.

The table on page shows that the number of females engaged in dairyfarming is falling off steadily.

This latter interpreted in the light of observation, probably means that the help of the wife and daughter in the shed, is less common today than formerly.

A similar classification to the above for an earlier period would probably show a greater predominance of the family farm.

However the following would probably be a fairly good summary of the position in the Waikato today, particularly as there would be a tendency to understate the number of relatives assisting, and this would particularly apply to a wife assisting. The predominant type of labour supply is that of the farmer plus family help in the shed at milking time. In approximately one third of the farms one hired labourer is employed.

Belshaw, in the work already cited illustrates from an investigation into nine farms in 1920, shows that 93.2% of the labour was from those attached to the farm, as occupiers and relatives assisting; while 5.1% was from permanent hired (1) labour. The above discussion shows a marked increase in hired labour, and a decrease in family labour. The development is correlative to the increase in the size of the herds carried, but probably also reflects a higher standard of living of the farmers, and the greater capacity to hire labour and free family, especially female labour.

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(1) Belshaw op cit. page 57.

Constitution

AGE ~~DISTRIBUTION~~ OF THE LABOUR SUPPLY.

1584

A study of the age consitution of the farm population as far as it is available reflects some interesting conditions relative to farming and farm labour in New Zealand.

The following tables shows the age consitution of male labour on farms in New Zealand in 1926.

Table No. 68

TABLE SHOWING NUMBER IN EACH AGE GROUP OF FARM POPULATION UNDER VARIOUS HEADS IN N.Z.

Classifiaation.	14-16.	16-21.	21-25.	25-35.	35-45.	45-55.	55-65.	Over 65.	Total.
Employees.									
Dairy Farmers	2	18	119	1039	1626	1321	865	382	5373
Sharemilkers		9	19	94	85	85	27	4	324
Working on own account.									
Dairy Farmers	3	81	308	2099	3250	2723	1463	753	10671
Sharemilkers	2	50	101	242	228	166	51	7	847
Relatives assisting	956	4149	1240	1004	233	126	81	92	7947
Labourers	1239	8805	6480	3529	2545	1474	695		30414

Population Census. Vol.IX.

Table No. 6g

TABLE SHOWING PERCENTAGE OF EACH CLASSIFICATION IN THE VARIOUS AGE GROUPS.

Classification.	14-16.	16--21.	21-25.	25-35.	35-45.	45-55.	55-65.	Over 65.	Total
Employers.									
Dairy Farmers	.0	.3	2.2	19.4	30.3	24.6	16.1	7.1	100
Sharemilkers	-	2.8	5.8	29	26.2	26.2	8.3	1.2	100
On own Account.									
Dairy Farmers	-	-	12.9	19.7	30.5	25.5	13.7	6.9	100
Sharemilkers	.2	5.9	11.9	28.6	26.9	19.6	6.0	.9	100
Relatives Assisting	12.0	58.2	15.5	12.6	3.1	1.6	1.0	1.2	100
Labourers	4.1	28.9	18.2	21.3	11.6	8.4	4.8	2.8	100

Re grouping the above table, and omitting the sharemilkers.

Table No. 7. TABLE SHOWING PERCENTAGE OF VARIOUS GROUPS UNDER 25 AND 25 AND OVER.

Classification.	under 25.	25 and over.
Employers	2.5	97.5
Working on own account	3.7	96.3
Relatives assisting.	80.5	19.5
Labour	51.1	48.9

The same facts are illustrated by the graphs on the next page.

74.3% of those employing labour and 74.7% of those working on their own account are between the ages of 25 and 55 The modal group in each case being the 35 - 45 group.

The most striking fact of the above table is that not only 80.5% of the relatives assisting are under 25, but 65.2% are under 21 years of age. The modal group of farm labourers is the 16 - 21 group.

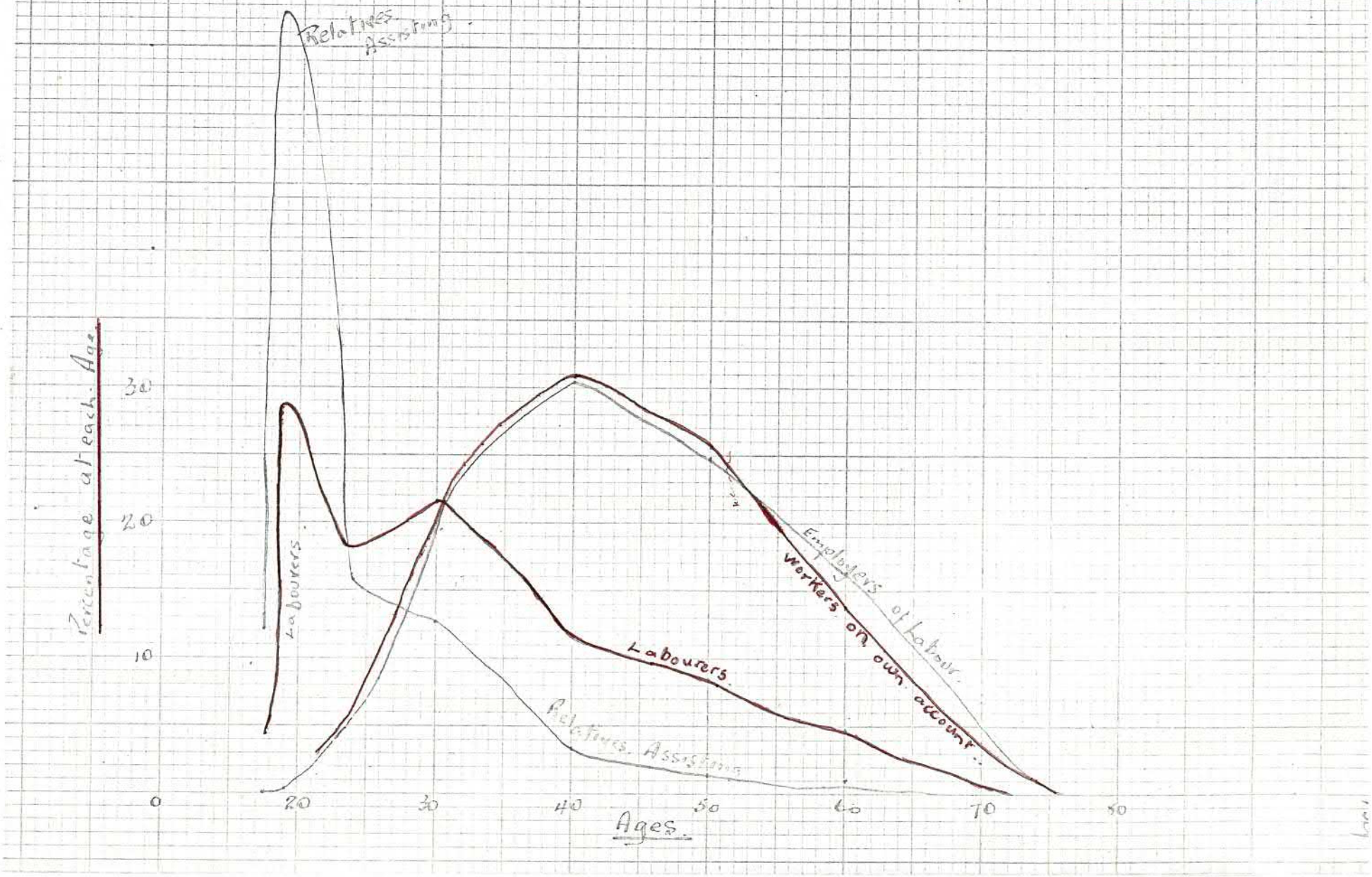
These tables reflect the general structure of the diary industry.

Since the mechanisation of the industry, particularly as to milking, the youth is as valuable as the matured man and as he is cheaper to employ, he is employed at the expense of the matured man. General observation suggests that dairy farm labouring is a blind alley occupation. Numerous instances could be cited where youths can easily find work, but mature men tend to drift to the ranks of unskilled urban labourers. There is a further tendency however for farmers' sons to go out as lhbourers till they are about 25, and then for them to get a small farm of their own.

Belshaw in the work already cited suggests that the relatively small scale farming practised was largely due to the lack of an adequate labour supply, and he gave various reasons to account for that fact. (1)

(1) Belshaw op cit. page 58 et seq.

Percentage Age Distribution of Farm Labour



The writer is of the opinion, that while the lack of adequate labour supply may have determined the size of the farm when the lack of mechanisation made much more farm labour necessary for milking, and when the absence of grassland farming made much more field work necessary, yet the size of the farm being more or less determined (with fairly great difficulty as to increase in size), particularly in closely settled districts, the labour requirement is determined by the size of the herd, which is conditioned by the size of the farm, and of late years there has been no statement as to the scarcity of labourers for dairy farms, although there has been an outcry that young people were avoiding the land.

However there has of late years, and even before the present depression, been no difficulty in filling vacancies on dairy farms, the difficulty has been in placing adult workers due to the tendency stated above to employ youths.

The age distribution of the relatives assisting, is of great interest as confirming the point made earlier as to the family farm. The fact is 65.2% of the relatives assisting are under 21, and while the numbervover 35 is very small, ~~it~~ suggests that the family is a unit in dairying, but that over 21, the family tends to scatter, as might be expected.

It will be noticed that relatives are the only group having employees under 14. These would represent school-children. This point of school children helping in milking before and after school of course cannot be completely investigated by published figures, because of tendency to understate children so occupied. The table on page shows that number of persons as " occupiers and their families", and " other ", in the counties of Waikato, Waipa, Hauraki Plains and Piako for 1930, would agree more or less with the census figures above. The per cent of occupiers and their families under 15 years of age ~~less there~~, is 4, and while this probably is an understatement, general observation would suggest that the practice is not very wide-spread.

As to the age distribution of employers of labour, and of those working on their own account, this when compared with the distribution of labourers reflects the fact, that a permanent agricultural class is not known in New Zealand.

The acquiring of land is relatively easy, and in fact encouragement has been given to fitted persons to take up land, by the cheapness of credit. hence one finds youths going on to land as labourers to get experience, and to accumulate a small capital with which, and with Government or private financial assistance , the former of which is very easy to obtain, they take up land themselves when they get between 25 and 30. It may be said that the aim of most agricultural labourers is to take up land for themselves.

The modal group in the case of both classifications of sharemilkers is lower than in the case of occupiers, but the groups from 25 to 55 are steadier than those of occupiers.

The writer is inclined to think as stated before that though sharemilking was a decade ago a temporary condition of a man who had been a labourer and aspired to be a landowner, that sharemilkers are becoming a class who tend to remain such. These figures give some colour to the suggestion. (1).

As to labourers, the figures as to ages which show the modal group ~~are~~ robe from 16 to 21 years of age, confirm the two points made earlier, that :—

(1). The youth is as valuable as a matured man in dairying and is cheaper.

(2). Persons who commence as agricultural labourers, tend to pass into the ranks of either farmers or unskilled labourers in later life.

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(1). see page 56 and cf. Belshaw op cit. pp. 68/70.

Conjugal condition of Labour

CONJUGAL CONDITION OF FARM LABOUR.

The following table shows the conjugal conditions of employees on farms.

Table No. 71

TABLE SHOWING CONJUGAL CONDITIONS OF PERSONS EMPLOYED ON FARMS.

Classification.	Single. No.	Single. %	Married. No.	Married. %
Employers	668	13	4472	87
Own account.	1788	17	8537	83
Relatives assistg.	7578	97	264	3
Labourers	22905	78	6581	22.

Note. (1). Employers and on own account does not include all dairy farms.

(2). Labourers include some labourers on farms other than dairying, but chiefly dairying.

This table would confirm the findings of the previous section. The predominance of married farmers is as might be expected. The fact of the overwhelming predominance of single relatives assisting, merely reflects the family farm.

The fact that 78% of the labourers are single shows an important phase of the farm labour problem. There is practically no scope in dairying for the married labourer.

He involves a separate dwelling which is normally not present, and this coupled with the fact that the single man is normally just as efficient, tends to make for little employment for married men.

Consequently when labourers reach the marrying age, they drift to the town where wages are higher, or take up a farm themselves., or go sharemilking.

It is the opinion of the writer that this latter phase of the farm question should be investigated relative to the unemployment problem. One registry proprietor of the who had a considerable clientele stated that not 5% applications were for married men, and what married labour was required, was was rathervin a managerial capacity that that of a labourer.

In conclusion it will be convenient to summarise the results of the previous two sections as follows:-

1. The general demand on dairy farms is for youths, as the work is not heavy, and a youth is as efficient as a matured man, and also is cheaper.

2. Census statistics tend to show that the family is in the majority of cases, the unit for dairying.

3. There is some employment of school children before and after school, but this is not marked.

4. There is no permanent agricultural proletariat, the labourer tending to become, (a), a farmer between the ages of 25 and 35; ~~and~~ or (b), to drift to town as an unskilled labourer.

5. There is nodemand for married labourers, and consequently on marriage, these either drift to the towns, become sharemilkers, or take up land.

6. Dairy farmers tend to be above thirty, the modal group being from 35 to 45.

THE HIRING OF LABOUR. 16-2

The general conditions governing the hiiring of labour are somewhat as follows:- §1).& (2)

There are three principal means of hiring labour,

a. Advertisement in a newspaper.
b. Through a registry office.
c. Through a Stock and Station agency.

The order of importance is roughly that stated as above. Newspaper advertisements are widely used by both parties to the hiring contract. They are cheap, and relatively effmeient. The registry office is, generally speaking, not so efficient, as the better class labourer does not frequent them. The Government Labpur Bureau is not used at all in connection with the hiring of labour for farms.

The registry office functions in the normalway by bringing the farmer and the applicant together, making a charge to each party. A few labourers are secured by stock and station agents in touch with the farmers, the work (securing the labour), being done gratmitously, with a view to securing and retaining the custom of the farmer.

The conditions governing the hiring, are that the labourer will, in addition to wages, receive board and residence. The fact that in general there is only one hired labourer, results that he is practically treated as one of the family, having a room in the house - or in a nearby outhouse - dining with the family, and having the use of the full facilities of the house, who also launder his clothes.

The cases where labour is not "found" are so rare

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(1). The discussion in this chapter is based on the following information:-
(a) Personal knowledge as to dairying in the district.
(b) Interviews with several proprietors of registry offices, who have considerable clientele with dairy farmers.
(c) A summary of the advertisements for "farm hands" in the files of the New Zealand "Herald" - the leading Auckland daily paper - and the Waikato Times, the principal provincial daily circulating in the Waikato.

(2). The present chapter is not concerned with sharemilkers, who are dealt with in chapter 2. Part II

as to be negligible. In nine of the farms, one hired labourer, whose home was less than half a mile away, lived at home, but received two of his meals at the farm.

Such married men as are employed, live in a separate house, and in approximately 50% of the cases, the wife is required to help. In such cases, with the exception of milk and a free house, the married couple must provide for themselves.

Money wages have fallen considerably in the past season, the fall being approximately 5/- in the £1. In the following discussion, money wages only are given, but real wages include board and residence.. Boys of 15 - 17, who cannot milk, and merely fit teat cups receive from 10/- to 15/- per week. Youths from 17 - 19, who are able to strip and help in general field work, receive from 15/- to £1. per week, over 19, the wages vary from £1. to £1/15/- varying according to ability, experience, age, and district.

Married men usually receive from £2/10/- to £3/10/- and a free house. As an incentive for employees to remain the whole season, there is frequently offered a defferred bonus, generally of 5/- per week, if the employee remains the whole season. However there is considerable complaint over this bonus, as it is contended that though relations are pleasant early in the season, there is an incentive for pin-pricking tactics in the late part of the season resulting in the dismissal of the labourer, or making it so unpleasant that he leaves the job. The 5/- per week bonus is thus saved, although it has stimulated better work earlier in the season. Personal observation would seem to suggest that there is some ground for this dissatisfaction.

Labour is usually hired for the milking season, which extends from mid August to mid May. The seasonal nature of the work is definitely a factor in the winter unemployment and a tracing of one or two such labourers showed that they went on to relief works during the winter months; others spend the winter months living with relatives, living on the accumulated funds of the last nine months.

There is growing amongst the better class farmers a practice of keeping a good man over the Winter months, in order that one who not only has proved his worth, but is also used to the routine and the cows may be available for next season. This practice is more prominent in connection with youths who have been trained on the farm.

~~The result of~~ Apart from the above ~~is that~~ the labour turnover on farms is fairly high.

The following table relative to the nine farms illustrates the matter discussed in this chapter.

Table No. 12 TABLE SHOWING LABOUR TURNOVER ON THE NINE FARMS IN THE TE AWAMUTU AREA.

Farm. No.	Hired labour at one time. adults.	youths.	No. of separate labourers during season. adults.	youths.	No. of hands during winter. adults.	youths.
1.	1	1	2	2	–	1
2.	2	–	3	–	–	1
3.	1	–	3	–	1	–
4.	–	1	–	1	–	1
5.	–	1	–	3	–	–
6.	–	1	–	1	–	1
7.	–	1	–	1	–	1
8.	–	1	–	1	–	1
9.	–	–	–	–	–	–

In all cases where adult labour was employed there was some turnover whilst in only one case where youths were employed was there any change. In farms Nos. 4, 6, 7, and 8, where there was no turnover, and where the labourer was kept on during the winter, the youth was trained on the farm, although in two cases, blood relationship had some effect.

Of course the smaller wages to youths has some relation to their being kept on.

Such purchases as are made by the labourer, are usually made through the employer, and charged to his account being deducted from wages. No regular weekly half holiday is usually given, the usual practice being that the hand has a day off – that is between milkings – one day a month.

As amplifying a point made earlier relative to the fact that men over 21 are less frequently found as labourers, the fact that urban adult labourers get approximately £3/15/- per week, while the wages of dairy hands are about £2/10/-. has some importance (1).

The net advantages of each class of work are approx. in accordance with above, if the advantage of living in a town be set off against the less expense involved in living in the country. The above would reinforce the conclusion that unless they intend to take up land themselves, labourers drift to the towns where they are able to secure the higher wages.

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(1). The Government Statistics, allow 30/- per week for board and residence, which would make the ~~total~~ real wage £3/5/-, but the concensus of opinion is that ~~£3/5/-~~ £4/- is the approximate value of " found."

Casual Labour ~~CASUAL LABOUR~~.

The major requirement of casual labour is haymaking, which because of its nature, requires to be harvested in the shortest possible time. With the greater use of ensilage the importance of this item is less than it used to be, for ensilage making is not conditioned by the weather, and frequently takes several weeks to complete, the labour supply usually being that of the permanent employees on the farm.

It has beenmnoted earlier that co-operative labour in connection with harvesting is very common but - " although it enables work to be done without the hiring of casual labour ---------- (it) has certain disadvantages. The various hay crops mature at about the same time, and harvesting is done quickly so that the hay (of all co-operators), may be harvested before the weather breaks. Hay is frequently stacked before it is mature, the stack heats, and firing of stacks has been fairly common since the use of co-operative haymaking machinery has been in vogue. " (1).

However, casual labour is at apremium inthe haymaking season, owing to the heavy demand. Large numbers of unskilled urban workers go to the farms, ~~while~~ in the haymaking season, while in the vacations of educational institutions, numerousstteachers and students go to the hayfields.

Wages are high, being usually at the rate of 2/6d per hour, plus one meal per day.

The two factors of the mechanisation of harvesting and the growth in popularity of ensilage making, have rendered the demand for casual labour less than previously.

Among other minor uses of casual labour is clearing ~~dairying~~ areas which have not been previously"brought in" from the rough, natural state.

Indians - chiefly Sikhs - are very common in this

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(1). Smallfield op cit. page 47.

regard, but the aggregate demand for this is small, as most of this type of work is done by the farmer himself, and permanent labour.

Payment for this class of work is usually on the contract basis.

Casual labour is also used occasionally for fencing, and drain digging, and clearing. Here again contract method of payment is used.

However the chief demand for casual labour arises from harvesting operations as discussed above.

Part III

Stock Management

Part III Chapter 1

Breeds

BREEDS

The following table shows the numbers of the various dairy breeds in New Zealand in 1928, (the last date on which a " Breed " Census was taken), compared with a similar statement for the years 1921, and 1924.

Table No. 73 TABLE SHOWING DISTRIBUTION OF DAIRY BREEDS IN NEW ZEALAND IN 1921, 1924, & 1928.

Breed. Pedigree.	BULLS. 1921.	1924.	1928.	COWS OVER TWO 1921.	1924.	1928.
Jersey.	402	6458	11347	5808	10336	16772
Friesian.	1458	1533	1459	2359	3675	4682
Milk Shorthorn.	1910	477	559	4705(x)	1756	2255
Ayreshire.	397	474	674	1293	2082	2739
CROSSBRED.						
Jersey.	9972	16858	20905	303476	539636	820431
Friesian.	5164	4837	3439	117183	159076	150665
Milk Shorthorn.	16985	8481	5000	570873	489727	286534
Ayrshire.	1119	983	962	30770	34041	32379

(x) includes beef shorthorns in 1921 only in pedigree class.

Table No. 74 TABLE SHOWING PERCENTAGE DISTRIBUTION OF DAIRY BREEDS IN NEW ZEALAND IN 1921, 1924, & 1928.

BREED. Pedigree.	BULLS. 1921.	1924.	1928.	COWS OVER TWO. 1921.	1924.	1928.
Jersey.	51.	72	81.	41	58	61
Friesian.	19	18	10	17	21	21
Milk Shorthorn.	25. (x)	5	4	33 (x)	10	8
Ayrshire.	5	5	5	9	11	10
CROSSBRED.						
Jersey.	30	54	69	30	44	64
Friesian.	16	16	11	11	13	12
Milk Shorthorn.	51	27	17	56	40	22
Ayrshire.	3	3	3	3	3	2

(x) includes beef shorthorn in 1921 only in pedigree class.

The outstanding fact in the above table is that predominance of the Jersey breed in every class. This increase has been most marked in recent years, as a comparison with the percentage figures for 1921 and 1924, in the above table will show. The predominance has of course been associated with a relative decline in the heavier breeds of Ayrshire, Friesian, and Shorthorn.

The foregoing facts are further illustrated by the following table, which shows the hords of cattle in the Auckland Land district.

Table No. 75

BREEDS.

TABLE SHOWING BULLS & COWS OVER TWO IN THE AUCKLAND LAND DISTRICT. IN 1921, 1924, & 1928.

BREED. Pedigree.	BULLS. 1921.	1924.	1928.	COWS OVER TWO. 1921.	1924.	1928.
Jerseys.	705	1382	3397	1030	2299	3601
Friesians.	319	365	486	654	875	1792
Milk Shorthorns	387	111	166	1576	385	723
Ayrshire.	52	62	156	270	243	490
CROSSBRED.						
Jerseys.	1842	4962	5683	54444	138825	250514
Friesians	787	812	765	20593	34690	39040
Milk Shorthorns.	5442	1818	1316	169746	115475	72716
Ayrshire.	123	111	143	2967	2678	5491

Table No. 76

TABLE SHOWING PERCENTAGE OF VARIOUS BREEDS IN THE AUCKLAND LAND DISTRICT IN 1921, 1924, & 1928.

BREED. Pedigree.	BULLS. 1921.	1924.	1928.	COWS OVER TWO. 1921.	1924.	1928.
Jersey.	48	72	81	29	60	55
Friesians.	22	19	11	17	23	27
Milk Shorthorns,	20	6	4	45	10	11
Ayrshire.	4	3	4	8	7	7
CROSSBRED.						
Jersey.	22	64	72	22	49	68
Friesians.	9	10	9	8	1	11
Milk Shorthorns.	66	24	2	69	40	20
Ayrshire.	2	2	17	1	0	1

The percentage distribution corresponds roughly to the distribution throughout New Zealand, as shown by the tables on the previous pages. The growth in popularity of the Jersey herd in the North Island, has been a comparatively m modern developement, the herd replacing the shorthorns as the premier breed since ~~1914~~ 1921., as evidenced by the absolute and relative decline of the Shorthorn breed as shown by the above tables. In the Southern part of the South Island, in the

province of Otagô, and Southland, the shorthorns still hold the firstoplace, followed by the Friesian, Ayrshire, and Jersey, in that order. The preference for the heavier breed in this area is probably due to the severe climatèc conditions in winter and the heavier types of soil in the area, both of which conditions mitigate against the most successful exphoitation of the lighter Jerseys.

However the Jersey cow in the milder climate, and on the lighter soils of the North Island, have several points in their favour. They mature earlier, and have a milk higher in butterfat content than the heavier cows. Further, being a much smaller beast, there is ability to carry a larger herd on a given area. The question however of the economic advantage of each type of cattle, that is to say, the relation of the unit of output to the unit of outlay, has not yet been finally solved. It seems evident however, that the heavier type cows have a definite superiority in cheese making. (1).

" Jersey grade cows are bred up from Shorthorn cross cattle ---- Herds have been bred from a basic Shorthorn stock with Jersey bulls. The majority of the cattle are grade bred - i.e. pedigree bulls ----- are mated with crossbred cows, and after the fourth cross, the animals resemble the breed of pedigree size; after the sixth cross, the animals are practically pure bred." (2)

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(1). F.O.Veale, B.A. M.Sc. " The Relative values of high and low testing milk for cheese making in New Zealand (Veale's work is the standard authority on the subject) The whole question of milk for cheese making is a very live one at the present time. Payment made on the fat content of milk which while an efficient system for buttermaking, is not accurate with regard to cheesemaking "Producers of milk for cheese making are depriving themselves of 1½d. to 2d. per lb. butterfat, by their present adherance to high testing." (Veale, Page 60.)

However the whole question is outside the scope of this essay being concerned with " marketing " rather than"farm organisation."

(2). Smallfield, op cit. page 48.

The following table shows the breed and class of cattle on the nine farms in the Te Awamutu group.

Table No. 77 TABLE SHOWING THE BREED AND CLASS OF CATTLE ON THE NINE DAIRY FARMS.

Farm No.	BULLS. Pedigree. Jrsy.	Frsn.	Other. Jrsy.	COWS. Pedigree. Jrsy.	Frsn.	Jrsy	Other. Frsn.	S/horn
No.1.	1	-	1	-	-	105	-	-
No.2.	1	-	1	-	-	71	-	-
No.3.	1.	-	-	-	1	53	-	1
No.4.	-	-	1	-	-	43	-	-
No.5.	1	-	-	-	-	42	2	1
No.6.	1	-	-	-	-	52	-	-
No.7.	-	-	1	-	-	34	-	-
No.8.	-	1	1	-	5	-	41	-
No.9.	-	-	-	-	-	19	4	1

In most of the above famrs the cows are " grade " as above defined. The growing use of the pedigree bull illustrates one phase of the movement to grade up dairy herds.

At the Combined Breeders' Sale in September 1930 551 pedigree bulls were offered for sale of which 427 were Jersey, 57 Friesians, 43 Shorthorns, and 17 Ayrshire, and 5 Red Poll bulls. In 1932, the offering at the same sale, there were 429 Jerseys, 41 Friesians, 51 Milking Shorthorns, and 9 Ayrshire, The advertisement in this case is justified speaking of the bulls as " Herd improvers " while the catalogue in a big percentage of cases, gives the butterfat backing ~~taking~~ of the dams, This illustrates the point which is gaining in importation, namely that (1). pedigree cattle apart from proved butterfat production, are of very little use.

PEDIGREE STOCK. It is the aim of progressive dairy farmers to have a pedigree bull from proved stock. The relative importance of pedigree bulls to other bulls is shown in the table on page 174 to be 1 to 1.7 in the Auckland land district.

This leads to the question of pedigree breeding. Pedigree breeding is a specialist occupation, and

(1). See section on Calfmaking, page 245

forms a class of farming by itself. Numerous farmers specialise in pedigree breeding, while the various breed Associations carry on prppaganda, and organise sales on their behalf, as well as keep herd books. The larger pedigree farms have their own pedigree sales of young stock.

There is a national show and sale of Jersey cattle, while all the Breed Associations combine in the sales above described.

Pedigree cows, as opposed to pedigree bulls are in general not kept by the dairy farmer, and it will be noticed above, that the ratio of pedigree bulls to pedigree cows is as 1 to 1.5 in the South Auckland province, while all bulls to all cows is as 1 to 31., which reinforces the above point that pedigree breeding is a specialist occupation.

Bulls are usually sold as one year olds, when they are valuable for serving heifers. Heifers are usually sold in calf rising two years old. As might be expected pedigree heifers are not sold with anything like the frequency of pedigree bulls.

The pedigree breeder has performed and is performing a very important function in the industry today. His activities articles have gone a long way in grading up of the herds, and while much of the improvement is due to the improved management much is also due to improved sires.

In six of the nine farms, pedigree bulls are present. One farm has no bull. Where there are two bulls the "Other" bulls are used on cows from which it is not desirable to keep the calf, while good cows, whose calves are required for herd replacement are served by the pedigree animal.

Regarding pedigree cows in the above farms, farm No. 3. is the only one which has sold young stock as pedigree. This farm aims ultimately at breeding. In the other cases no breeding for sale was done. The cows on these farms are chiefly high grade cows - as above defined - and where management has been careful over a number of years, the herd approximates closely to pure-bred animals. In farm 8 the herd is a pure brod Friesian herd.

It will be convenient to present a summary of this section here.

Jersey cows predominate in New Zealand, and in the Waikato, the proportion of Jersey cows in each case being 2/3rds. of the total cattle. Shorthorns and Friesians are the only other breeds of importance.

The smaller Jersey is preferred for the high butterfat content of its milk, as well as the capacity to carry ~~nine~~ more cows per acre and its earlier maturity.

There is a growing use of pedigree bulls with butterfat backing as a means of ultimately grading up the dairy herd.

Pedigree breeding, which is a specialist occupation and is not carried out as a side line to dairying, has performed a great service to the dairy farmer.

Part III Chapter. II

Building up the Herd.

BUILDING UP THE HERD.

The increasing carrying capacity of properly managed pastures has converted the problem of maintaining the herd tomone of building up the herd.

The method of haphazard " picking up " of cattle at auction sales, toosoften resulted in the buyer getting merely the " Culls " from another man's herd. A case is on record, where a stock driver collected a herd of culls from a number of farms in one district, and drove them to another district and advertised them as " Mr. ————'s fine herd. removed to the sale yards for the purpose of sale, all proved producers." However, in spite of the above criticism being generally understood, farmers still buy extensively from auction sales, for herd increase or replacement. (1).

Private buying is much better, but the progressive farmer aims to build up his own herd by raising his own stock.

Only calves by sires with good butterfat backing, out of proved dams are kept, and the ultimate effect must be a general grading up of those dairy herds, where this practice is used. The figures relating to rearing and purchasing, on the nine farms were not very reliable, but the following table shows the percentages bred and reared, and the years the farmer has occupied the farm.

Table No. 78 TABLE SHOWING PERCENTAGE OF COWS (a) PURCHASED, AND (b) REARED, AND THE LENGTH OF TENANCY OF THE NINE FARMS.

Farm No.	Length of tenancy in years,	Percentage of cows. Purchased.	Reared.	
1.	7	50	50	(x)
2.	8	40	60	(x)
3.	10	-	100	
4.	9	60	40	
5.	9	57	43	
6.	10	25	75	(x)
7.	10	25	75	(x)
8.	7	6	94	
9.	½	100	-	

(x) estimated by the farmer.

(1) See section on Calf marking p...

The foregoing shows the very large place that rearing herds has taken in dairy stock management.

Replacements in herds take place for a number of reasons, among which are the following:-

(a). Low production.
(b). Disease.
(c). Old age.

A full discussion of the methods of determining low production will be found under Herd Testing, see Part III Chap. 5.

The prevalence of mammitis has accounted for a considerable need of replacement, while breeding troubles take a considerable toll.

The following table shows the average percentage of cows eliminated from herds in 2547 farms in 1929/30. (1).

Table No. 79 TABLE SHOWING PERCENTAGE OF COWS ELIMINATED, DIED, DESTROYED, SOLD? OR TO BE SOLD.

	% of total cows.
Old Age	1.1
Low production	5.3
Accident	.6
Mammitis	1.5
Breeding troubles	1.2
Tuberculosis	.2
Other reasons	.8
	10.7

Private investigation suggest that replacements on on the lower lying areas are very much heavier than the above, but over all the above figure is representative of conditions in the Waikato.

Consequently there is a need for an annual raising of stock to replace stock eliminated, as well as to increase the herd. The table on page 69/70 showing the number of cows per yearlings carried on farms grouped according to acreage and cows carried respectively, would suggest that one heifer is kept for every five cows on the average.

The table on page 73 shows that the average was 4.2 cows per yearling on the 9 farms, While all dairy cows normally drop a calf each year, these calves are only kept when they are from a better producing cow.

However, calf rearing is an important item of management, as calves are fed on whole milk for a period which is a definite loss of Butterfat. Calf rearing also entails considerable work.

Again the young stock in the winter months, consume considerable quantities of grass which is then at its lowest point of growth.

Calves are weaned at three days old, and are fed on whole milk for a forthight, then half whole milk and half skim milk. then skim Milk Calves are baled, and fed out of tins, twice a day after milking. they Calves are hand-fed in this manner for about three months. They are then grazed till the spring of the next year when they are mated with the bull and brought into the herd the following spring. Young stock are frequently grazed in rotation after dairy cattle to clean up the paddocks.

Stock buying usually takes the form of purchasing " in calf heifers, close to profit ", or " heifers in milk " or cows in milk. Calves, yearlings, and dry cows are not bought for dairying to any extent.

Calves which are not kept, are either killed and skinned - the skin being sold - or sold as vealers, i.e. 3 days old calves, which are taken to the slaughtering works, killed and prepared for export as frozen veal. This latter industry has grown to very big proportions from its inception about five seasons ago, and now accounts for a big proportion of the unwanted calves. They are put in pens at the farm gate on certain days, and picked up by motor lorries, and conveyed to the slaughtering works.

GENERAL HANDLING OF STOCK. Dairy stock are all treated with great care, and from the earliest days are tended by hand, this making handling them when they are in the herd, much easier. ~~For instance~~ All cows are dehorned to aid in restfulness in the yards. Cows are very quiet, and normally take their place in the milking bales without driving as soon as a bale is vacant.

Part. III Chapter. III

Butterfat Production

BUTTERFAT PRODUCTION.

Introduction. The central problem of dairy farm organisation is the production of milk. Production of milk, is not necessarily the same problem as the production of butterfat (see chap Part III page 176), but since payment is almost universally made in terms of butterfat units, a study of dairy farm (1) organisation must be related to butterfat production rather that to milk production.

The managerial function relative to a given dairy farm is to maximise butterfat production in terms of:-

(a) a given area
(b) a given size, of herd
(c) a given outlay.

or to minimise outlay relative to:-

(a) a given area
(b) a given size of herd
(c) a given total butterfat production.

That is to say that a farmmx should aim at:-

(a) maximum production per acre
(b) maximum production per cow
(c) maximum return per unit of labour.

It is possible that (a), may be achieved without (b), for obviously, one good producing cow on a large area may mean a small per-acre production. Further, in each of the above cases, it is not the absolute maximum, but the maximum which which does not result in diminishing returns to outlay as a whole. That is to say, relative to given costs, given technique, given rate of returns per unit, the optimum production for the farm is that which results in the largest net profit, and hence it may pay to continue production after diminishing returns have set in.

While one cow may produce much less that another yet the relative costs of maintainance for the two beasts will be approximately equal, which means that the expence of maintaining a cow does not vary in the same proportion as its rate of production.

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(1). It is probably that for cheesmaking payment on a butterfat basis is not wholly equitable, and there is a strong movement to change the basis of payment for cheese supplied. See Veale op cit passim. This discussion is relative to high testing and low testing herds as in the previous chapter.

While there can be no effective answer to the economic advantage of the high producer, yet the relative factor in farm management is not production per cow, but production per acre.

Lactation periods. Both production per cow and production per acre depend on the lactation period of the particular cow in two ways,

(a) the duration of the lactation period
(b) the season of the lactation period

(a). The discussion in chapter in relation to pasture management, suggests that both the duration and the season of the lactation period are largely determined by the seasonal nature of the grass growth, and that efficient management aims at having the cows at their top of production at the period of the flush growth of the grass, while cows are dry when grass growth is at a minimum in the winter. Dairying as herein discussed, differs then from milking cows for Town supply, where the endeavour is to get as regular supply over the year as possible. This seasonal nature of dairying of course reacts on the manufacturing and marketing sides of the industry.

Broadly the period of lactation is from 8 to 9 months. Cows are usually dried off about the end of May, at which time grass growth is very low, and even assuming that the cows have not been in any length of time, their production falls markedly at this period. Hence the actual length of the production period depends on when the cows come in. For the same reason the period at which cows come in, is largely determined by the grass growth. Normally, grass does not begin to come away until late August and early September, and this period corresponds to the time at which cows are normally brought in. This would make thd lactation period 8½ to 9 months, or from 250 to 280 days. (D)

(D) This whole discussion has been descriptive of present practice rather than of possible improvements. For instance in the section on Fertilisers (chap.6 p.119) is was pointed out that nitrogenous manures increase autumn, winter, & spring growth, and Dr. Annet (op cit p.) suggests that ultimately there will be (no obstacle to a whole year production. period.

(contd. foot of page after next)

The following table showing the figures of the various groups of lactation periods in the farms investigated bears out the above statement.

Table No. 80

LENGTH OF LACTATION PERIOD.

Table showing number of farms having lactation periods within certain groups of days.

Lactation period. days.	No. of farms.	Lactation period. days	No. of farms.
under 200	6	251 - 260	180
200 - 210	13	261 - 270	201
211 - 220	28	271 - 280	193
221 - 230	40	281 - 290	120
231 - 240	78	291 - 300	25
241 - 250	101	301 - 310	4

In the above table over 80% of the farms have lactation periods of between 241 and 290 days, while 58% are between 251 and 280 days.

The following table supplied by the New Zealand Co-Op Herd Testing Assoc., shows the increase in the average lactation period in the herds tested over the past seven years.

Table No. 81

Table showing average lactation period of herds tested over the past 7 years.

Season	Lactation period - days.
1923/4	237
1924/5	238
1925/6	244
1926/7	250
1927/8	(x) 241
1928/29	(x) 255
1929/30	(x) 260

(x) Prior to this date, figure refers to cows tested only, after this date to the whole herd.

This table is instructive as showing the movement to an increased lactation period, and is correlative to the developement of pasture management and the provision of supplementary feed.

The fact that group herd testing associations allow a maximum production period of 305 days, gives some idea of the standard arrived at by the more progressive section of the farming community.

While there is a fairly obvious relation between the lactation period and the quantity of butterfat produced, it must be remembered that the capacity to sustain a longer lactation reflects inter alia the quality of the cow, and the building up of a herd of high producers involves necessarily attention to the question not merely of the actual test of the cows milk, and the quantity of milk per milking, but also the length of the lactation period; that is to say, one factor influencing from what cows, calves are to be kept, should be the length of the lactation periods.

The following table relative to the nine farms shows the relation between the length of the lactation period the production per cow, and production per acre.

Table No. 92 TABLE SHOWING ON THE NINE FARMS IN 1929/30.

(a) length of lactation period.
(b) production per cow.
(c) production per acre.

Farm No.	approx. length laction period in months.	production per cow.	production per acre.
1.	8½	200.8	68.69
2.	8½	206.49	65.61
3.	10	260.09	109.59
4.	9	270.73	128.66
5.	8	258	109.86
6.	9	221.34	125.10
7.	9½	206.58	123.94
8.	8	218.28	98.6
9.	8	254.39	76.3

Note. footnote continued from the page before last.

While this probably will never happen, the following extract gives the opinion of one authority relative to current condition, ..." on the basis of 230 days it means that there are more than five months in which our average dairy cow is doing nothing in butterfat production. During that period she requires bodily maintainance, and general charge bearing on the cost of the cow's keep much as during the milking period. Two months rest from milk production should be sufficient" (1).

(1). "Dairy herd testing for yield", Singleton

Even though the matter of quality of cows and quality of pasture, and number of cows per acre, materially affects both production per cow and production per acre, yet there is a fairly distinct tend showing high production per cow to be associated with the longer lactation periods.

This does not prove that longer lactation periods are necessarily financially advantageous, because they may involve higher costs in fertilisers and other expenses, as well as necessitating a lower carrying per acre on the average of the year.

Season of lactation period. The following table shows the percentage of total annual production for each of the months on the nine farms.

Table No. 13

TABLE SHOWING PERCENTAGE THAT BUTTERFAT PRODUCED EACH MONTH BEARS TO TOTAL ANNUAL PRODUCTION.

Farm No. / Month.	1.	2.	3.	4.	5.	6.	7.	8.	9.	Avge.
August.	4.7	5.4	7.8	4.6	2.7	4.6	6.2	3.4	3.7	4.8
September	7.6	9.1	9.5	10	7.2	7.9	10.3	6.3	8.2	8.3
October	10.7	13	12.6	13.1	11.4	12.1	13.0	11.6	13.6	12.1
November	13.2	13.4	12.8	12.5	12.9	13.2	12.9	12.4	14.	13
December	14.8	13.6	12.7	12.6	14.3	1313	13.4	13.1	13.4	13.6
January	14.7	12.7	11.3	12.1	13.5	12.2	11.4	12.7	12.4	12.8
February	12.0	10.4	9.3	10.5	10.8	10.3	9.1	10.3	10.6	11.1
March	11.0	9.6	9.6	10.9	10.6	10.4	9.5	10.1	10.2	10.4
April	6.5	6.9	6.3	7.6	7.5	7.0	6.3	7.5	7.5	6.8
May	2.9	3.3	2.6	4.8	5.1	4.1	3.2	5.6	3.5	3.7
June	1.0	2.5	2.1	1.2	2.5	1.3	1.9	5.4	1.8	2.1
July	.7	.1	3.4	.1	1.5	3.6	2.8	1.6	1.1	1.3
TOTALS.	100	100	100	100	100	100	100	100	100	100

The graph on page is drawn from the average of the above group, and illustrates diagrammatically the seasonal distribution of butterfat production.

Farm No.3. which is a very well managed farm, both as to pastures and supplementary feed, makes a point of bringing his cows in in July. In Farm 8. the cows did not come in till mid September. This distribution cannot be altered in a short time, because the gestation period being nine months, and the cow not being in a condition to go to the bull till at least two months after calving, the result is that if cows are allowed to calve late in any year, it is very difficult to bring them in earlier in the next year. This point is important, not only with a whole herd, but also with individual cows which for any reason do not " hold " at the first or subsequent servings.

Early calving enables full advantage to be taken of flush growth for milk production. Early calving cows have restored their physical vigor by the time grass is at the flush, and consequently more of their feed turns to milk. Late calvers have to restore their constitution after calving and consequently loose someof the advantage of the grass at the flush for milk production.

Finally, for some years past " pay outs " by the Dairy Companies have been higher in the months of July, August, and September, than in later months, largely owing to the fact that London prices are higher then, due to the relative scarcity of New Zealand produce. There is also the point that Dairy Companies endeavour to make " pay outs " as large as possible then, in order to attract suppliers even though such a " pay out " is greater that is warranted by the level of the finished products. They can do this specially in July and August because the amount supplied is relatively small and an extra ½d. per lb. butterfat, does not absorb much money. The importance of the point raised in the previous paragraph can be illustrated by the following table which shows the average payout over the season, of the 9 farms.

Table No. 14

19 ?

TABLE SHOWING AVERAGE RECEIPTS PER LB. BUTTERFAT ON THE NINE FARMS FOR THE SEASON 1929/30.

Farm No.	Receipts per lb. butterfat. s. d.
1.	1/3.88
2.	1/4.44
3.	1/3.98
4.	1/3.77
5.	1/3.67
6.	1/3.79
7.	1/3.92
8.	1/3.27
9.	1/3.07
Average for all suppliers	1/3.93
Average for suppliers of butter factories	1/3.86

Note. Farm No. 2 supplied a factory making cheese for which there ~~involved~~ a premium, over butterfat supplied to butter factories.

In the season 1929/30 there was a definite falling off in "payouts" from August to the following March, so that the average payout was definitely affected by the month at which cows were brought in. The average receipts per lb. of butterfat for each farm shows a definite correlation to percentage of the total annual butterfat supplied during the first, and the first two months. This fact largely accounts for the different average receipts pr.lb. of butterfat all through. Seven of the farms supplied one company and their monthly receipts per lb. were the same, and the other two cases had approximately the same average monthly payouts. (1). & (2).

(1). The amount of butterfat classified as (a), Superfine, (b), First Grade, and (c), Second Grade, also affects the payout per lb. butterfat, but there was practically no difference in this regard.

(2). Note, the above discussion of course involves that there are no extra costs, e.g. fertilisers, involved in bringing the cows in early, or that the extra return is greater than the extra cost. The present investigation does not cover these points.

It can be said that the lactation period broadly corresponds to the seasonal nature of the grass growth, which in turn is influenced by the weather, and by managerial ability. It appears that from both the technical and financial dides it has its advantages to have cows calve in August, rather than later.

QUALITY OF THE PRODUCT.

As has been pointed out, payments are made on the butterfat content of the product whether milk or cream, with a further adjustment of the quality of the product which is graded (a) Superfine, (b) First Grade, (c), Second Grade. Government regulations provide that superfine is to be paid at least ½d. per lb. more than first grade, and second grade, at least 1d. per lb. less than first grade. The object of these regulations is to stimulate the production of a high grdde product. Cream grading, which is carried out on receipt at the factory, has to do with colour, small, taste and cleanliness. The most usual defects are foody flavours and other odours due to dirty machines, i.e. separators or dirty cans and utensils. The regulations (vide chap. last III page 198), relating to hot water, are aimed at keeping machines and utensils clean. " Good milking machine practice can deliver the best quality milk; bad milking machine practice delivers the worst quality milk." (1).

Finally, home separated cream delivered to the factory usually contains between 40% and 50% by weight of butterfat. Regulations aiming at greater standardisation of the product, provide, that unless the cream contains 35% of butterfat, it shall be paid ½d. per lb. less per lb. of butterfat according to grade..

The general aim of the above is to produce not only a high class, but also a standardised product.

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(1). Quoted. Russell & Macklin op cit. page 18.

BUTTERFAT PRODUCTION PER ACRE.

It has been pointed out earlier (vide chap 3 Part III page 184), that butterfat per acre provides a better basis for a discussion of the efficiency of farm management, than does butterfat per cow. A farm carrying a fairly high number of moderately producing cows per 100 acres, is a more financially advantageous proposition that a farm with a few higher producers per 100 acres. In the following sections the factors affecting butterfat production per acre will be examined under the following headings:-

(a). Relation of area of farm to butterfat production per acre.

(b). Relation of production per cow to butterfat production per acre.

(c). Relation to size of herd to butterfat production per acre.

(d). Relation of cows carried per 100 acres to butterfat production per acre.

In the following chapter the relations of Fertilisers to butterfat production will be examined.

(a). Relation of the area of the farm to butterfat production per acre. Table No. 85 and Graph No. 6 showing for farms grouped according to area, the butterfat production per acre and per cow, will be found on the two following pages.

Table No. 85

TABLE SHOWING FOR FARMS GROUPED ACCORDING TO ACREAGE

(a) COWS PER FARM, (b) AVERAGE COWS PER 100 ACRES, (c) AVERAGE BUTTERFAT PER COW,

AVERAGE BUTTERFAT PER ACRE.

Acreage.	No.of Farms.	Average acreage.	Avge.cows per farm.	Avge.cows per 100 acres.	Avge.B'fat per cow.	Avge.B'fat per acre.
- - 19	2	14	6	42	300	128
20 - 29	15	26	17	67	256	174
30 - 39	18	34	21	60	226	135
40 - 49	45	46	25	56	252	139
50 - 59	88	52	29	56	217	139
60 - 69	69	63	35	56	246	138
70 - 79	73	73	42	60	237	137
80 - 89	82	83	43	53	253	132
90 - 99	72	94	49	53	245	130
100 - 109	130	101	51	50	239	121
110 - 119	30	114	57	50	254	128
120 - 129	58	121	59	48	230	112
130 - 139	44	132	65	50	239	117
140 - 149	39	142	64	45	237	107
150 - 159	56	151	69	45	242	110
160 - 169	24	162	74	45	253	116
170 - 179	16	173	86	50	239	116
180 - 189	19	181	77	43	218	93
190 - 199	11	191	73	40	246	94
200 - 209	25	200	88	43	229	101
210 - 219	5	211	79	37	239	89
220 - 229	6	221	93	42	232	98
230 - 239	3	233	98	42	225	94
240 - 249	6	241	109	45	234	106

TABLE CONTINUED.

Acreage.	No.of farms	Average acreage.	Avge. cows per farm.	Avge. B'fat per 100 acres.	Avge.B'fat per cow.	Avge.B'fat per acre.
250 - 259	5	250	98	40	234	92
260 - 269	3	261	86	33	258	86
270 - 279	1	270	77	29	216	62
280 - 289	6	280	82	29	261	77
290 - 299	-	-	-	-	--	-
300 - 399	15	318	119	37	220	82
400 - 499	3	471	105	22	228	51
500 - -	2	585	65	11	189	21

(a) Butterfat per cow
(b) Butterfat per acre.
on farms, grouped according to acreage.

Relation of the area of the farm to butterfat production per acre. Contd.

The following points emerge from the foregoing table and graph:-.

1. There is no definite observable relation between the size of the farm, and the butterfat per cow,
2. Since carrying capacity per 100 acres falls off steadily on farms over 120 acres - (vide chap. page), per acre production also falls off over that area.
3. In farms from 30 to 120 acres, the size of the farm has obviously a connection with per acre production.

Summing up, there is little causal connection observable between the size of the farm and per acre, or per cow production, over the majority of farms, but there is a connection between size of farms and density of stock. The density falling off as size increases.

Relation of production per cow to butterfat production per acre.

The following table shows for farms grouped according to butterfat per cow, the particulars as to average butterfat per cow and per acre.

No
186

TABLE SHOWING

FOR FARMS GROUPED ACCORDING TO BUTTERFAT PER COW

(a) Number of Farms
(b) Av. Cows per 100 acres.
(c) Av. Acreage.
(d) Av. Butterfat per acre.

No. of Farms	Av. Cows Carried	Av. Cows Tested	Av. Cows per 100 acres	Av Ac-age	Av. Br-fat per cow	Av. Brfat peracre
1	32	27	26	120	102	23
1	22	22	56	40	117	64
–	–	–	–	–	–	–
4	35	35	22	100	131	46
5	44	44	20	195	144	33
16	38	38	34	111	155	53
21	50	46	48	103	165	73
12	44	43	40	109	174	69
41	45	43	43	103	186	77
50	49	46	40	115	195	78
47	50	48	43	116	206	85
63	52	50	43	118	215	91
68	57	55	48	119	225	104
85	56	54	53	108	233	116
89	58	55	48	119	243	113
80	54	52	50	110	252	121
80	51	50	50	104	266	128
69	58	56	53	112	276	138
54	53	51	53	100	287	145
63	48	46	45	107	294	128
37	47	46	48	99	304	139
28	56	55	50	114	315	152
20	56	54	59	97	323	182
5	40	40	53	74	334	181
13	44	43	56	79	343	184
6	36	35	48	76	351	161
11	41	37	59	70	364	200
1	20	20	42	48	374	156
1	31	31	67	46	389	263
1	42	42	53	78	398	213
2	22	22	42	52	405	167

Butterfat per acre on Farms grouped according to Butterfat per cow.

Butterfat per acre (lbs)

Butterfat per cow (in lbs)

Butterfat per acre

0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400

An analysis of the foregoing table reveals the following:-

The median farm is in the 240 - 250 lbs. group, which is also the modal group. The interquartile range is from 210 - 280 lbs. per cow. These figures give some idea of the average production of cows of the area.

The following table relative to group herd testing in the Waikato, shows the progress in the past seven years of per cow production.

Table No. 87 TABLE SHOWING ASSOCIATION AVERAGE PRODUCTION PER COW IN THE SEASONS AS UNDER. (1).

Season.	Cows tested.	lbs. butterfat per cow.
1923/24.	31003	207.81
1924/25.	55745	227.52
1925/26.	56010	232.02
1926/27.	60507	255.49
1927/28.	72734 (x)	228.37 (x)
1928/29.	77591 (x)	244.89 (x)
1929/30.	90861 (x)	262.73 (x)

(x). Prior to 1927/28, the average is only for cows tested, since that date, the average has been for all cows.

It should be noted that this high figure is true of the Waikato only, the average figure for the Dominion of tested cows in 1930 was only 218.05 lbs. butterfat, but the same steady increase per cow production is visible.

Next it will be noted relative to Table No. 86 on the previous page, that cows per 100 acres increase as butterfat per cow rises, although with several breaks. However the general trend is upwards. This is quite striking, as one would expect a drop as cows per 100 acres increases. It probably means that heavier carrying capacity is associated with better pasture management.

Up to 330 lbs per cow , the size of the farm seems to bear little relationship to the production per cow.

(1). Table supplied by the New Zealand Herd Testing Co-op. Association.

After that the general trend of the acreage is downward. The probable explanation of this is that the higher producing cows are on the smaller farms where fieldwork is less, and consequently attention to the cattle is more detailed, and where an attempt is being made to offset small acreage, and hence smaller carrying of stock, by high producers. However, despite this exception it is broadly true to say that on over 96% of the farms there is no relationship evident between the size of the farms and the butterfat per cow.

The table shows a definite connection between increased per cow and per acre production. This connection is not so observable on farms over 350 lbs., per cow, but as they are less that 2% of the farms they do not affect the general trend.

Relation of size of herd to butterfat production per acre.

The following table shows the butterfat per cow, and per acre in farms grouped according to the size of the herd.

Table No. 88

TABLE SHOWING FARMS GROUPED ACCORDING TO SIZE OF HERD SHOWING AVERAGE BUTTERFAT PER COW and per acre

Size of Herd. Cows.	No. of farms.	Av. Cows.	Av. cows per 100 acres.	Av. acreage.	Average butterfat. per cow.	per acre.
- - 10.	4	6	24	25	235	60
11- 20	46	18	45	39	227	101
21- 30	135	22	34	63	240	99
31- 40	171	35	43	81	254	110
41 -50	170	45	45	99	242	111
51- 60	141	55	48	117	247	117
61- 70	90	63	48	131	261	125
71- 80	73	75	50	154	241	118
81- 90	58	85	52	164	245	116
91-100	26	95	50	188	222	113
101-110	28	105	56	192	241	132
111-120	14	115	48	239	247	115
121-130	4	126	50	255	215	106
131-140	1	132	67	200	186	123
141-150	-	-	-	-	-	-
151-160	4	154	56	272	199	113
161-170	1	170	48	350	207	101.

The modal groups in the above farms are in the 31 -40 and 41 - 50 groups. The mean farm is the 127th. in the group 41 - 50. The interquartile range is from 31 - 70 cows.

As the size of the herd increases, the cows per 100 acres increases, omitting herds of over 101 cows which comprise only 2% of the farms.

This is of interest as there does not appear to be a marked falling off in butterfat per acre. If the obviously exceptional case of the 101 - 110 group be omitted, the general trend of butterfat per acre to the 61 - 70 cow herd is upward and thence slightly downwards. This falling off might represent less personal attention to cows, as the general trend of per cow production follows that of per acre production fairly closely. This table seems to suggest that 48 cows per 100 acres is the most economical under present conditions, for both under and over that carrying capacity, the per cow production and the per acre production fall off, and the fall off in per acre production seems to be caused by a fall in cow

(b) Butterfat per head
(c) Butterfat per acre
on farms grouped according to size of herd.

production which more than offsets the advantage of increased carrying capacity. This of course may be due to the causes affecting personal attention to cows noted in the previous paragraph. Again it might represent the loss personal interest of the extra hired labour necessary in the larger herds.

As might be expected, the average acreage increases as the size of the herd increases. There is a fairly marked correlation between butterfat per cow and butterfat per acre, the maximum in each case is the herd group 61 - 70 cows. Both per cow and per acre production tending to fall thereafter to the 100 cows. Herds of over 130 cows show a distinct falling off per cow probably due to the loss of personal interest in cows in larger herds.

This whole table would suggest that there is an optimum size of herd consistent with maximum production per cow and per acre.

The optimum size is determined largely by personal interest in the cattle.

Relation of butterfat production to cows carried per 100 acres.

The following table shows the butterfat per cow and per acre in farms grouped according to cows per 100 acres.

Table No. 89

TABLE SHOWING FOR FARMS GROUPED ACCORDING TO NUMBER OF COWS PER 100 ACRES.

(a) BUTTERFAT PER COW & (b) BUTTERFAT PER ACRE.

Cows per 100 acres.	No. Farms.	Av. cows per 100 acres.	Av. acres per farm.	Butterfat. per cow.	Butterfat. per acre.
11 - 20	10	16.5	245	245.8	30.0
21 - 30	61	27.1	178.4	220.3	58.9
31 - 40	160	36.8	127.8	231.6	83.6
41 - 50	253	45.0	108.1	234.8	107.7
51 - 60	252	55.8	99.9	249.2	136.4
61 - 70	149	65.1	86.0	244.9	162.8
71 - 80	46	74.5	85.2	241.6	181.4
81 - 90	18	84.6	79.9	245.2	207.8
91 - 100	11	94.5	53.3	206.5	193.9

The modal group is the 41 - 50 and 51 - 60 group. That is to say, the modal average acres per cow is approximately two. The interquartile range comprise the groups 31 - 60 cows. This table shows that the heavier the stocking the smaller the average area of the farm, which fact implies a tendency to more intensive farming the smaller the area.

Butterfat per cow increases to the 51 - 60 cows per 100 acres, and then falls. It probably reflects the same fact as noted in the previous section, that the larger herds involve less personal attention to the individual cow, with a consequent falling off in per cow production, but the falling off is not very marked.

The marked correlation between the number of cows carried per 100 acres, and the butterfat per acre is the most striking fact of this table, and as butterfat per acre is most intimately connected with receipts, the ultimate advantage of high carrying is obvious. However the falling off in the 91 - 100 groups suggest that the point of diminishing returns has been passed. Another factor is of course that though heavier stocking is definitely connected with high returns, per acre, there may come a point when the ~~increased~~ outlay e.g. fertiliser, may offset any increased income which may result.

(6) Butterfat per acre on farms grouped according to cows per 100 acres

Summary on butterfat production per acre.

The following table groups farms according to butterfat per acre, and shows butterfat per cow, and stock per 100 acres in farms so grouped.

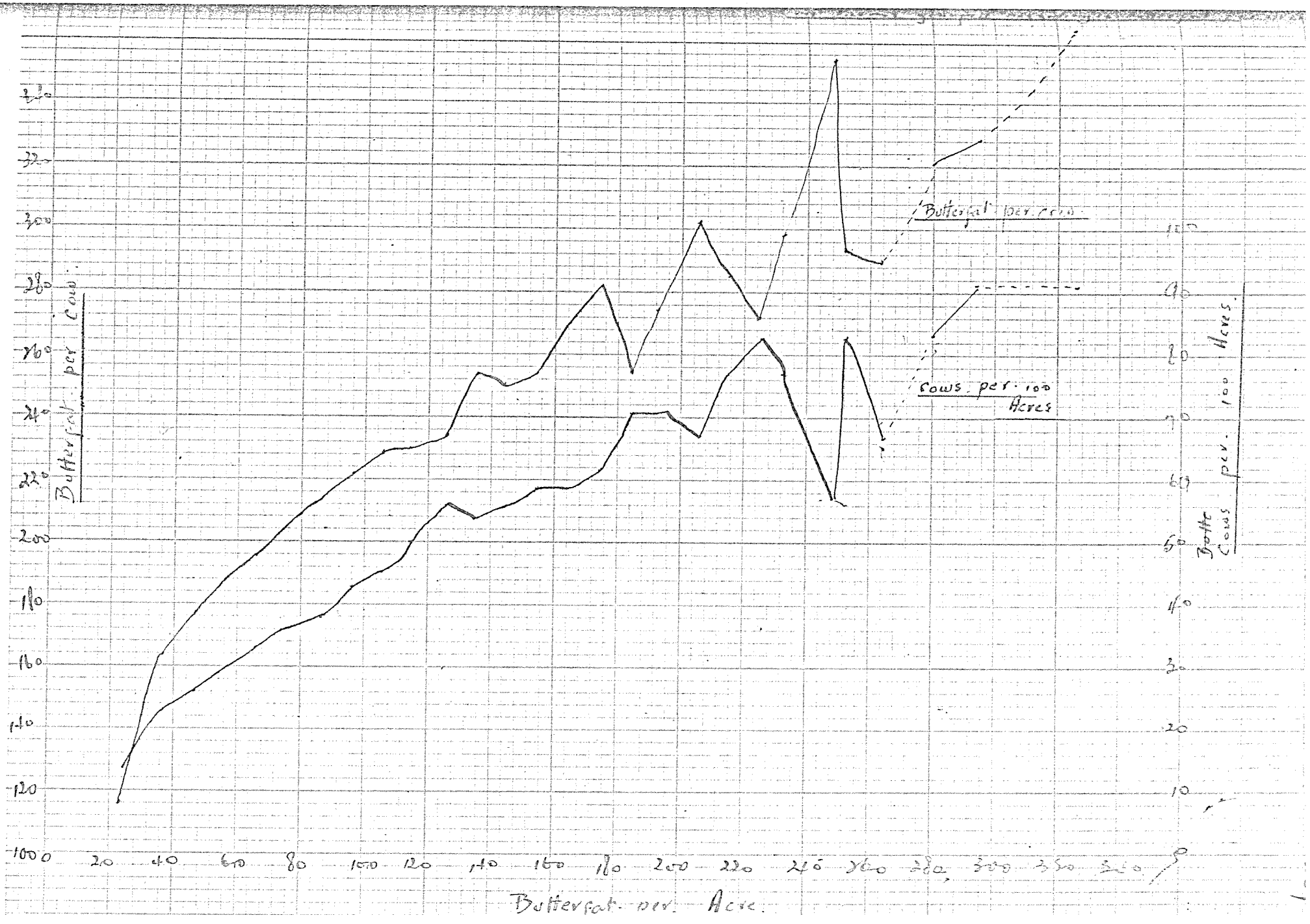
Table No. 90

TABLE OF FARMS GROUPED ACCORDING TO BUTTERFAT PER ACRE SHOWING AVERAGE BUTTERFAT PER COW AND AVERAGE COWS PER 100 ACRES.

Butterfat per acre.	No. of farms	No. cows per farm.	No. cows per 100 acres.	Avge. acreage.	Butterfat. per cow.	Butterfat. per acre.
- 30	5	42	14	305	116	22
30 - 39	6	42	23	186	164	36
40 - 49	22	44	26	170	178	46
50 - 59	26	42	29	147	187	53
60 - 69	13	48	33	145	196	65
70 - 79	57	49	36	136	203	73
80 - 89	62	47	38	122	215	85
90 - 99	82	57	43	119	222	96
100 -109	87	54	45	120	229	105
110 -119	77	49	50	98	230	115
120 -129	90	52	56	97	235	125
130 -139	82	54	54	102	255	136
140 -149	67	55	56	96	251	144
150 -159	57	55	59	93	255	155
160 -169	56	51	59	85	271	164
170 -179	34	57	62	93	283	174
180 -189	27	59	71	82	257	184
190 -199	30	67	71	96	275	192
200 -209	14	50	67	82	303	205
210 -219	13	55	77	73	287	214
220 -229	4	53	83	60	272	225
230 -239	6	50	77	66	299	232
240 -249	4	44	57	77	355	248
250 -259	2	60	83	77	293	251
260 -269	1	31	67	46	290	263
270 -279	-	-	-	-	-	-
280 -289	1	87	83	100	322	280
290 -299	3	45	91	50	329	294
300 -309	-	-	-	-	-	-
310 -319	-	-	-	-	-	-
320 -329	1	44	91	50	367	323

The modal group which contains the median farm is the 120 -129 lbs per acre group. The interquartile range is from 90 - 169 lbs per acre.

Omitting farms with only 200 lbs per acre, which represent only 5% of the total farms, there is a definite increase in the size of the herd with the increase of butterfat per acre, while this is associated with a fall in acreage. The combined effect of these two points is shown in the steady rise of cows per 100 acres as butterfat per acre increases.


Butterfat per Acre
Cows per 100 Acres
Butterfat per Cow
Cows per 100 Acres
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
Butterfat per Acre.

There is a definite correlation between butterfat per acre, and cows carried per 100 acres. This point was observed when the farms were classified according to cows per 100 acres. Another factor is the steady increase in per cow production as per acre production increases, which reinforces the point made in the section on butterfat per cow.

Summarising the above results there appears to be a causal relation between per cow production and per acre production, and between carrying of cows per 100 acres and per acre production, but there appears to be little if any casual relation bewteen the size of the farm and per acre production.

There appears to be some casual relation between the size of the herd and per cow production reflecting probably the personal attention given to the cow.

APPENDIX "A" TO THIS CHAPTER.

There has emerged from the above discussion a composite picture of the typical farming unit as follows:-.

Modal area, 100 - 109 acreage.
Modal butterfat per cow, 241 -250 lbs.
Modal herd, approximately 40 cows.
Modal carrying per 100 acres, approximately 50 cows.
Modal butterfat per acre, 120 - 129 lbs.

The above figures give a typical picture of the average farm today.

APPENDIX "B" TO THIS CHAPTER.

The following tables show the points on the nine farms in relation to the above discussion, or the factors influencing butterfat prdduction per acre. No deductions are permissable for two reasons, (a) The sample is too small and (b) The butterfat figures are " factory figures while the figures in the chapter are " test "figures which differ up to 10% increase over factory figures (vide section on herd testing, page 27).

Table No. 91

TABLE SHOWING.

(a) ACREAGE, (b) COWS CARRIED, (c) COWS PER 100 ACRES, (d) BUTTERFAT PER COW, (e) BUTTERFAT PER ACRE; ON THE NINE FARMS.

Farm No.	Acreage.	Cows Carried.	Cows per 100 acres.	Butterfat. per cow.		Butterfat. per acre
1.	299	102	34	200.8		68.69
2.	208	64	32	206.49		65.91
3.	101	45	42	260.09	x	109.59
4.	101	47	47	276.49	x	128.66
5.	101	45	45	264.58	x	117.89
6.	92	52	56	221.34		125.10
7.	92	41	45	220.44		98.45
8.	81	48	60	206.58		123.94
9.	67	2	30	254.39		76.3

Grouping the above according to cows per 100 acres, the three highest carrying of cows per 100 acres, represent the three highest per acre production. The next three in order of carrying capacity, are the next three highest per acre production. While the lowest three carrying capacity are the lowest three per acre production.

There seems to be no correlation between per cow production and per acre production, so that this may suggest that density of cows is a more important cause of high per acre production than per cow production.

Part. III. Chapter. IV

Relation. of. Fertilisers to Butterfat. Production.

RELATION OF FERTILISERS TO BUTTERFAT PRODUCTION.

In the present section it is proposed to examine if any relation exists between fertilisers and butterfat production.

(A). Farms classified according to area.

TABLE OF FARMS CLASSIFIED ACCORDING TO AREA SHOWING:-

(a) BUTTERFAT PER COW (b) BUTTERFAT PER ACRE

(c) PHOSPHATE PER COW. (d) PHOSPHATE PER ACRE.

(e) LIME PER COW. (f) LIME PER ACRE.

See next page.

Table No. 92

TABLE OF FARMS CLASSIFIED ACCORDING TO AREA SHOWING

(a) BUTTERFAT PER COW, (b) BUTTERFAT PER ACRE, (c) PHOSPHATE PER COW, (d) LIME PER COW,

(e) PHOSPHATE PER ACRE, AND (f) LIME PER ACRE.

Area.	No of Farms.	Butterfat per cow. lbs.	Butterfat per acre. lbs.	Phosphate per acre. cwts	Lime per acre. cwts	Phosphate per cow. cwts	Lime per cow. cwts
- - 19	2	300	128	2.0	2.0	5.0	5.0
20 - 29	15	256	174	3.8	1.6	5.6	2.4
30 - 39	18	226	135	2.4	2.2	4.0	3.6
40 - 49	45	252	139	2.6	1.8	4.6	3.0
50 - 59	88	247	137	2.8	1.0	5.2	1.6
60 - 69	69	246	138	2.8	1.4	4.8	2.4
70 - 79	73	237	137	2.6	1.4	4.6	2.4
80 - 89	83	253	132	2.6	1.4	4.8	2.6
90 - 99	72	245	130	2.6	1.4	5.0	2.6
100 - 109	130	239	121	2.6	1.2	5.0	2.4
110 - 119	30	254	128	2.2	1.8	4.4	3.4
120 2 129	58	230	112	2.2	1.0	4.6	2.0
130 - 139	44	239	117	2.4	1.2	5.0	2.2
140 - 149	39	237	107	2.4	1.2	5.2	2.6
150 - 159	56	242	110	2.0	.6	5.2	1.6
160 - 169	24	253	116	2.2	1.0	4.8	2.4
170 - 179	16	239	116	2.4	1.2	4.8	2.4
180 - 189	19	218	93	1.8	.6	4.2	1.6
190 - 199	11	245	94	2.2	1.6	5.4	2.2
200 - 209	25	229	101	1.8	1.0	4.2	2.2
210 - 219	5	239	89	1.2	.8	3.6	2.4
220 - 229	3	225	94	2.2	1.2	5.4	2.4
230 - 239	6	234	106	2.6	1.4	6.2	2.8
240 - 249	5	234	92	2.2	1.0	5.6	2.6
250 - 259	6	232	98	2.2	1.2	5.4	2.8
260 - 269	3	258	86	2.4	2.6	7.6	7.6

Contd.

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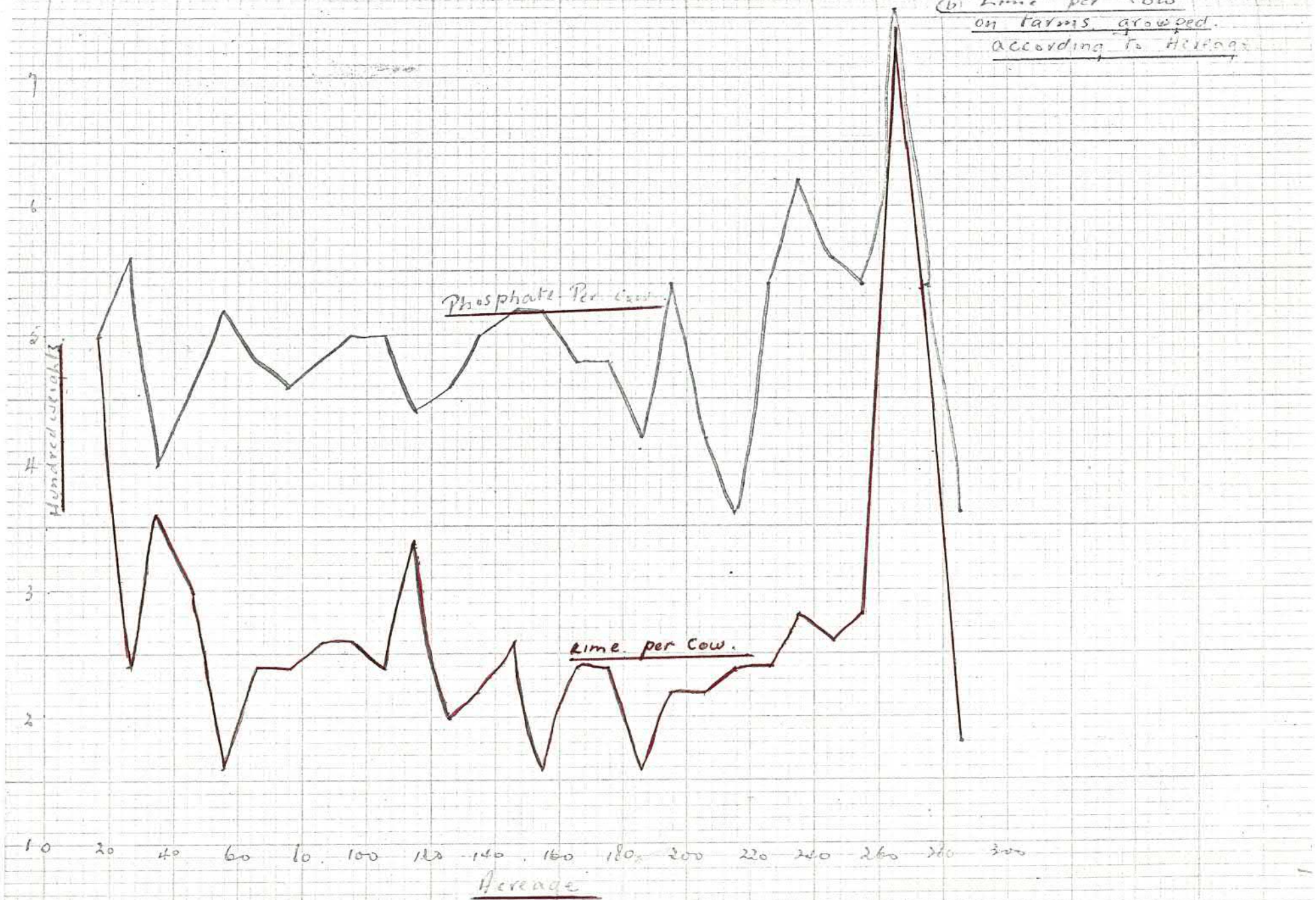
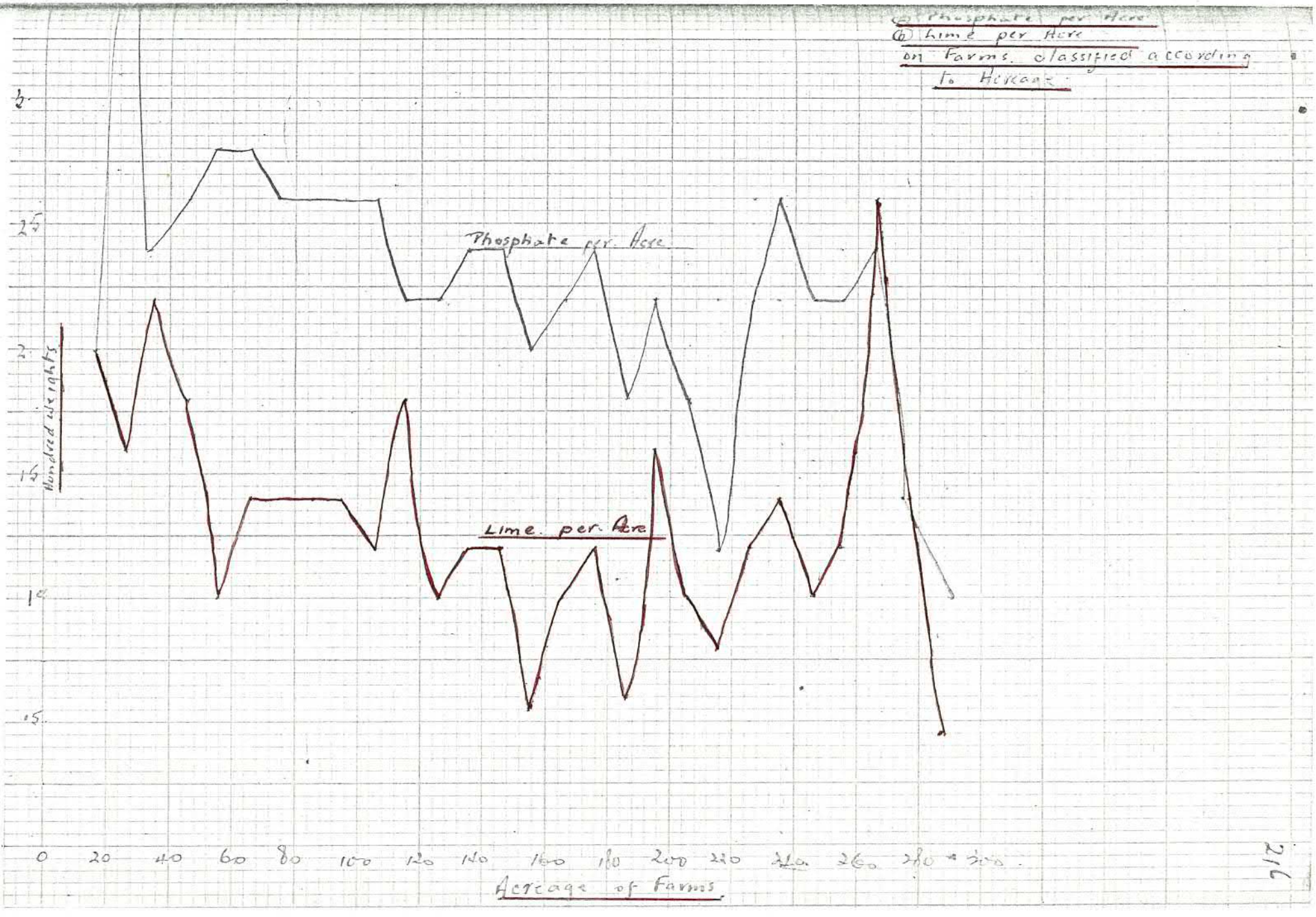
TABLE CONTINUED.

Area. Acres.	No of Farms.	Butterfat per cow. lbs.	Butterfat per acre. lbs.	Phosphate. Per acre	Lime. Per acre	Phosphate. Per Cow.	Lime. Per Cow.
270 - 279	1	216	62	1.4	1.4	5.4	5.4
280 - 289	6	261	77	1.0	.4	3.6	1.8
290 - 299	-	-	-	-	-	-	-
300 - 399	15	220	82	1.8	.8	5.0	2.0
400 - 499	3	228	51	.4	-	2.0	.0
500 - -	2	189	21	-	-	-	-

(b) Lime per cow on farms grouped according to Acreage



Ⓟ Phosphate per Acre
Ⓛ Lime per Acre
on Farms classified according to Acreage.



In the discussion on the size of farms (chap. Part II), and on the factors affecting butterfat production (chap. Part III), it was noted that smaller farms were associated with higher density of stocking, and that as this latter factor was a causal factor in the matter of high per acre production, the result was that smaller farms tended to be higher in per acre production, than larger farms.

Keeping the above facts in mind, two conclusions are deducible from the above table and graph Nos 11 and 12.

1. The actual quantity of phosphate and lime applied per acre tends to be greatest on the farms about 50 acres, and tends to fall thereafter. This would be an evidence of more intensive cultivation on the smaller farms, and would be of some significance in regard to the points noted in the previous chapter.

2. The amount of phosphate and lime per cow seems to bear very little relationship to the area, which of course bears out the argument of the previous paragraph. The above discussion would afford little, if any grounds for connection between product per acre and fertilisings. All that can be said from this table is that when farms are grouped according to acreage, the production per acre curve (see graph No) and the phosphate and lime per acre curves, all are inclined negatively.

Butterfat per cow table on the next page

Omitting the small items at each end of the table on the next page, which owing to the smallness of the sample are hardly typical, the general slope of the curves for phosphate and lime per cow respectively are both in a positive indicating that up to a point - about 330 lbs of fat per cow, increased production per cow is definitely associated with higher fertilising and liming - the trend is more positive in the case of lime.

Chap. Part III Page 198 indicated a definite correlation between per cow production and per acre production. The slope of both the phosphate and the lime per acre curves is positive, indicating some degree of correlation between butterfat production per acre and fertilising.

Table No. 93

TABLE OF FARMS CLASSIFIED ACCORDING TO BUTTERFAT PER COW

SHOWING (a) BUTTERFAT PER COW, (b) BUTTERFAT PER ACRE, (c) PHOSPHATE PER ACRE, (d) LIME PER ACRE, (e) PHOSPHATE PER COW, (f) LIME PER COW.

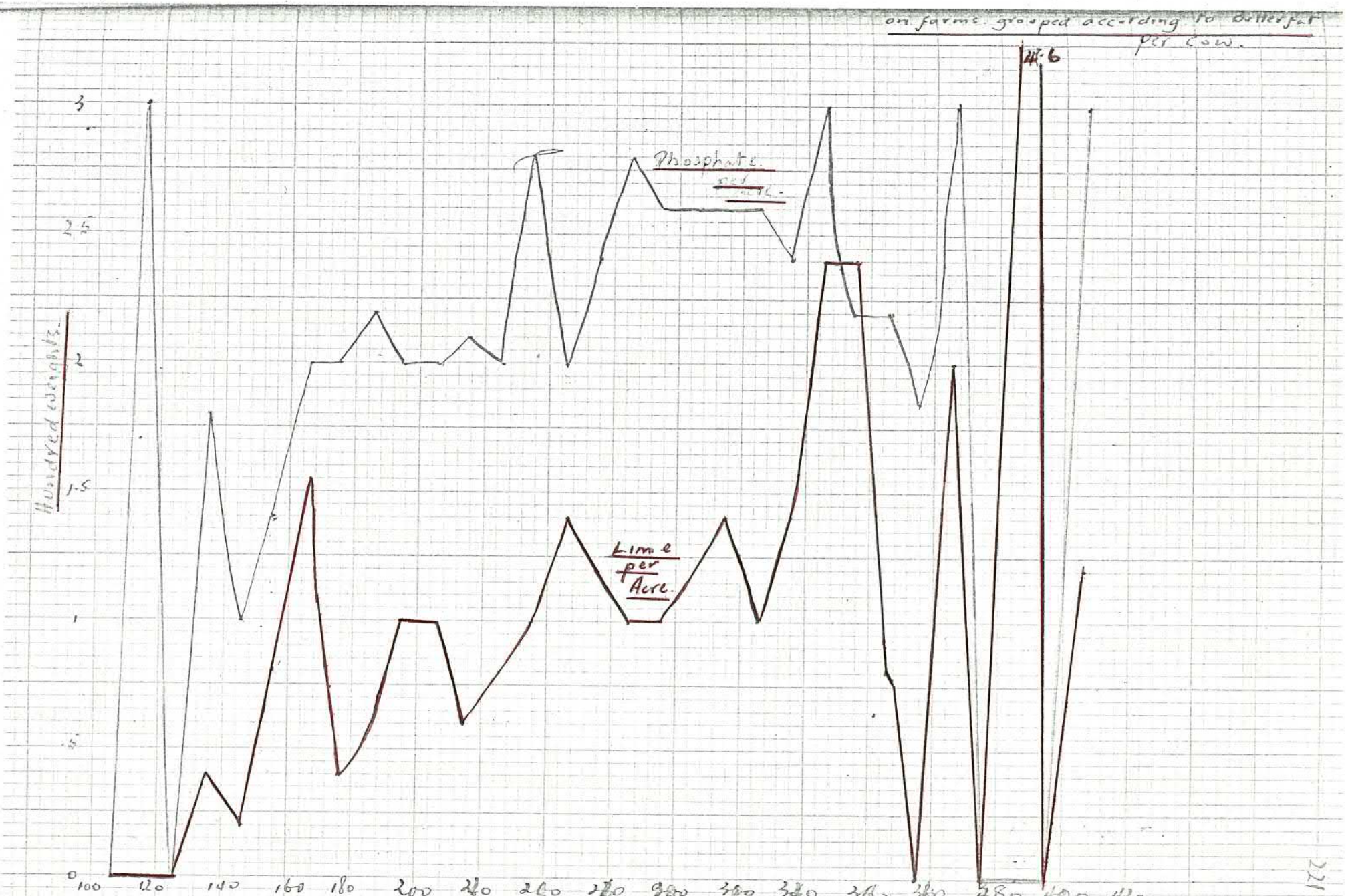
Butterfat per cow. lbs.	No of farms.	Butterfat per cow. lbs.	Butterfat per acre. lbs.	Phosphate. Per acre.	Lime. Per acre.	Phosphate. per cow	Lime. per cow
100 - 109	1	102	23	-	-	-	-
110 - 119	1	117	64	3.0	-	5.4	-
120 - 129	-	-	-	-	-	-	-
130 - 139	4	131	46	1.8	.4	5.2	.8
140 - 149	5	144	33	1.6	.2	4.2	.6
150 - 159	16	155	53	1.4	.8	4.2	2.0
160 - 169	21	165	73	2.0	1.8	4.0	3.6
170 - 179	12	174	69	2.0	.4	5.0	1.0
180 - 189	41	186	77	2.2	.6	5.2	1.6
190 - 199	50	195	78	2.0	1.0	4.6	2.0
200 - 209	47	206	85	2.0	1.0	4.4	2.4
210 - 219	63	215	91	2.1	.6	4.8	1.4
220 - 229	68	225	104	2.0	.8	4.4	2.0
230 - 239	85	233	116	2.8	1.0	5.0	2.0
240 - 249	89	243	113	2.0	1.4	4.2	2.6
250 - 259	80	252	121	2.4	1.2	5.0	2.4
260 - 269	80	226	128	2.8	1.0	5.4	2.0
270 - 279	69	276	138	2.6	1.0	4.8	2.0
280 - 289	54	287	145	2.6	1.2	5.0	2.2
290 - 299	63	294	128	2.6	1.4	5.4	2.4
300 - 309	37	304	139	2.6	1.0	5.4	2.8
310 - 319	28	315	152	2.4	1.4	4.8	2.6
320 - 329	20	323	182	3.0	2.4	5.0	4.2
330 - 339	5	334	181	2.2	2.4	4.4	4.4
340 - 349	13	343	184	2.2	.8	4.0	1.8

Contd.

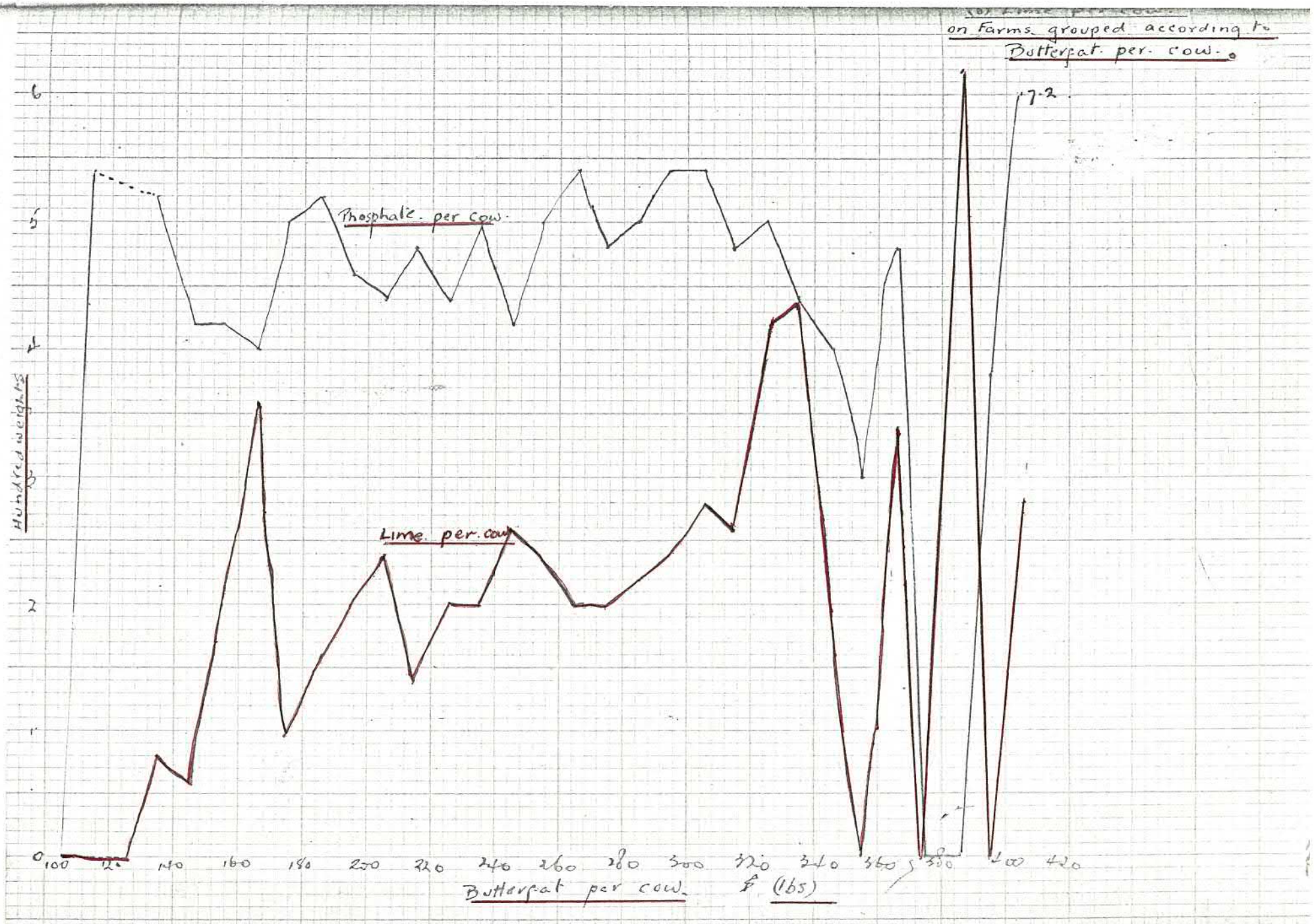
TABLE CONTINUED.

Butterfat per cow lbs.	No.of farms.	Butterfat per cow lbs.	Butterfat per acre lbs.	Phosphate. Per acre.	Lime. Per acre.	Phosphate. Per cow.	Lime. Per cow.
350 - 359	6	351	161	1.6	.0	3.0	.0
360 - 369	11	364	200	3.0	2.0	4.8	3.4
370 - 379	1	374	156	-	-	-	-
380 - 389	1	389	263	-	4.6	-	6.2
390 - 399	1	398	213	-	-	3.8	
400 - 409	2	405	167	3.0	1.2	7.2	2.8

on farms grouped according to butterfat per cow.



on Farms grouped according to Butterfat per cow.



FARMS CLASSIFIED ACCORDING TO THE SIZE OF THE HERD.

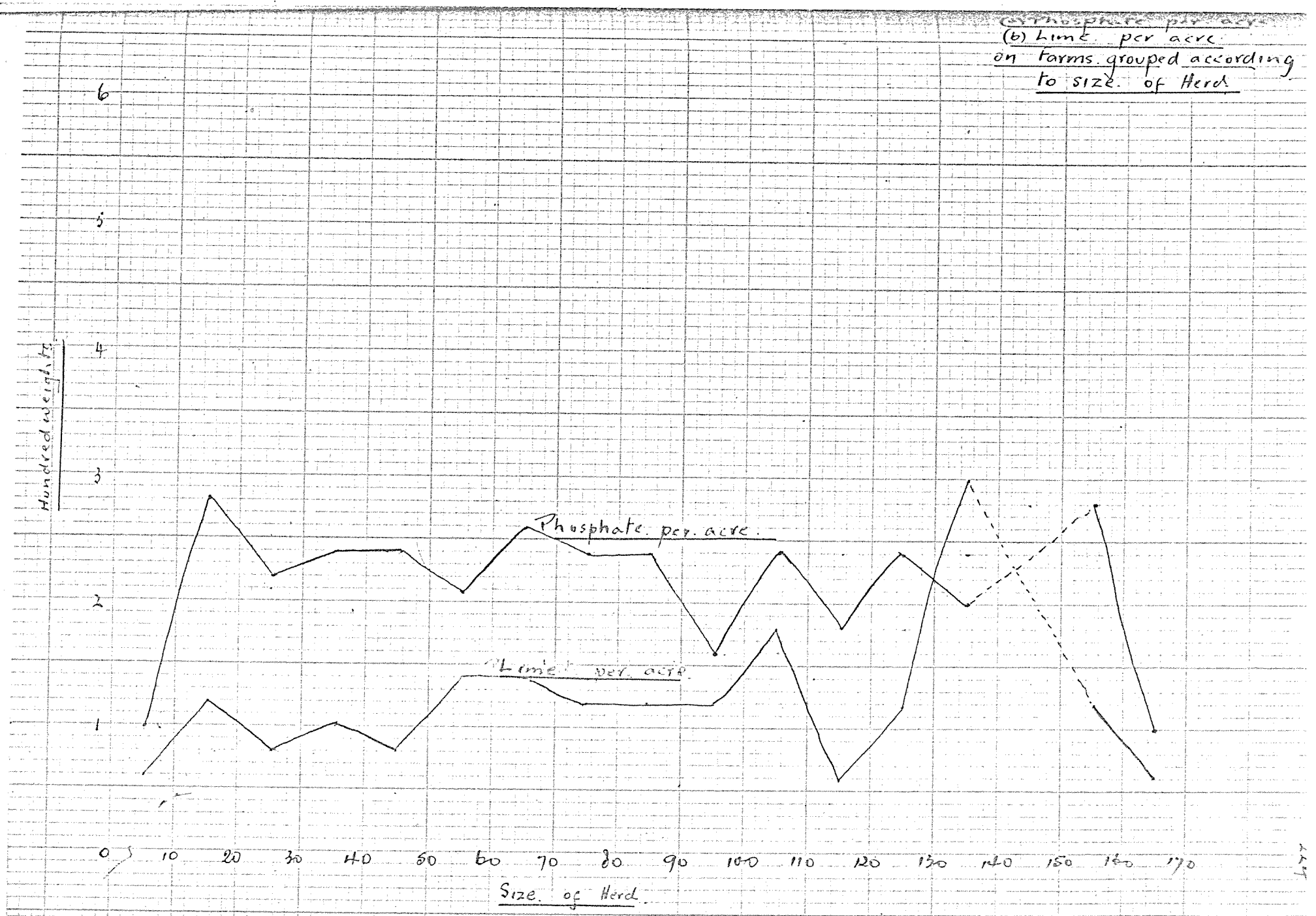
Table No. 94

TABLE OF FARMS CLASSIFIED ACCORDING TO THE SIZE OF THE HERD SHOWING :-

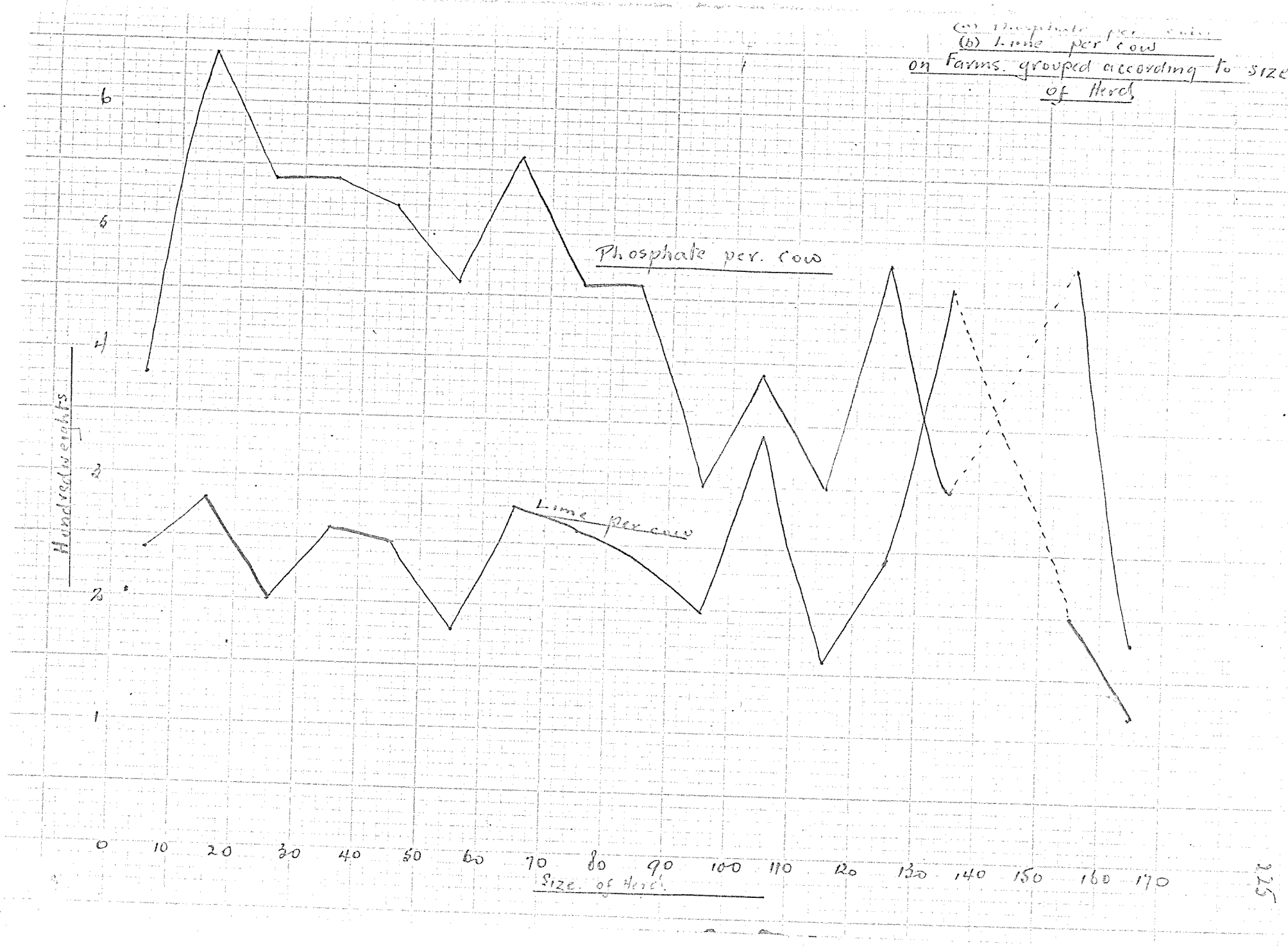
(a) BUTTERFAT PER COW
(b) BUTTERFAT PER ACRE
(c) PHOSPHATE PER ACRE
(d) LIME PER ACRE
(e) PHOSPHATE PER COW
(f) LIME PER COW.

Size of herd.	No. of farms.	B'fat per cow.	B'fat per acre	Phosphate. per acre	Lime. per ~~cow.~~ acre	Phos. pr. ~~ac.~~ cow	Lime. pr. cow
- 10	4	235	60	1	.6	3.8	2.4
11- 20	46	227	101	2.8	1.2	6.4	2,8
21- 30	135	240	99	2.2	.8	5.4	2.0
31- 40	171	254	110	2.4	1.0	5.4	2.6
41. 50	170	242	111	2.4	.8	5.2	2.5
51- 60	141	247	117	2.2	1.4	4.6	1.8
61- 70	90	261	125	2.6	1.4	5.6	2.8
71- 80	73	241	118	2.4	1.2	4.6	2.6
81- 90	58	245	116	2.4	1.2	4.6	2.4
91-100	26	222	113	1.6	1.2	3.0	2.0
101-110	28	241	132	2.4	1.8	4.4	3.4
111-120	14	247	115	1.8	.6	3.0	1.6
121-130	4	215	106	2.4	1.2	4.8	2.4
131-140	1	186	123	2.0	3.0	3.0	4.6
141-150	-	-	-	-	-	-	-
151-160	4	199	113	2.8	1.2	4.8	2.0
161-170	1	207	101	1.0	.6	1.8	1.2

(a) Phosphate per acre.
(b) Lime per acre
on farms grouped according
to size of Herd



(a) Phosphate per cow
(b) Lime per cow
on Farms grouped according to size of Herd



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This table as illustrated by the graphs, shows that there is little change observable in per acre application of phosphate and lime as the size of the herd changes. If there is any distinct movement, it is that lime per acre increases very slightly as the size of the herd increases.

The curve for phosphates per cow tends to be inclined negatively to 100 cows per herd, after which it is approximately steady. On the other hand there is a slight tendency in the case of lime for the curve of lime per cow to increase up to herds of 100 cows. The table on page 65 showed that for farms grouped in this manner that as the size of the herd increased, the area per herd increased. While up to herds of 100 cows the density of stocking tended to increase.

The tendedey for per cow production to fall off in herds of over 70, is counterbalanced by the falling off in phosphate per cow - this is probably an indication of over stocking. However it does reinforce the deduction made in the previous section relating to the connection between fertilising and per cow production.

That is to say that per acre application is a matter of custom, and change is not readily made although the size of the herd increases.

Table No. 95

FARMS CLASSIFIED ACCORDING TO COWS PER 100 ACRES.

TABLE SHOWING FARMS GROUPED ACCORDING TO COWS CARRIED PER 100 ACRES SHOWING:-

(a) BUTTERFAT PER COW.
(b) BUTTERFAT PER ACRE.
(c) PHOSPHATE PER COW IN CWTS.
(d) LIME PER COW IN CWTS.
(e) PHOSPHATE PER ACRE IN CWTS.
(f) LIME PER ACRE IN CWTS.

Cows per 100 acres.	No. of Farms.	Butterfat per cow.	Butterfat per acre.	Cwts pr.ac. Phos.	lime.	Cwts.pr.cow Phos.	lime
11 - 20	10	245.8	30	.6	.0	.48	.4
21 - 30	61	220.3	58.9	1.6	.4	1.52	1.2
31 - 40	160	321.6	83.6	2.0	1.0	1.56	2.4
41.- 50	253	234.3	107.7	2.4	1.2	.54	2.4
51 - 60	252	249.2	136.4	2.6	1.2	1.48	2.0
61 - 70	149	244.9	162.8	2.8	1.8	4.0	2.6
71 - 80	46	241.6	181.4	2.8	1.8	3.6	2.4
81 - 90	18	245.2	207.8	3.4	2.0	3.8	2.6
91 - 100	11	206.5	193.9	3.0	2.2	3.2	2.4
101 - 110	-	-	-	-	-	-	-

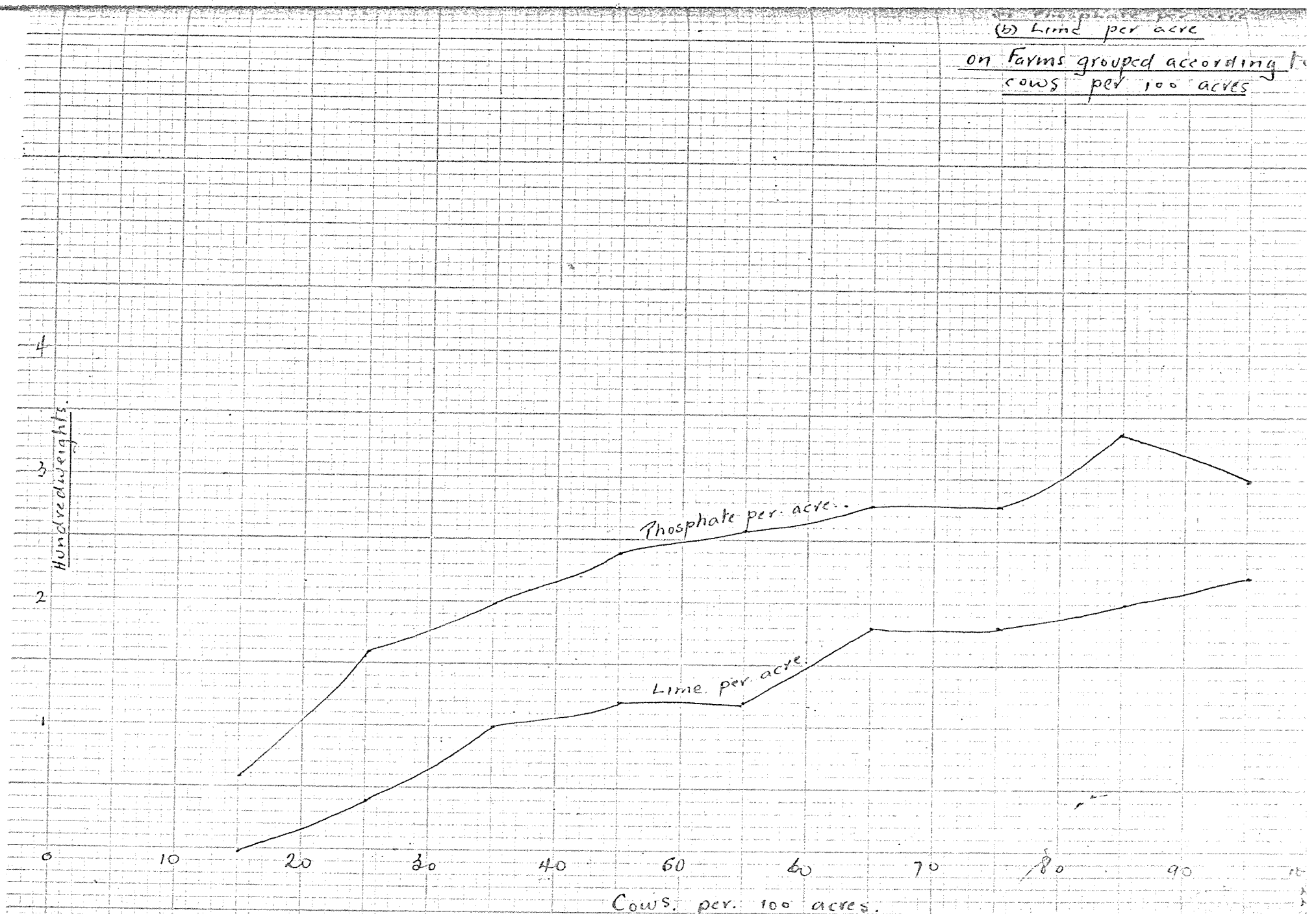
The distinct positive inclination of the phosphate and lime per acre curves indicate a positive correlation between amount of fertiliser and cows per 100 acres. When it is remembered that there is a close correlation between butterfat per acre, and cows per 100 acres, we can also say that this table and graph indicate a positive correlation between butterfat per acre and fertilisers per acre applied.

The negative inclination of the phosphate per cow curve is indicative of the fact that higher carrying of stock, although associated with higher per acre production, and hence higher financial gain, means also that the cost of fertilisers per cow is less as the density of the stocking increases.

This of course implies that the pasture is more efficiently used.

(b) Lime per acre

on Farms grouped according t
cows per 100 acres



(a) Phosphate per cow
(b) Lime per cow
on Farms grouped according to
Cows per. 100 acres

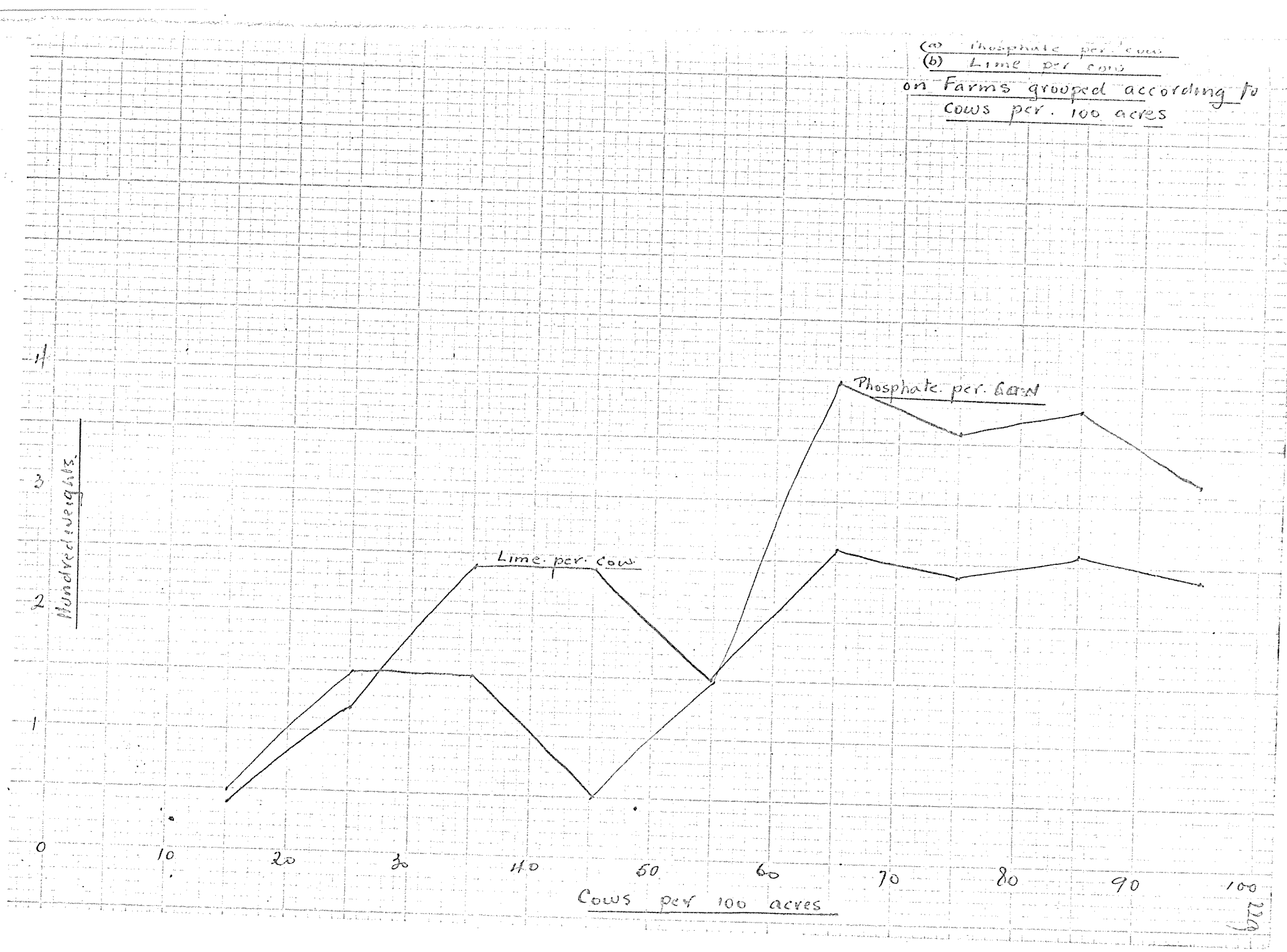


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Table. No. 96

TABLE OF FARMS CLASSIFIED ACCORDING TO BUTTERFAT PER ACRE SHOWING

(a) BUTTERFAT PER COW, (b) AVERAGE BUTTERFAT PER ACRE, (c) PHOSPHATES PER ACRE

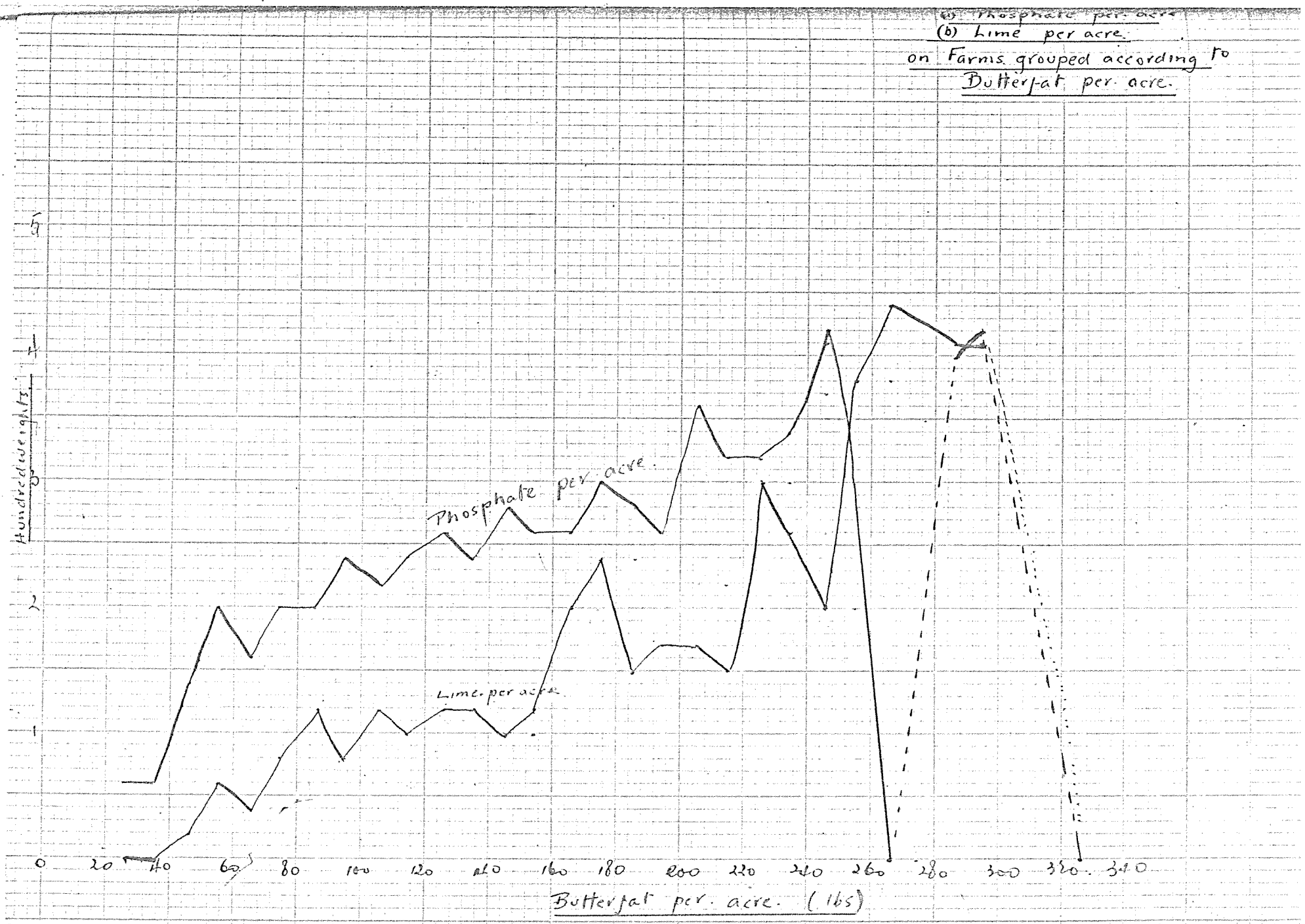
(d) LIME PER ACRE, (e) PHOSPHATES PER COW, (e) LIME PER COW.

Butterfat per acre.	No.of farms.	Butterfat per cow lbs.	Butterfat per acre lbs.	Phosphate.	Lime.	Phosphate.	Lime.
				Per acre.		Per cow.	
20 - 29	5	116	22	.6	.0	.4	.0
30 - 39	6	164	36	.6	.0	2.8	.2
40 - 49	22	178	46	1.4	.2	5.4	1.0
50 - 59	26	187	53	2.0	.6	7.0	2.2
60 - 69	53	196	65	1.6	.4	5.0	1.2
70 - 79	57	203	73	2.0	.8	5.8	2.2
80 - 89	62	215	85	2.0	1.2	5.0	2.8
90 - 99	82	222	96	2.4	.8	5.4	1.8
100 - 109	87	229	105	2.2	1.2	4.8	2.6
110 - 119	77	230	115	2.4	1.0	4.8	2.2
120 - 129	90	235	125	2.6	1.2	5.0	2.0
130 - 139	82	255	136	2.4	1.2	4.6	2.4
140 - 149	67	251	144	2.8	1.0	4.6	1.8
150 - 159	57	255	155	2.6	1.2	4.4	2.0
160 - 169	56	271	164	2.6	2.0	4.2	3.2
170 - 179	34	283	174	3.0	2.4	4.8	3.8
180 - 189	27	257	184	2.8	2.0	4.0	2.8
190 - 199	30	275	192	2.6	2.2	5.0	3.0
200 - 209	14	303	205	3.6	2.2	4.6	1.8
210 - 219	13	287	214	3.2	2.0	4.2	2.6
220 - 229	4	272	225	3.2	3.0	4.0	3.6
230 - 239	6	299	232	3.4	2.6	4.4	3.2
240 - 249	4	325	248	4.2	2.0	5.6	2.6
250 - 259	2	293	251	3.0	3.8	3.6	4.6
260 - 269	1	290	263	-	4.4	-	6.2

TABLE CONTINUED

Butterfat per acre.	No.of farms.	Butterfat per cow lbs.	Butterfat per acre. lbs.	Phosphate. Per acre.	Lime. Per acre.	Phosphate. Per cow.	Lime. Per cow.
270 - 279	-	-	-	-	-	-	-
280 - 289	1	322	280	4.0	2.8	4.6	3.2
290 - 299	3	329	294	4.2	2.0	4.6	2.2
300 - 309	-	-	-	-	-	-	-
310 - 319	-	-	-	-	-	-	-
320 - 329	1	367	323	-	-	-	-

(a) Phosphate per acre
(b) Lime per acre
on Farms grouped according to Butterfat per acre.



(b) Lime per cow on farms grouped according to Butterfat per acre.

Phosphate per cow

Lime per cow

Hundredweight

6
5
4
3
2
1
0

20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320

Butterfat per acre (lb)

The very definitely positive inclination of the phosphate and lime per acre curves confirm the conclusion noted above of the positive correlation between phosphates and lime applications and butterfat production per acre.

Again phosphates per cow shows a falling tendency while the graph of the lime per cow curve is slightly positive. The higher the butterfat production per acre, the lower is per cow fertilisers.

This last point is further illustrated by the following table which shows the application of fertilisers per lb of butterfat produced.

Table No. 97

TABLE SHOWING NUMBER OF POUNDS OF FERTILISER TO EACH POUND OF BUTTERFAT PRODUCED ON FARMS GROUPED ACCORDING TO BUTTERFAT PER ACRE.

Butterfat per acre range.	pounds Phosphate per lb. butterfat.	pounds Lime per lb. butterfat.
- - 30	.29	-
31 - 40	1.91	.19
41 - 50	3.44	.67
51 - 60	4.22	1.36
61 - 70	2.80	.65
71 - 80	3.22	1.26
81 - 90	2.63	1.09
91 - 100	2.72	.92
101 - 110	2.31	1.24
111 - 120	2.31	1.06
121 - 130	2.33	1.00
131 - 140	2.08	.81
141 - 150	1.68	.86
151 - 160	1.77	1.29
161 - 170	1.77	1.29
171 - 180	1.92	1.49
181 - 190	1.69	1.26
191 - 200	2.07	1.27
201 - 210	1.77	.67
211 - 220	1.63	1.05
221 - 230	1.62	1.49
231 - 240	1.46	.12
241 - 250	1.98	.86
251 - 260	1.37	1.73
261 - 270	1.60	1.85
271 - 280	-	-
281 - 290	1.60	1.12
291 - 300	1.57	..75

The steady falling off in lbs of phosphate per lb. of butterfat produced as the total butterfat production per acre rises, is an indication of the relative financial advantage of high butterfat per acre. Unit costs of production in term of fertilisers at least, fall off, as would also unit costs of field charges.

There is no definite trend in the unit costs of lime the inclination if anything being slightly positive over the whole length of the curve suggesting a positive correlation between between per acre production and lime applications.

latter
Insofar as the/tendency is apparent it would offset any advantages which might accrue to lower phosphate applications as noted in the previous ~~chapter~~ paragraph. However as the tendency is not so marked, and as lime is only about 25% of the cost of phosphates, the offsetting would not be great.

No good purpose would be served by any similar tables for farms grouped otherwise, as the correlations are very indistinct.

To sum up this chapter, the following conclusions have appeared relative to per acre and per cow application of phosphates and lime:-

1. As the area increases, phosphates and lime application per unit of area, decrease. This is associated with a lower density of stock, as the area increases. It indicates more intensive farming on smaller areas.

2. There is a slight relationship between phosphates per cow, and per cow production, while there appears to be a fairly positive relation between lime per cow and per cow production.

3. Where farms are grouped according to size of herd, it seems to indicate a certain customary element in per acre application of fertilisers.

4. There is a distinct positive correlation between cows per 100 acres, and phosphate and lime per 100 acres. Heavier stocking is associated with heavier manuring, which also warrants the statement - since heavier stocking is associated with heavier per acre production - that heavy per acre production is associated with heavy per acre manuring.

5. Butterfat production per acre is definitely connected with the heavinsss of per acre manuring..

Part III Chapter V
The Herd-Testing Movement.

THE HERD TESTING MOVEMENT.

While the herd tesing movement is a subject rather outside the scope of famm organisation, it is so important thereto as to necessitate a brief discussion of it.

Cow testing originated in Denmark, and that country is still the most forward in this movement. " Out of 1,184000 dairycattle in that country in 1922, 250000 or 20% were under test." In 1909 the Department of Agriculture in conjunction with the suppliers of the Dalifield Dairy Co. in the Wairarapa, inaugurated "cow testing" in New Zealand. Under this system, generally known as the Association system, the milk samples and weights were taken by the milker and sent to a factory for testing. From 815 cows in 1909/10, the number increased in 1913/14 to 25,000 cows.

While the association system was very valuable, it is obvious that for comparative purposes, whether in comparison of herd with herd, or district with district, the wide diversity of methods of taking samples, together with the personal element in the sampler, make it necessary to treat the records under this system with care.

In 1922, after the serious slump in dairy produce prices, the minds of the bodies of farmers were exercised as to methods of counteracting low prices by greater production. The Farmers Union, meeting in Hamilton in that year, decided to inaugurate a system of "group herd testing" similar to that which had been in operation in Australia for some years. Under this system, a group consists of approximately 27 herds, and once every month the herd is visited by a herd testing official who weighs and takes a sample of the milk of each cow at two consecutive milkings, night and morning. The samples are tested generally at a nearby factory, but sometimes on the farm. The independence of the herd tester makes for comparability of figures, or between herds and districts.

The groups are, for administration purposes, under the control of a central association for the district or

company. For instance, the New Zealand Co-Operating Herd Testing Association, has over 70 groups operating in the 1930/31 season. This is the largest association in New Zealand.

The group system has spread very widely although it is much more prominent in the North than in the South Island. In 1925, 14.5% of the dairy cows in the North Island as opposed to 2.3% cows in the South Island were tested. (1). Since that date the South Island figure has much improved. In 1926, a Dominion Federation of Herd Testing Associations was formed for the purpose inter alia of:- —

1. By systematic and efficient herd testing, to improve the standard of dairy cattle by,
   (a) marking and registering calves,
   (b) elimination of unpayable cows and scrub bulls,
   (c) encouraging the use of pure bred bulls found in best butterfat records.
2. To standardise group herd testing methods.

The State has taken cognisance of this Federation and subsidised its administration. In addition, heavy subsidies have been made through it to group herd testing associations.

In addition to the above semi-official testing for certificate of record is carried out under the direction of the Department of Agriculture. However, this is of small importance and is availed of by pedigree breeders only.

The following table shows the development of the herd testing movement.

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(1) Russell and Macklin, op cit loc cit.

Table. No. 98

TABLE SHOWING COWS TESTED IN THE SEASONS UNDERMENTIONED.

Season	Association	Group	Total Cows Tested.	Total Cows in N.Z.	Per cent Tested.
1909-10	815	-	815	583,163	.14
1921-22	45,564	-	45,564	1137,055	4.00
1922-23	77,325	7,500	84,825	1,248,643	6.79
1923-24	108,070	43,144	151,214	1,312,588	11.52
1924-25	96,795	100,055	196,850	1,323,432	14.87
1925-26	64,549	102,227	169,776	1,303,856	13.02
1926-27	60,323	109,827	170,150	1,303,225	13.05
1927-28	59,520	164,610	224,130	1,352,398	16.57
1928-29	47,114	212,480	259,594	1,371,063	18.93
1929-30	41,043	242,688	283,731	1,440,321	19.69

~~Dry Years~~.

"Herald" June 12th 1931, and statistics of main features of Primary Industries of N.Z. Dept. Ag. p.15.

The fivefold increase in the percentage of cows tested over the past Nine years is of particular interest when compared with ~~the~~ undermentioned No... table showing the increase in per cent production.

Table No 99 TABLE SHOWING BUTTERFAT YIELD PER COW FROM COWS TESTED IN THE UNDERMENTIONED SEASONS.

Season	Butterfat Production per Cow. lbs.
1909-10	148.45
1921-22	174.97
1922-23	180.62
1923-24	174.10
1924-25	182.09
1925-26	179.40
1926-27	198.50
1927-28	195.38 x
1928-29	210.84
1929-30	218.05 x Dry Year

Compared with the above figures the figures of the N.Z. Co-op. Herd Testing Association, Hamilton, which is the largest Group System in N.Z. and confines its attention practically solely to the suppliers of the N.Z. Co-op. Dairy Co. Ltd. is important.

Table No. 100

TABLE SHOWING EXTENT OF THE OPERATIONS OF THE NEW ZEALAND CO-OP FEED TESTING ASSOCIATION IN THE WAIKATO FOR THE SEASONS 1922/1931.

Season.	Groups.	Herds.	Cows tested	lbs. fat.	Days.	Cows.
1922/23	6	157	6900	-	-	-
1923/24	25	630	31003	207.81	237	31003
1924/25	45	1728	58308	227.52	238	55745
1925/26	49	1336	57756	232.02	244	56010
1926/27	52	1432	68732	255.49	250	60507
1927/28	59	1570	76697	228.37	241	72734
1928/29	63	1712	80826	244.89	255	77591
1929/30	71	1844	94085	262.73	260	90861
1930/31	70	1738	95832	243.94	258	91782

On the justifiable assumption that only cows of the suppliers of the New Zealand Co-op Dairy Co. Ltd. are tested, - which is not absolutely true in the last two years - the following percentage of cows tested to total cows able to be tested, is of interest in comparison with the table on the previous page relative to the percentage of total New Zealand cows tested.

Table No. 101

TABLE SHOWING PERCENTAGE OF COWS TESTED TO THOSE ELIGIBLE FOR TEST IN THE NEW ZEALAND CO-OP. FEED TESTING ASSOCIATION.

Season.	Percentage.
1923/24.	15
1924/25	26
1925/26	26
1926/27	26
1927/28	30
1928/29	29
1929/30	29

A comparison of the figures in the above table with those for New Zealand as a whole, (see previous page), would suggest that the Waikato area tends to be much above the average

It should be noted here that besides the New Zealand Co-operative Herd Testing Association, which is, as has been stated more or less a subsidiary of the New Zealand Co-operative Dairy Co., it is the aim of the smaller Co-operative dairies as well as the Proprietory Dairy Company operating in the Waikato, to operate group herd testing as part of their competition for supplies. Hence though the figures of percentages given above are probably higher than for the whole of the Waikato, yet it is a well known fact that herd testing is more supported in this area than the rest of New Zealand.

The effect of herd testing on per cow production can be illustrated from the above table relative to the N.Z. Co-Op. Herd Testing Association. The per cow average of 243.94 lbs. fat in 1929/30as compared with 207.81 lbs. in 1923/24, does not reflect the whole story, as the number of cows tested was nearly three timesas large. Further1930/31 was an unsatisfactory season climatically ~~altogether~~, which militated aganist higher returns. The figure for 1929/30 was 262.73 lbs per cow being an increase of 55 lbs per cow in six years. The following extract illustrates the progress throughout the Dominion.

" It is interesting to note that the increase over the first 16 years (1909/10 to 1925/26), amounted to 30.95 lbs of butterfat per cow. For the past four years the increase has been 38.65 lbs a cow, a really phenomenal improvement. That increase over the 20 year period has been approximately 70lbs. The butterfat figures are for all cows in milk, and dry, the average for tested cows in the 1929/30 season was 253.61 lbs per cow." (1)

The praise for the whole of the progress cannot be allotted to herd testing, but herd testing has undoubtedly been an important factor in revealing the need for and in stimulating herd improvement.

An example of payments for herd testing is that of The N.Z. Co-op Herd Testing Association which is as follows:-

Herds of 50 cows and over.....£5. plus 3/- per cow
Herds of under 50 cows.....£2/10/- plus 4/- per cow.

(2)

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(1) Extract from the New Zealand Herald, 12th June 1931.

(2) For foot note 2, see bottom of next page.

The principle of herd testing is roughly as follows:-

The testing Officer tests once a month, during the lactation period of the herd. This test includes two consecutive milkings. On the basis of this sample the monthly per cow and per herd production of butterfat is worked out in the herd testing Office, and forwarded to the farmer monthly. At the end of the year, the production of each cow and for the herd for the lactation period of this herd is forwarded to the farmer.

This method of sampling involves a very large probability of error due to:-

(a) Differences in feeding during the months.
(b) Differences in weather conditions.
(c) Differences in treatment and in milking
(d) Physiological change in the cow, e.g. due to menstruation periods and health.

However over a very large sample the differences from the factory returns of butterfat are fairly constant, and are due to the above four cases relative to the probable error in the sampling, in addition to which are :-

(a) Separator ~~basic~~ losses
(b) Milk and cream for the house
(c) Milk for calves.

Statistics of main factors of primary industries of N.Z.- table 13 - put this loss down at 2%, but general opinion, based on a comparison of herd testing figures with factory returns, would suggest that this figure of 2% is too low, and the real figure varies from 2% to 5% in general, while cases are in evidence of losses being higher.

The importance of the principle of centring herd testing round particular factories lies in the fact that factory administration is thus definitely linked with herd improvement.

Footnote (2) from previous page.

1. In 1931/2 this is reduced 33 and 1/3rd on a/c of depression. (b). Government subsidy amounts to approximately 10%
2. Dairy Control Board subsidy amounts to approximately 10.%
3. Associations' own subsidy is 2/3rds%, making 33 1/3rd% in all
   Government subsidy approximately as above, has been in evidence for several years.

The value of herd testing lies not only in the fact that it enables the farmer to realise cows which are poor producers, and which should therefore be culled, but it also indicates which calves should be kept for herd replacement.

Type and colour, have in the past been the determinants of the calves kept. Herd testing enables a more scientific approach to this subject, and hence should result in grading up of herds considerably,. Again the the competitions sponsored by the various associations as to the highest herd, the highest group, and so on, have resulted in a greater attention to stock, both as to pasturing, and as to general handling in the sheds. Stripping is taken much more seriously, and the general attitude to the cow is much better. There is a competitive spirit, and a keen desire to help the good cows and a good herd. Further, testing is in the long run, a test of the quality of the bull and so herd testing will aid towards the movement for Butterfat Backed Bulls. Not only does testing provide a monthly audit of the dairy stock, but it also inculcates the business principle into farm management, and undoubtedly aids in more efficient management.

In conclusion, one of the avenues of profitable improvement in dairy farm management is that of the improvement of per cow production. Herd testing by affording a scientific elimination of the unsatisfactory cows, and a further basis for satisfactory herd replacement, has aided considerably in this direction in the past, and has great potentialities in the future. Herd testing provides one of the means towards a more efficient dairying industry. (1)

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(1) Sources of the above:- 1. "Dairy herd testing for yield" Singleton Bulletin, Department of Agriculture 1925.
2. Returns and annual reports of N.Z.C.O-Op Herd testing Assen. supplied by [illegible] Ward, Secretary.
3. Literature of Dominion Group N.Z. Federation, supplied by Mr. C. H. Lowe, Dominion Supervisor.
4. Articles in various issues of the "Dairy Farmer" (Monthly mag.)
5. Articles in N.Z. Herald (Daily, Auckland), various date.
6. Articles in Waikato Times (daily Waikato paper) various data.
7. "Intensive dairying in N.Z. and Wisconsin", Russell and Macklin Bulletin 377, 1925. of University of Wisconsin.
8. Statistics of Main Features of Primary Industries of N.Z." issued by Economics section of the Department of Agriculture.

Part. III Chapter. VI

Calf- Marking

CALF MARKING.

A movement which has arisen out of the herd testing operations is the desire to give some standard and some certification to proved cows and to the progeny of proved cows. The difficulty which the purchaser at auction is under in endaevouring to purchase cows for his herd, is well illustrated by the following incident. (1) " Such purchases are usually made on type, shape, and general appearance."

The N.Z. Co-op. Herd Testing Association organised a competition at the Mata Mata Summer Show in 1931. The competition was to judge, (a) The order of merit in terms of production of each of five cows, and (b) The butterfat production of each of the five cows. Competitors were told the average for the five cows for the first 200 days of the lactation period. Ninety nine farmers took part and no single person guessed the correct order of merit, only seven competitors placed the first three cows in the correct order. It is interesting to note how wide of the mark most of the entries were. Of the 99 competitors who took part only 7% placed the first three cows in their correct order; 14% placed the first two cows in their correct order; 22% picked the highest cow; 18% considered the highest cow was the poorest producer; 23% considered the poorest producer the highest cow. It is also interesting to note the fate of the highest producing cow, which was selected as the worst cow by 18% of the competitors. The poorest producer was considered the highest by 23%, while only 7% placed this cow in her correct order at the bottom of the list.

The above incident is related to show the practical impossibility of forming a correct guess of the production capabilities of a cow from mere appearance.

Cows which are culled from one herd, are frequently bought in by another herd, mainly on appearance. This is wholly undesirable, and a system of "cull" cow drives has been instituted but has received little support. Such cull cows are driven to the abbatoirs. As a part of this movement

(1) Extract from " Dairy Farmer", March 1931.

cull cows are branded with a distinctive brand. This movement is negative, and has little support.

The marked calf movement has not had the support it deserves. The original principle was that heifer calves from pedigree sires out of dams of a given standard of butterfat production, by herd testing, were eligible for marking. The weakness of the system was that pedigree bulls were accepted because they were pedigree, and not because of proved production capacity. Since 1931 calves are eligible for marking only if they comply with the following conditions:-

1. From pedigree sires whose dams have, under group herd testing, in not more than 305 days have produced the following quantities of butterfat; as a two year old, 250 lbs of fat plus 1/10th lb butterfat for each day of age after two years. This standard equals:-

   as a two year old.....250lbs.
   " three " 287
   " four " 323
   " Five " 360

   Under Certificate of Record test - 365 days test - (semi official testing) the standards are:-

   as a two year old.....275.5lbs
   " Three " 287
   " Four " 348.5
   " Five " 385

   This of course involves the registration of pedigree sires, not only in the Herd Books of the pedigree Associations, but also in the books of the Herd Testing Office, of which calf marking in an adjunct. Another implication is of course, the testing of all pedigree cows from which pedigree sires are likely to come.

2. Dams must have minimum record under group herd testing as under (in a 305 days period).

   Not more than 2yrs and 6mths at beginning of best 250 lbs. fat
   Not more thann3 yrs and 6 mths at beginning of best 275 lbs fat.
   After 3 yrs and 6 mths, 300 lbs.

However testing must have been (a) in the season prior to calves' birth, in which case, calf is eligible for marking at birth, or (b) in season after calf's birth, in which case the calf is eligible as soon as the dam qualifies.

The new regualtions as outlined above, provide not only for a pedigree sire, but a pedigree sire of stock proved for butterfat production, as well as a proved dam. The provision regarding the butterfat backing of the sire, is

important, as pedigree stock has been sold mainly on type rather than production. Calves and pedigree sires of proved butterfat production are marked, registered, and certificated.

In the two organised sales, the prices for marked heifer calves has been 50% over unmarked calves. Sales of marked calves are largely subject to private control.

The importance of this movement as aiding in herd improvement is enormous, and though it is as yet in its infancy, it is safe to say that in a year or two, only marked calves will be saleable for dairy herd purposes. The educational as well as stimulation value of the movement is also of importance.

Both these movements - calf marking, and herd testing out of which calf marking sprung - are two of the finger posts on the highway of the progress of dairying.

Part IV

Financial Organisation

Part IV Chapter 1

Methods of Financial Organisation.

METHODS OF FINANCIAL INVESTIGATION.

Mr. F.L. McDougall, in a preface to a brochure entitled " The Survey method of Research - Farm Economics " by J.P. Maxton, says, " Efficient farm management is ultimately dependent on a knowledge of the economics of the industry. The knowledge can only be built up by a careful and continuous analysis of reliable detail. Great importance attaches therefore to the study of the method by which research of this kind is carried out." The various methods which are adopted in different places to investigate farm management are :- (1).

1. COST ACCOUNTING. In this method detailed accounts (2) are kept not only of the financial affairs of the farm as a whole, but of the distribution of the expense, and labour both of man and machine, over the various branches of farming.

Very full and detailed knowledge is recorded of every phase of farm management. Obviously the method involves considerable time, and considerable ability, even for one farm. Where the method is used as a basis of research into farm conditions, the intensiveness of the survey renders it that only a very small number of farms can thus be investigated.

2. THE FINANCIAL METHOD. In this method the investigator keeps financial accounts on any recognised system for a number of farms. The work involved is much less than that of keeping costs accounts, and as a consequence, the information gained is less than that given by cost accounts.

On the other hand a much larger range of farms can be covered, and hence there is a greater possibility that such information as is gained is more likely to be free from bias than under the former method. " The importance of this method in providing information upon the condition of farming as well as certain useful facts relating to capital investment labour, etc., need not be emphasised. (3).

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(1). See Martin op cit. pages 9/10.
(2). See King, " Cost accounting applied to agriculturelpassim
(3). Martin op cit. page 9.

King seems to suggest that financial accounts have no relation to quantity of produce and labour conditions etc., and seems to imply that the difference between " cost " accounting and " financial " accounting lies in this dis-similarity but all accountants keep records other than purely financial cost. Cost Accounting is a definite attempt to " cost " each unit of output as it is put out, while financial accounting gives the costs which have been incurred in the past accounting period. (1).

THE SURVEY METHOD. The objection to both the above methods is the smallness of the sample, and to rectify that, the survey method aims to cover a much wider field. Details are collected annually of such items as total receipts under given heads, total expenses under given heads, farm assets, and liabilities, stock, acreage, production and fieldwork, and so on. The fact that much of the information collected is not the result of accurate record keeping makes the individual return unreliable, but individual errors will tend to cancel out over a large sample and it is claimed that the ultimate result gives a truer picture of the industry in the district covered, than is possible under either of the other methods.

Relating these various methods to dairy farming in the Waikato area, the writer would suggest in the first place that the " cost account " method is not only unreliable, but impracticable if it is thereby desired to get a general picture of the costs of producing the various things that the modern dairy farm has for sale. Pigs, calves, and butterfat are largely joint products. It would perhaps be possible to isolate the cost of skim milk to pigs, but even then there are so many other joint costs, that the isolation of a separate cost of production for each article is impossible. Further actual time spent would be most difficult to apportion. The fact that grassland farming is practically universal, does away with any extensive need

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(1). See King op cit. pages 157/8.

for ploughing, hence such items as horse hours are negligible yet horses are neeadd for drilling fertilisers and so on. The general principle of cost accounting would be very cumbersome owing to the enormous number of small time jobs such as tending sick stock, and machinery. Another interesting fact is that most agricultural costing systems have been worked out in connection with some system of arable farming, (1)., and even if it be admitted that cost account book-keeping is only a "method" of financial book-keeping which " analyses all expenditure and distributes it as precisely as possible, ~~deriving~~ among the ultimate products for sale,(2) yet on dairy farms in New Zealand the only real ~~(2).~~ product is milk or rather butterfat, so that the cost account method would synchronise with the financial methods.

Pigs are a joint product, of minor importance, but the cost of producing pigs could not be isolated, except on such arbitrary lines as would negative the value of the cost so arrived at. ~~Orwin~~ Orwin makes the same point, " On a farm (3). where the sole object of the management of cattle is the production of milk, it may fairly be said that the cost of raising calves to maintain the herd, and the cost of feeding off old cows no longer profitable in the dairy, are both of them incidental to milk production, and only one record which ~~involves~~ includes. cost of feeding and tending calves, dairy cows, and fattening cows is all that is needed when the determination of the cost of milk alone is needed." The account would be a composite one and ----------." Dairying in the Waikato would fall under this head. Much of the discussion of cost accounting is therefore inapplicable where the sole feeding is - as in New Zealand - permanent grass, and hence we conclude that the cost accounting method is inapplicable to dairying in the Waikato, or rather that cost accounting in this connection is merely financial accounting. (4)

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(1). See King op cit page 9. FOR QUOTATION SEE ATTACHED SLIP
(2). King op cit page 11.
(3). Farming Costs. Ed, Dec. 1920. p.32. see also pp. 93/5.
(4). The general difficulty re cost accounting on dairy farms is fully treated by ~~Orwin~~ ORWIN refs. quoted, and King, pages 27 and 114 and passim.

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(1). "It will not be claimed that any clear light was thrown upon the cost of producing a gallon of milk.... the final statement of costs are hedged about with

This in addition to the smallness of the sample discussed above, renders this method unsatisfactory for dairy farming.

The financial method is obviously available, while the periodicity of financial dealings and the general routine nature of the work makes the survey method quite valuable.

Both these methods are made more simple by the practically universal custom of handling all financial dealings through a bank so that general financial returns are relatively easily obtainable.

Because of the reasons above mentioned, and also because of time, finance, and of the general lethargic attitude towards research, there are no cost accounts available concerning dairying in New Zealand to the writer's knowledge. There is also considerable difficulty in getting details of such financial accounts as are kept - the attitude of secrecy being due largely to a fear that the Government will use any information as a basis on which to levy income tax on the farmer, who is at present exempt from that tax.

The Agricultural Department, as a part of a large survey, distributed through Herd ~~and Boy~~ Testing officers, a large number of books which asked questions as to farm organisation and finance. General hostility was apparent, and did not allayed even after a circular guaranteeing that the information would be treated as confidential, and not used for Income Tax purposes. Several financial institutions keep books of debtors to whom they have loaned money, (the object being to keep check on financial affairs), but naturally their details are regarded as confidential.

The financial records kept by the writer of the nine farms in the Te Awamutu district ~~is~~ have as far as is known, the only attempt so far in New Zealand, to apply the financial method to research into the conditions of New Zealand dairying.

Belshaw in the work already quoted, conducted a broad survey of nine widely scattered dairy farms throughout New Zealand, the results were not as a consequence of financial accounts, but merely derived from answers to a questionnaire.

Mr. F.J.Fawcett, M.A. farm ~~economist~~ economist of the Department

of Agriculture, has, through officers of the Department, conducted some very valuable surveys into dairying conditions in Taranaki and the Waikato, and North Auckland. (1).

There are a number of studies on the basis of observation unsubstantiated by verbal or written evidence, which are of course valuable at times as they come from men of very wide experience in dairying, and as Marshall sayd, are valuable as giving general hints as to the direction in which research should proceed.

It is proposed herein to use the investigation of the nine farms as a sample with which to indicate costs on typical dairy farms on the Waikato. The general discussion in part 2 of this study has shown that in point of acreage, stocking, and general production these farms are a very good sample of dairy farms in the Waikato..

The general method in connection with the collection of the data is discussed in Chapter 2. Part 1. page 6.

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(1). See a. Department of Agriculture bulletin NO.138 "Dairy farm management.
b. Journal of agriculture April 1930.
c. do do May 1930
d, do do June 1931.

Part IV Chapter II

Farm Capital Organisation

Capital

FARM FINANCIAL organisation

It is proposed in this part of the study to proceed as follows, to give:-.

1. A general view of the financial structure of the farm, which involves.——
2. A discussion of credit facilities.
3. Farm revenue and expenditure.
4. The relation of produce values, and farm income to values of land and capital equipment.

ASSETS AND LIABILITIES.

The assets of the industrial concern, may for description purposes be divided into:-

1. Land and buildings.
2. Machinery.
3. Debtors
4. Finished, partly finished, good and raw materials on hand.
5, Cash.

In the case of the dairy farm,debtors, and goods in any stage of manufacture are absent (unless pigs being fattened can be looked on as partly finished products). The assets of the dairy farm consist of:-

1. Land and buildings.
2. Machinery. (a). ~~Mechanising~~ machinery implements.
   (b). Live stock, e.g. cows and horses.
3 Cash in hand.

The following table gives the assets of the nine te Awamutu dairy farms classified as above.

Table. No. 102

TABLE SHOWING ASSETS OF THE FIVE TE AWAMUTU DAIRY FARMS AS AT 1/8/29.

Assets.	1. £	2. £	3. £	4. £	5. £	6. £	7. £	8. £	9. £	Total. £
Land & Buildings.	2390.	1438	1575	1600	1600	1000	1315	2000	1456	
Buildings and improvement.	2535	1489	1110	865	1005	1070	1035	1105	1195/10/-	25387/10
Machinery.										
Milking Machines	159/ 2/ 4	110/ 5/	166/19/ 9	79/16/4	134/ 5/	188/ 2/3	178/ 4/1	72/ 5	241/ 2/6)	2766/ 4
Implements	139/10/ 6	157/10/	163/ 3/6	157	137/10/5	128/ 3/1	128/15/	91/11	32/ 9/)	
Stock.										
Dairy Cattle	1494	1053	951	653	662/10	734/ 8/	625/	621/ 5/	324/)	8026/13
Horses	125	65	100	75	50	50	50	50	50)	
Pigs	18	35	36	73	55/10	16	43	49	10)	
Cash.	136/10/4	-	5	5	20	-	3/ 8/4	25/13/1	2/ 6/	195/14
Other.										
Shares.	209	50/19	44/ 2/11	125/10/	121/16	80	121	95/19	6/	984/ 7
TOTALS.	£ 7206/ 3/2.	4711/14/-	4251/ 6/2.	3638/ 6/4.	3866/11/6.	3266/13/4.	3499/17/5.	4110/13/5.	3259/ 4/-	37810/ 9

Table No 103

TABLE SHOWING PERCENTAGE DISTRIBUTION OF ASSETS ON THE NINE TE AWAMUTU FARMS.

Assets.	1.	2.	3.	4.	5.	6.	7.	8.	9.	Average.
Land & Buildings										
Land	33	31	37	44	41	31	38	49	44	38
Buildings.	35	31	36	22	27	32	29	26	27	30
Machinery.										
Implements.	4	12	9	7	8	10	9	5	8	7
Stock.	23	24	25	22	20	25	21	17	11	21
Cash.	2	-	-	-	1	-	-	1	-	1
Shares.	3	2	3	3	3	2	3	2	-	3
	100	100	100	100	100	100	100	100	100	100

The percentage distribution of the assets is fairly regular, and the average may be taken as fairly typical of the general value distribution for farm assets throughout the district. (1).

Before discussing the above distribution of assets the following table shows the average percentage distribution of the assets of all New Zealand manufacturing industries - except those processing primary produce - in 1927., compared (2) with the average percentage distribution of the nine farms.

Table No 104

TABLE SHOWING PERCENTAGE DISTRIBUTION OF ASSETS IN THE MANUFACTURING AND DAIRYING INDUSTRIES

ASSETS	MANUFACTURING INDUSTRIES	DAIRYING INDUSTRIES.
Land & Buildings	38	68
Machinery	26	28
Stock & Material	22	-
Cash & other	14	4
	100	100

The first noticeable fact in the above table is the remarkable difference in the percentage value of land and buildings in the two cases. Taking fixed assets as a whole for which long term credit is usually required, the dairy farm requires 96% of its capital in this form as opposed to the 64% in the case of manufacturing industries. Not only does this affect the relative ease of obtaining credit in the two cases, but it also means that the average farmer has much less circulating capital, 4% as opposed to 36%. (3).

Further, this implied of course, that the return for interest on fixed capital is much higher in the case of farms

(1). The value taken for land is the Government unimproved value which, while it may be low, taken as to any particular farm yet provides the only comparable basis of valuation over a series of areas.
(2). Adapted from a previous enquiry conducted by the writer "Statistical survey of the secondry industries of N.Z. unpublished MS, compared with the average percentage distribution of the nine farms.
(3). See Belshaw, "Profit cycle in agriculture," Economics Journal March 1926.

than in the case of manufacturing - and this implies of course, that the relative value of supplementary costs in dairying are much less that in manufatturing ~~xxxxxxxxx~~ production, implying of course, a lesser capacity to adjust selling prices - assuming such were possible.

A further interesting fact is that the ratio of turnover to assets was in the case of manufacturing, 105% as compared with 21% in the case of the average of the nine farms. (1) This would increase the burden of fixed capital charges to the farmer or at least emphasise the predominance of them in farming costs.

The foregoing raises them, the point of credit facilities to farmers which will be dealt with in the next section.

The liabilities of the nine farms are given on the following page.

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(1) Stephens op cit.

Table No 105

TABLE SHOWING THE LIABILITIES OF THE NINE FARMS.

Liabilities.	1. £	2. £	3. £	4. £	5. £	6. £	7. £	8. £	9. £	Total. £
Long Term	x	2720. 1472 ø	591/13	1679/ 4/1	2120/ 9/3.	1000.	962/17/11	2100.	1019	14065/14/3
Short Term	100	100	-	-	91/13/4	210	7/ 4/	475	263	816/17/4
Totals.	£ 100	4292	591/13/-	1679/ 4/1	2212/ 2/7	1210	970/ 1/11	2575	1282	14912/ 1/7

(x) This farm is under a sharemilking agreement, and there is no long term liabilities.

(ø) Overdraft from Bank, nominally short term, but in reality, long term.

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As might be expected, borrowed money figures much more largely on some farms than others, depending on many factors, such as the original capital owned by the farmer, the length of the tenancy, the efficiency of management, and the character of the farmer. However the aggregate figure seems to give some idea of the relative importance of long terms as opposed to intermediate or short term credit, the respective percentage of total credit being 94% for long term and 6% for short term. This bears out the conclusions made from the constitution of the assets. Comparative figures are not available as in assets for manufacturing industries, but taking Factory Production Statistics, which includes all forms of manufacturing in New Zealand, " Loan (1). Capital ", which may broadly be taken as indicating long term credit is only 10% of the total assets, compared with 37% in the case of the nine farms.

The intermediate credit is relatively small ~~short~~ here. Credits other than long term are usually liquidated within twelve months, and hence are definable as "Short term "

The intermediate loans in the above cases are associated with farm improvement, such as fencing, and additional stocking, while the shorter credit is usually associated with fertiliser purchases.

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(1). "Loan capital" in the factory production statistics includes, Debentures, Loans, but not bank overdrafts. It also includes " Reserve ". Hence this figure for loans may be:- (a) Too high because of reserve. or (b). Too low because certain forms of long term credit are omitted. However the absolute figure is not important for the present purpose. The indication given herein is sufficient purpose.

ADDENDUM TO THIS CHAPTER.

VALUATION OF ASSETS.

Because of the absence of any records the following procedure was adopted regarding the valuation of assets.-

1. Land was valued at the Government unimproved value.
2. The value of permanent improvements was arrived at by deducting the unimproved from the capital value.
3. Implements were valued by the writer;machinery was valued at cost & when ascertainable - less depreciation, - in other cases valued.
4. "Stock" was valued on the "Standard Values" method (1) except for pedigree bulls and cows where cost price was taken. The Standard valued adopted were:-

(a)	Cows		£12
(b)	Year Old Hiefers		8
(c)	Calves		4
(d)	Horses		25
(e)	Pigs	Stores	2
		Breeding	5.

These values were broadly in keeping with average prices over a series of years. (2)

A Stock adjustment account was kept, and stock purchased was adjusted to £12, and stock sold similiarly adjusted. Calves and hèifers reared of course involved a profit of £4 per head per year, so that they were in the books at £12 when they entered the herd. Over one year the results may be out of touch with reality but in the long run they must agree with the real profits and losses on stock.

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(1) See King Op. cit. p. 35/7.

(2) This matterwas discussed with Prof. Riddett, Professor of Dairy Husbandry at the Massey Agricultural College, who agreed that the above method was the only one suitable where (a) cost price was unknown.
(b) Where the Majority of cows were reared.
He also agreed with the Standard values adopted.

Part IV Chapter III

Rural Credit

RURAL CREDIT.

The purpose of this section is ~~not~~ but to discuss the problem of rural credit, not to enumerate the avenues by which credit is supplied to the rural community in New Zealand. Both of these ~~types~~ topics are well set out in Belshaw, "The provision of credit, with special reference to agriculture."

It is proposed herein to illustrate the importance of the various agencies for the ~~pp~~provision of credit in relation to dairying.

It is natural to suppose that each type of farming not only has its own peculiar needs due to the technicalities incidental to that type, and for that reason, finance for dairying is different from finance for say, sheep or arable farming.

The broad differences in the characteristics of the credit required for dairy farming from that required in industry, have been indicated in the previous chapter, namely a much greater demand for a long term credit in the former than in the latter. In addition to the above, the risks involved in farming, are not only different in character, but also of a greater intensity from that of manufacturing.

The risks may be classified as (a), Technical:-

Farming production is more the subject of the chance of the weather, the physiological condition of the cow, and the general invasion of pests, all of which are practically outside the control of the farmer. That is to say the incalculability of supply is particularly marked in farming.(1)

(b) Commercial risks. These are due to relative immobility of farming capital, and the consequent intractibility of supply, coupled with the widespread geographical nature of the supply, make the market conditions very difficult to forecast. This factor is enhanced in New Zealand, due to the great distance of the chief market for New Zealand dairy produce. As a consequence of the above, (2). credit is less likely to flow into agriculture than to

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(1) Belshaw, op cit page 62.
(2) Belshaw op cit page 65&69.

industry where returns are relatively stable, and when it does flow, the cost of that credit is higher.

In the previous chapter, we classified the demand for capital into - 1. Long term, 2. Intermediate, and Short term, This in turn involved a demand for (a)Long term credit, (b) Intermediate credit, and short term credit.

LONG TERM CREDITIn Chapter 2 Part II page 52 we showed that at least 50% of the capital used for the fixed capital equipment of farms, was provided by way of registered mortgage. The agents providing this credit are :-

1. Private Lenders. There are two major avenues here, (a). Solicitors, who have clients' money for investment, and (b), Farmers who sell a farm, and leave a portion of the purchase price on mortgage,. While the first mortgage is quite prominent from these sources, by far, the bulk of second and third mortgages emerge from private lenders. Government finance, (see below), is naturally concerned with first mortgages, and as these seldom exceed two thirds of the value, the balance is made up from other sources.

Private individuals or corporations, seldom accept any less security than a second mortgage over land, but third and subsequent mortgages are almost invariably held by vendors. The heavy fall in land values in the Waikato in the last decade, have resulted in the disappearance of many of the third and subsequent mortgages, which have consequently either been written off, or the holders of these securities have taken over the farms again, and adopted the existing mortgages. In addition to the above, first and second mortgages have been heavily written down.

2. Financial Institutions and Commercial Banks.

Commercial banks, by their very constitution, are not fitted to act as holders of long term mortgages. However though their overdrafts are normally reviewable at semi-annual intervals, in point offfact, their security frequently consists of nothing more than a mortgage over land, and the advance goes on over a long period. Farm No. 2. of the Te Awamutu group has an advance of this character. The writer has the

opinion that there is considerable de facto long term credit from Commercial banks. (1)

The Long Term mortgage Department of the Bank of New Zealand does not seem to have operated to any extent in the Waikato. Insurance companies have numerous small advances on the security of policies. These have been in effect, long term mortgages. In addition there does not seem to be a very extensive use of ~~their~~ THEIR funds, or the use of the funds of Trustee Savings Banks on dairy farm securities. The probable reason is that the (2) smallness of the average dairy farm would render the management of these securities, very costly. Finance companies, and stock and station agents, have been fairly heavy investors in rural security on long term, but this is less noticeable in dairying than in sheep farming, and arable farming. Finance companies have (3). invested in this manner, but two of the largest of these companies have recently stated that they are withdrawing from long term business and are concentrating on intermediate, and short term credit.

3. The State. In 1894, consequent on a slump in land values, and the extensive difficulty and costliness of financing rural industry, the State embarked on a scheme for providing cheaper credit facilities to farmers, which would at the same time encourage settlement. The objects were to effect relief from high rates of interest, heavy procuration fees and solicitors costs. (4).

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(2). A considerable amount of Insurance funds and Trustee Savings Bank funds are invested in real estate, but chiefly in urban security.
(3). It was the opinion of the manager of one of the largest stock and station agents in the Waikato, that investment on long term mortgage to dairy farmers was not large.
(4). Belshaw op cit. page 167 et seq.
(1) This opinion is based on a discussion with the managers of two of the largest commercial bakns operating in the area, as well as on the questioning of very many farmers.

The present methods of raising the money are, a. By public loan to the State, The State advance system and b. By Rural advance debentures secured over the whole of the lands to which funds are advanced, The actual administration of each system is practically identical, with the exception that the maximum advance under the State advance system is three quarters of the value of the security with a maximum of £3500, and under the Rural advances system it is two thirds of the value, with a maximum of £5500. In each case only a first mortgage is taken.

Ruling rates have certainly been lower than market rates rent in some cases, but this has been offset by higher rates for subsequent mortgages. (1).

The Discharged Soldiers Settlement Scheme is run similarly to the State advances scheme. The above forms are very importane, both relatively and absolutely, in the Waikato.

Of the nine farms, five secured their long term finance under the Discharged Soldiers Settlement system; two part of their advance from the State advances, and one farm from a private source. The other was a sharemilker. While the sample here is almost certainly unintentionally biassed this does indicate the relative frequency of Government finance in this regard. One advantage of the State scheme is the AMORTISATION principle, by which the capital is paid off in 36½ years by half yearly instalments of principle and interest. (see pg 52).

INTERMEDIATE AND SHORT TERM CREDIT. Short term credit is largely conditioned by the seasonal nature of receipts. With shopkeepers and dealers is is frequent to find that credit is on a monthly basis from September to May, while credit is frequently extended right through the winter non-producing months. This system is almost universal, not only in shopkeepers' credit but also in regard to repayment of short term and intermediate credit.

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(1). See Belshaw op cit page 171.

Intermediate credit is not greatly sought from Commercial Banks; but of recent years, banks have been competing fairly considerably to supply short term credit. In practically every case of the nine farms, the farmer had an arrangement, that he could overdraw for small amounts. As prices have fallen this prevelege has beenconsiderably availed of.

For the reason that stock and station agents have little direct contact with dairy farmers, they are not an important source of intermediate finance today. Various companies are in existance which provide farmers with intermediate credit, and of late years, their operations have been growing although the liberality of their advances to small farmers has resulted in most of them being in difficulties today. The future of the purely financial company is uncertain.

The need for finance to increase stocking, and to carry out necessary improvements to pastures and fences if production was to be increased, has led to an increased demand for intermediate finance in the past War years. Two major sources of finance have become available,

a. The Rural Intermediate Credits scheme which is State organised. Under this scheme, the administration of which is centered in Wellington, a group of twenty or more farmers in a district form themselves into a Rural Intermediate Credit Association with shares of limited liability. The Association then act as intermediaries, through which their members apply for credit. A farmer applying, must take up shares to one tenth of the value of his loan. (1).

The local Association report on his security, and his personality, and forward the report through a provincial Board to the Dominion Board. The purposes of the loan are broadly for(a.) fencing and clearing and(b) purchase of implements and stock. (2).

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(1). These shares have not been called up to more than 1/- per share. LETTERS from Head of Board in Dairyman in June 1930.
(2). Belshaw op cit. page 267.

The maximum amount of the loan is £2000, (although this amount is seldom granted to dairy farmers who usually receive between £200 and £500), and the maximum periodd is five years. The loan is repayable on the amortisation principle. The usual method of reppyment is by an order on the Dairy Factory supplied, to pay the Association one third of each month's butterfat cheque during the months from September to May, There are seven or eight such local associaddons in the Waikato, and though they have been in existence only a few years, they have been invaluable to the industry.

In addition to the local associations, most co-operative dairy associations have availed themselves of the provision which enables them to act as intermediaries between the Board and the suppliers, the dairy company guaranteeing the loan which is repaid as above. Probably more loans have been granted under this provision than under the local association system. The New Zealand Co-operative Dairy Co. Ltd., the largest co-operative dairy company in the Waikato, (and incidentally in the world), has guaranteed loans to its members totalling £ 224559 in three years, of which £111838 was outstanding on May 31st. 1931. The average advance was about £200, or about £30 for each of the 8000 suppliers.

Coincident with the developement of the Intermediate Rural Credit scheme, the various dairy companies have instituted finance departments as part of their organisation By the nature of this case, these companies have been leaders in the movement for more efficient management, and this involved finance, - hence the emergence of the finance departments. The leader here was the New Zealand Co-op. Dairy Co. Ltd., which formed in 1925 a sudsidiary finance company financed by all its members by means of yearly installments on shares, which were issued as shares in the parent company were issued on the basis of the quantity of butterfat supplied per annum. The nominal capital of this company was £75000. During the past five years the company

had advanced to its members £440000 on intermediate credit of which £50000 was outstanding on May 31st. 1931. The average advance was £200. Consistent with its policy of progress, the Company, whose operations dominate the whole Waikato, have advanced freely for the purchase of (1) pedigree bulls, for fertilisers and additional stocking, (2) and fencing. Their policy has been combined with instruction and advice.

Other smaller co-operative and proprietary companies have for competitive purposes, had to inaugurate a similar system, although not on the same scale.

The length of time for which the credit is granted is usually much shorter than under the Rural Intermediate Credit system, and it is quite common for advances to be made for less than one year. Advances are made for fertiliser purchases, which advances are repaid out of the " bonus " payments at the end of the season. Six of the nine Te Awamutu farms took advantage of this form of credit for amounts under £50, in the season 1929/30. It is probably true to say that the major part of the short term and intermediate credit comes through co-operative companies, either from their own finance departments or as a guarantor under the Intermediate Credit scheme. In both the above systems, the loan is secured by a chattel mortgage over stock or a good second mortgage on the land.

SUMMARY. A large proportion of first mortgages are held by the Government, which subsequent mortgages are generally in the hands of private individuals, among whom, vendors of the property predominate. The bulk of the short term and intermediate credit comes through co-operative dairy companies.

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(1). They market over two thirds of the produce of the area.

(2). See chapter Part IV page.177

Part IV Chapter IV

Farm Income and Expenditure

FARM INCOME AND EXPENDITURE.

There are really two major problems in a discussion of farm income and expenditure. These two problems partake of the nature of prime and supplementary costs.

> " (supplementary costs) must be completely covered by it - (selling price) - in the long run; for if they are not, production will be checked." (1).

> "Thus although nothing but prime costs enters necessarily and directly into the supply price for short period it is yet true, that supplementary costs also exert some influence indirectly." (2).

The prime costs of dairy farming may be said to be ~~costs~~ cash expenses of running the farm. The total cost - that is prime and supplementary costs - include the above plus depreciation, necessarily maintainance of stock, implements, pasture and improvements, and a reasonable wage to the farmer, and just as it is true in manufacturing, that in the short run supplementary costs may not be fully covered, so in dairy farming.

Hence it is proposed to consider the problem of income and expenditure under two headings:-

(1). Revenue, cash available, to reimburse the farmer.
(2). Cost of producing butterfat.

REVENUE CASH AVAILABLE.

This problem is particularly important, when owing to the lag in production costs, there is a lack of coincidence between costs and returns, and so the farmer finds that many needed repairs must wait, because the cash available is not more that sufficient to provide him with a living wage.
The problem then in this sub-section is to examine the amount of cash available after current revenue expenses have been met.

The three tables show:-
(1). The receipts.
(2). Payments on revenue account.
(3). The net cash available.

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(1). Marshall. Principles, (8th.edition) page 360.
(2). Marshall. op cit. page 376.

This last is not a profit statement, but merely a statement of the aggregate amount of cash which would have been available, if other than current revenue expense had Not been met.

The butterfat item on the receipts side, represents the gross receipts when butterfat was returning 1/4d. approx. to the farmer. It should be noted that the aggregate cash available does not allow any returns on the capital invested by the individual farmer.

Table. No. 106

TABLE SHOWING MONEY RECEIPTS AND THE GROUP AVERAGE.

Items.	1. £. s. d.	2. £. s. d	3. £. s. d.	4. £. s. d.	5. £. s. d.	6. £. s. d.	7. £. s. d.	7. £. s. d.	9. £. s. d.	Average
Butterfat.	1356. 0. 9	908. 5. 2	779.15. 7	854. 7. 2	777. 4. 2	752.12. 5	601.12. 2	636. 4. 0	525. 2.10.	776.17. 2
Pigs	76. 2. 3	86. 9.10	50. 3. 0	109.10. 0	144. 8. 0	64. 0. 0	103.10. 0	47.12. 4	40. 0. 0	80. 3.10
Calves Sold	21. 7. 0	10. 6. 0	2. 3. 6	7. 0. 0	1. 1. 0	20. 0. 0	4. 4. 0	6. 0. 0	2. 9. 0	3.16.10
Other	18. 7	2.12. 8	2. 2.10	2.14. 6	3. 4.10	-	18. 5	-	21.18. 5	34.10. 8
Totals £	1454. 8. 7	1007.13.8	834. 4.11	973.11. 8	925.18. 0	816.12. 5	710. 5. 0	689.16. 4	598.10.11	895. 8. 6

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Table No 107

TABLE SHOWING TOTAL MONEY EXPENSES OF RUNNING EACH OF THE NINE FARMS AND THE GROUP AVERAGE.

Items.	1.	2.	3.	4.	5.	6.	7.	8.	9.	Average
	£. s. d.	£. s. d	£. s. d	£. s. d.	£. s. s	£. s. d	£. s. d	£. s. d	£. s. d.	£. s. d
Fertilisers	125.17. 8	91.17. 2	77.12. 6	120.12. 0	81. 0.10	46. 6. 4	35. 4. 6	85.14.11	19.18. 7	76. 0. 6
Rates	7.13.11	16. 3. 4	23. 4. 8	14. 16. 8	18.13. 2	19. 8. 0	16.14. 3	19. 0. 7	18.11. 6	16.12.4
Elec.Power	- - -	49. 0.10	28.18. 0	25. 2. 4	26. 6. 1	29. 9. 1	17. 6. 0	- - -	20.17. 6	21.17. 9
Wages.	267.17. 4	183. 2. 0	119. 5. 0	101. 1. 0	173. 2.10	125. 0. 5	105. 4. 0	97. 6. 2	7.12. 0	133.11. 3
Freight	21.13. 9	- - -	31.16. 0	24.11. 2	34. 3. 3	35. 7. 7	29.19. 3	39.14.11	6.13.11	24.18.10
Other Exes.	103.12. 4	156. 5. 9	105.14. 3	69. 2. 9	55.13. 4	52. 5. 7	57. 9. 4	166. 4.11	34. 1. 4	88.18. 4
Interest.	452. 3. 7	238.10. 0	110. 8. 5	77. 0. 8	100.14. 9	113.17.10	118.15.11	152. 2. 6	66.14. 2	160.14. 3
Totals.	£ 978.18. 7	734.19. 1	496.18.10	432. 6. 7	485. 4. 3	421.14. 0	380.13. 3	560. 4. 0	174. 9. 2	522.13. 5

Table No. 108

TABLE SHOWING AGGREGATE NET CASH AVAILABLE IF ONLY CURRENT REVENUE EXPENDITURE HAD BEEN MET

Farm Nos.	1. £. s.d.	2. £. s. d	3. £. s. d.	4. £. s. d.	5. £. s. d.	6. £. s. d.	7. £. s. d.	8. £. s. d.	9. £. s. d.	Average. £. s. d.
Receipts.	1454. 8. 7	1007.15. 8	834. 4.11	973.11. 8	925.18. 0	816.12. 8	710. 5. 0	689.16. 4	389.10.11	895. 8. 6
Expenses	978.18. 7	734.19. 1	496.18.10	432. 6. 7	485. 3. 4	421.14.10	380.13. 3	560. 4. 0	174. 9. 2	522.13. 3
	475.10. 0	272.14. 7	337. 6. 1	541. 5. 1	440.14. 9	394.17. 7	329.11. 9	129.12. 4	215. 1. 9	372.15. 3
Net cash available for living expenses, or income.	9. 0. 0	5. 0. 0	6.10. 0	10.10. 0	8.10. 0	7.10. 0	6.10. 0	2.10. 0	4. 0. 0	7. 0. 0

The foregoing figures ~~in respect of~~ allowances an aggregate cash return per week to the farmer as follows:-

Table No.109

TABLE SHOWING TO NEAREST 10/- THE AGGREGATE CASH RETURN TO THE FARMER.

Farm No.	Average weekly cash return correct to nearest 10/-.
1.	£ 9. 0. 0.
2.	5. 0. 0
3.	6. 10. 0
4.	10. 10. 0
5.	8. 10. 0
6.	7. 10. 0
7.	6. 10. 0
8.	2. 10. 0
9.	4. 0. 0
Average	£ 7. 0. 0

A farmer's house rent is worth say 25/- per week while farm produce would be equivalent to another 5/- per week. To get a comparative figure for urban wages, the above amount of 30/- should be deducted from wages received. That is to say net earnings to a skilled worker would be £3.10.0 per week.

The average capital invested by the farmers was £1900 approx. , so that if we allow 5% interest on his own capital, that is £95 per annum, the amount available after giving the farmer £3/0/- per week for depreciation and general repairs and replacements was £89, or approximately £1.14.0 per week.

The conclusion of course is that at 1/4d per lb. for butterfat, the farmer was able to meet all costs both prime and supplementary.

The next table shows what would have been the position if butterfat had been 1/- per lb. in 1929/30, and running expenses had been the same.

Table No.110

CASH AVAILABLE IF BUTTERFAT HAD BEEN 1/- per lb.

Farms Nos.	1.	2.	3.	4.	5.	6.	7.	8.	9.	Average.
Receipts.	£ 1085.	731.	620.	725.	655.	620.	525.	538.	290.	675
Expenditure.	988.	735.	497.	432.	485.	421.	380.	560.	174.	523
Cash available.	£ 97.-	£4.	123.	293.	170.	199.	145.	-22.	116.	152

The cash available in terms of weekly average returns would have been as below:-.

Table No. 111

TABLE SHOWING AVERAGE WEEKLY RETURNS OF DAIRY FARMERS IF BUTTERFAT HAD BEEN 1/- per.lb. AND COSTS HAD REMAINED AT THE PREVIOUS LEVEL.

Farm No.	Average weekly cash available to the nearest 10/-.
1.	£ 2. 0. 0.
2.	- - -
3.	2. 10. 0.
4.	6. 10. 0
5.	3. 0. 0
6.	4. 0. 0
8.	3. 0. 0
8. minus	10. 0
9.	2. 0. 0
Average.	3. 0. 0.

In 1930/31 butterfat was 1/- per lb.,. Costs did fall but not nearly in proportion to the fall in butterfat returns. Even if we allow a 10% drop in expenses, which is probably an over-estimation, it would make the ~~use~~ one of only £1. per week (available in cash) on the nine farms, Up to the end of the dairy year, urban wages had not fallen, ~~so that~~ the farmer was definitely unable to meet all prime costs with butterfat at 1/-. per lb., for it is obvious that a minimum means of living must be a first charge. Consequently some necessary running expenses were cut down, such as a reduction in fertilising, thds impairing the ultimate efficiency of the farm.

COSTS OF PRODUCTION.

In discussing the long run effects, it is obvious that not only must depreciation be charged, but all revenue income and expenditure charged. If the important factor in the short run is cash available, in the long run, the important factors are, costs and receipts per lb. of butterfat raised. Hence in this sub-section, details will be reduced to costs and receipts per pounds of butterfat raised.

COSTS.

The following table shows the costs of production per lb. of butterfat in the nine farms, the costs being divided into the major categories of expenses.

Table No. 112

TABLE SHOWING EXPENSES IN TERMS OF COSTS PER LB. OF FAT. AND THE GROUP AVERAGE.

Items.	1. d.	2. d.	3. d.	4. d.	5. d.	6. d.	7. d.	8. d.	9. d.	Average. d.
Fertilisers.	1.47	1.66	1.59	2.24	1.63	.96	.93	2.06	.92	1.56
Rates	.09	.29	.48	.28	.29	.41	.44	.46	.86	.34
Elec. Power	-	.89	.59	.48	.53	.61	.45	-	.96	.63
Wages	3.35	3.31	2.24	1.86	5.57	2.60	1.79	2.32	.36	2.69
Freight	.25	-	.66	.45	.69	.74	.79	.95	.32	.51
Other Exes.	1.21	2.84	2.15	1.23	1.11	1.09	1.52	3.98	1.57	2.21
Interest actually paid	5.49	4.31	2.27	1.45	2.03	2.37	3.14	3.65	3.09	3.29
Totals.	11.86	1½1.30	9.98	7.97	9.85	8.78	9.06	1/1.42	8.08	10.69

We will next discuss each item of the costs.

(1). FERTILISERS. Expenses on fertilisers.

Table No. 113

Table showing percentage of fertiliser expenses to (a). Cash expenses, and (b). Gross returns of butterfat.

Farm No.	Cash exes. for fertilisers pr.lb.B'fat raised.	% to cash exes.	% to gross returns.
1.	1.47	12.4	9.3
2.	1.66	12.5	10.1
3.	1.59	15.9	10
4.	2.24	28.0	14.2
5.	1.63	16.6	10.4
6.	.96	10.9	6.1
7.	.93	10.3	5.9
8.	2.06	15.4	13.5
9.	.92	11.4	6.1
Average	1.56	14.6	9.8

The farm with highest expenditure on fertilisers isthe one with the highest butterfat per acre. Three cases where expenditure in fertilisers was over the average include three of the four highest returns per acre. The number of farms surveyed is too small to warrant any conclusion from these figures alone but, they confirm the conclusions arrived at in chapter 4. Part III. The importance of fertilisers can be seen from these figures, which represent 1½d per lb. on the average of all butterfat raised or ≏ 1/6th of the total expenses or 1/10th. of the gross receipts.

RATES. This item (see table 112 page 282), varies with the location of the farms its unimproved value, and so on. There is no direct relation between this item and production

ELECTRIC POWER. This item bears a close relation to the number of cows carried, rather than to the productivity. Farms Nos. 1 and 8 did not have electric power, but milking machines were worked by oil engine.

WAGES. Wages are divisable into permanent and casual (Note, only wages actually paid are ~~discussed~~ discussed here. No allowance is made for wage payment to the farmer). The following table shows the cost of permanent and temporary labour respectively. (1).

Table No 114

TABLES SHOWING COST PER LB. OF BUTTERFAT OF PERMANENT AND CASUAL LABOUR RESPECTIVELY. in pence

Farm No.	Permanent labour.	Casual labour.	Total.
No.1.	2.93 d	.42 d.	3.35 d.
2.	3.29	.02	3.31
3.	2.03	.21	2.24
4.	1.44	.42	1.86
5.	2.57	1.00	3.57
6.	2.60	—	2.60
7.	1.63	.16	1.79
8.	2.12	.20	2.32
9.	—	.36	.36
Average.	2.37d	.32 d	2.69 d

Wages in the above discussion include £1. per week for board (see chapter 8 Part II The conclusions to be drawn must be very tentative for the following reasons:-

(1). Different weekly wage rates were paid on different farms-the rates ranging from £1. to £2. per week found fixed in all cases.
(2). Some farms did not have hired labour.
(3). Casual labour was principally due to harvest work, which in several cases was done co-operatively.
(4). In one or two cases, family help was paid at less than current rates.
(5). In at least two cases, special domestic circumstances necessitated a different labour supply from normal.

Omitting farm NO.9., which was much smaller in every way than the others and was run entirely by the owner, permanent labour in no case fell below 1.44d. per lb. butterfat. The group average was 2.37d, the median being approximately the same. Casual labour does not permit of much discussion because of the emergence of co-operative labour. Farms Nos. 1. 4. and 5, had less co-operative labour that the others. On Farm 5, where co-operation labour was practically absent the casual labour costs were approximately 1d. pr. lb. for butterfat. Farms 3, 6, and 7, co-operated harvesting

and their costs are about equal, ranging from .16d. to .21d per lb. butterfat. The saving here, represented by co-operative labour, assuming the amount of supplementary feed in each case to be approximately the same, was .8d per lb. butterfat. This is a very considerable saving (1)

The following table shows for each farm, the approximate number of cows per herd, the returns from which were required for wages payments on the assumption that the average per cow production of butterfat was £15. per annum.

Table No 115

TABLE SHOWING APPROXIMATE NUMBER OF COWS NECESSARY FOR WAGE PAYMENTS.

Farm No.	No. of cows.	approx. %. of cows.
1.	20	19.6
2.	18	26.6
3.	7	15.5
4.	6	12.5
5.	10	22.2
6.	9	17.3
7.	7	17.1
8.	7	14.6
8.	½	2.5
Average	9	17.3

Broadly, the production of one cow in every five is necessary for wage payments.

A further view of the relation of wages to costs may be gained from the next table.

C/. Chapter page.

TABLE SHOWING PERCENTAGE OF WAGES TO:- (1).

Table No. 116

(1). Total cash outgoings, and

(2) gross returns of butterfat. on the nine farms

Farm No.	Cost inpence per lb. fat raised.	% wages to cash outgoings.	% wages to gross returns butterfat.
1.	3.35	28.2	21.-1
2.	3.31	24.8	20. 1
3.	2.24	22.5	14. 6
4.	1.86	23.3	11. 8
5.	3. 57	36.2	22. 8 (x)
6.	2.60	29.5	16. 4
7.	1.79	19.9	11.2
8.	2.22	17.3	15.2
9.	.36	4.4	2.4
Average.	2.69	25.2	16.9

(x) ~~[illegible]~~

The average percentage relation of wages to total cash expense almost exactly coincides with the result of the enquiry by the Government Statistician over all farming industries in New Zealand. (2)

The fact that 25% of the total expenditure is for farm wages, and that the average wage of farm hands over the nine farms is £2/10/5. (which includes £1 per week board allowance), has an important bearing on the labour question on dairy farms. Urban skilled labour wages were approximately £4 per week in 1929/30. (3).

The superior social amenities of town life, coupled with the shorter hours and higher wages, must have an effect on the class of farm hands that will be forthcoming, and in view of the fact that it is now more difficult for a farm hand to " set up " for himself, it is probable that there will ultimately be an acute shortage of labour problem in connection with the dairy industry. (4).

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(1). see discriptive matter in "Relation of Labour costs to total costs of production in agriculture, p. 10. Memo. International Labour ~~Office~~ Office.
(2) For table see page. 296
(3) See Official Year Book 1930 page 856.
(4). other phases of this subject are discussed in chaps. Part II

The following table shows the amount of wages per cow carried.

Table No 117

TABLE SHOWING WAGE PAYMENTS PER COW CARRIED.

Farm No.	£ per cow.
1	2.62
2	2.86
3	2.68
4	2.11
5	3.84
6	2.40
7	2.56
8	2.02
9	.38
Average.	£2.55.

This table in conjunction with the previous three tables shows a striking similarity in the cost of hired labour per cow, and would seem to give a fairly accurate guide to of the costs under this heading. In view of the fact that the actual number of cows carried, differs fairly widely, the conclusions hereunder would support the statement in chap Part II that the determining factor in the amount of labour necessary on the farm, ~~is determined largely~~ by the number of cows to be milked.

FREIGHT. (see page for figures).

The usual system in connection with the cartage of cream for buttermaking, to the factory, is for the farmer to put it at his gate in the morning, from which place it is picked up and carted to the factory by cartage contractors engaged by the dairy factory company. For this service the farmer is charged ½d. per lb. butterfat supplied.

The saving of time under this method is very great, as distances from dairy factories are often very great. The policy of having large scale, centrally situated, butter factories is intimately bound up with the problem of cartage. Before this method was adopted, it was customary to have collecting stations or skimming stations dotted all over the country side, within an mile or two of the farms in the district. With cheese making, where whole milk is supplied, it is still necessary to have numbers of relatively small factories to which the whole milk is carted by the farmer. All the farms supplied butterfat, except No2. which supplied a cheese factory.

The fact that cartage facilities for cream were not necessary, led to the emergence of a carrying system for farm requisites. The cream cartage contractor is usually also the general cartage contractor for the district, charging on the basis of work done. Farms Nos.1, 2, and 9, did not use the cartage service, but in all other cases this was used, and on the other five farms, cartage of farm requirements cost slightly less than ½d. per lb. butterfat raised. The difference in each case being the cost of cream cartage, namely ½d. per lb. butterfat.

OTHER EXPENSES. This item includes all other minor expenses pig feed, herd testing fees, (if any), insurance and car expenses. No detailed criticism of these items is necessary, except to say that the item, car expenses, represents a compromise on the question of whether car expenses are a legitimate farm charge or not. All the farms except No.6. had cars. In this study, the farmer is allowed to bear the

depreciation of the car, while running expenses are charged to the farm. This is a working principle, arbitrary, it is agreed, but probably as satisfactory as is possible. The expenses under this head, average about ½d. per lb. butter-fat raised. (1).

The remaining items under this head, showed very wide personal divergencies as might be expected,

INTEREST. The only other item of expense to be dealt with is interest. (rent on farm No.1. is grouped with interest).

From the point of view of the aggregate net return to the individual farmer, the only interest which is relevant is that of interest paid by him. However, when comparison of costs, (from the purely theoretical standpoint interest on the true value of the land is equivalent to economic rent, which of course is not a cost, although it affects the income of the farmer), of running various farms are desired, or when it is desired to discuss the costs over the industry, interest should be allowed on all assets involved no matter what amount of interestiis paid to outsiders.

In the long run, interest must be paid on the owners personal capital as well as on that borrowed, if the industry is to maintain its present extension, otherwise the MARGIN of production will recede.

The following table is self explanatory.

Table No 118

TABLE SHOWING PERCENTAGE OF INTEREST ACTUALLY PAID TO (a) Total cash expenses, (b),

	Pence per lb Bfat.	o/o of Cash Expenses	o/o Cash Receipts
1.	5.49	44.7	33.5
2.	4.31	31.6	26.2
3.	2.27	22.7	14.2
4.	1.43	17.7	9.1
5.	2.03	20.6	13.0
6.	2.37	27.0	15.0
7.	3.14	34.6	19.7
8.	3.65	27.2	23.9
9.	3.09	38.2	20.5
Average.	3.29	30.8	20.6

(1) The car is used for pleasure and business in about equal proportions.

The average figure of 30.8% agrees approximately with the figure 33.3% in the Official Year Book for the Government Statistician's estimate of the relation of rent and Interest to total expenses of running farms throughout New Zealand (1).

One fifth of the gross returns are paid as interest Omitting the rent items of farm No.1., the average over other farms is 2.70d. per lb. butterfat, 25.77% of total cash expenses, and 16.11% of gross returns from butterfat.

This is almost exactly equal to the figure for wages.

The discussion of wages would suggest that little relief can be got from a reduction of wages, but rates of interest have ruled very high since the War, and a reduction is urgently needed. (2).

DEPRECIATION. (see figures on page 292).

The usual allowances for depreciation have been made as under:-

House.....	2½%	- wood - per annum
Plant and Implements.....	10%	" "
Electric machinery.....	12½%	" "

Depreciation must of course be an estimate, but the fact of depreciation is too obvious to need discussion. In general the allowance for depreciation should be such as over the period of the usefulness of the asset reduces it to residual value. Over the whole group the allowance for depreciation averaged 1.29d. per lb. butterfat.

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(1). See Official Year Book 1931 p. 801/2, and page 296 of this study for the full table.

(2). This whole problem is bound up with land values, which is the subject of the next chapter.

Table No. 119.

TABLE SHOWING TOTAL ALLOWANCE FOR DEPRECIATION AND THE GROUP AVERAGE.

1.	2.	3.	4.	5.	6.	7.	8.	9.	Average.
£30.17. 2	£96.4.6	£64.6.0	£53.18.3	£69.0.8	£61.17.6	£65.0.7	£48.10.8	£76.11.6	£62.18. 6

TABLE SHOWING DEPRECIATION IN TERMS OF PER LBS. OF FAT.

1.	2.	3.	4.	5.	6.	7.	8.	9.	Average.
.36d.	1.74d.	1.31d.	1.00d.	1.38d.	1.28d.	1.71d.	1.16d.	3.54d.	1.29d

ADJUSTMENTS.

Table No 121

TABLE SHOWING NET ADJUSTMENTS TO STOCK ACCOUNT DURING THE SEASON 1929/30, OF THE NINE FARMS (IN EACH CASE THERE IS A PROFIT.)

Farm No.	Total value.	Adjustments per lb. butterfat.
1.	£ 198.13. 0.	2.33d
2.	163. 00.0.	2.94d
3.	165.19. 0.	3.38d
4.	22. 6. 0.	.42d
5.	183.19. 6.	3.96d
6.	87. 5. 0.	1.81d
7.	122, 0. 0.	3.33d
8.	94. 6. 0.	2.25d
9.	74. 6. 3.	3.44d
Average.	£ 105. 6. 0.	2.56d

It is frequently lost sight of that stock reared on the farm represents a profit. The full value of the beast is not profit; labour in rearing and cost of feeding must be deducted to get the real profit. The difficulty of isolating these costs is very great, but they are included in the general costs of running the farm as well. Hence it is correct to enter the full value of reared stock as profit.

In this study, stock was valued at the standard values method as discussed in chapter 2 Part IV. Under this method, calves up to one year old were valued at £4., heifers up to two years, not calved, £8., on calving £12. This assuming in any one year, 12 heifers calved, 12 heifers over one year old, and 12 calves born, the aggregate profit would be £144. If the farm produced 10000 lbs. of butterfat this would represent a profit of about 3½d per lb. butterfat produced.

The stock adjustment account will also contain entries necessary to adjust stock purchases to standard values method, ~~losses~~ Losses will ~~be~~ include..... Not only these adjustments but also stock died.

Table no. 26 on page 93 shows that the average yearlings per 100 cows on the nine farms was 25. This figure had been fairly steady over a number of years. The average size of the herd on these farms was 47, so that the profit on stock rearing would be £141, or approximately 2.9d per lb. butterfat.

This discussion has been undertaken, because the profits on stock dealings may seem very large, and has been criticised on that account. The average return on all stock dealings was 2.56d. per lb. of butterfat produced. This profit would not be present if the farmers were not endeavouring to increase the size of their herds.
Farms Nos 3, and 5, were endeavouring to materially increase their herds and hence their returns are over the average.
Farm No.4. was merely attempting to maintain his herd size, hence his returns are lower.

SUMMARY OF EXPENDITURE.

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The following table, grouping the various percentage statements, will show a more comprehensive picture of the costs side of butterfat production.

TABLE SHOWING % OF VARIOUS COSTS ITEMS OF COST TO TOTAL CASH EXPENDITURE.

SEE NEXT PAGE

The above table shows the relation of the various expenses to one another, and to the total cash expenses.

Table. No 122

TABLE SHOWING PERCENTAGE OF VARIOUS ITEMS OF COST TO TOTAL EXPENSES.

Items.	1.	2.	3.	4.	5.	6.	7.	8.	9.	Average.
Fertilisers	12.4	12.5	15.9	28.0	16.6	10.9	10.3	15.4	11.4	14.6
Wages	28.2	24.8	22.5	23.3	36.2	29.5	19.9	17.3	4.4	25.2
Rent & Interst.	44.7	31.6	22.7	17.7	20.6	27.0	34.6	27.2	38.2	30.8
Other	14.7	39.1	38.9	31	26.6	32.6	35.2	40.1	46.0	29.4
Total Cash Expenses.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.

The following table shows a comparison between the figures of the Government Statistician covering an investigation into farming expenses in New Zealand. and the result of the present investigation (1).

The figures are not strictly comparable for the following reasons:-. namely that the Government Statistician's returns include.

(1). All types of farming are covered.

(2). Only farms with over five hired hands are enumerated.

The latter item would exclude dairying, but even so/there is a remarkable similarity in the figures, or an explainable difference.

Table No. 123

TABLE SHOWING PERCENTAGES OF ITEMS OF EXPENDITURE TO TOTAL EXPENDITURE IN THE INVESTIGATION OF THE GOVERNMENT STATISTICIAN AND THE PRESENT INVESTIGATOR.

Items.	Government Statistician.	Present investigator
Interest and rent	33.3	30.8
Fertilisers	7.7	14.6
Wages	25.0	25.2
Electric Power	1.0	5.9
Rates and Taxes	8.1	3.2
Other	24.9	20.3
Total.	100.0	100.0.

The discrepancy in fertilisers is due to the fact that fertilising is much heavier in the dairying industry than in other branches of farming. Electric power is heavier because of the use of power for milking machines in dairying which is not present in other industries. Rates and Taxes are smaller in dairying, because the farms are much smaller. However, wages and interest correspond almost exactly, suggesting a fairly stable relation of these two items to total expenditure.

(1). Official Year Book 1931 pages 801/2.

Fawcett's investigation is calculated on a different (1). method. This study was carried out on the survey method.

The following table shows the figures for the modal group of his (Fawcett's) costs.

Table No. 124 TABLE SHOWING % OF VARIOUS ITEMS TO TOTAL COSTS OF MAINTAINANCE (INTEREST & WAGES PAID NOT INCLUDED.

Items.	Percentage.	
Topdressing	39.0	
Rates	12.1	
Fencing	7.3	
Cultivation	7.3	
Power	8.9	
Depreciation	8.9	
Sundries	16.5	(x)
Total.	100.0	

(x) Fawcett has 18% here, (page 46) but this does not add to 100.

This table is not comparable with the figures of the present investigator on account of different methods. Further, for wages, Fawcett took £7 per cow as a standard figure covering returns to hired labour, and the farmer himself. However the figures above give another view of the distribution of farm costs.

(1) " Dairy farm management " 1926 page 46 et seq.

The following table shows the relation of costs to gross returns.

TABLE SHOWING PERCENTAGE OF VARIOUS CASH EXPENSES AND THE TOTAL CASH EXPENSES TO TOTAL CASH RECEIPTS

SEE NEXT PAGE

On the average of the nine farms, cash expenses represented 60% of the gross receipts. Depreciation represented another 7%. That is to say, costs total 2/3rds. of the gross cash receipts when butterfat was 1/4d per. lb.

Table. No. 125

TABLE SHOWING PERCENTAGE OF VARIOUS CASH EXPENSES, AND THE TOTAL CASH EXPENSES TO TOTAL CASH RECEIPTS. TOTAL CASH RECEIPTS = 100% on the 9 FARMS.

Items.	1.	2.	3.	4.	5.	6.	7.	8.	9.	Average.
Fertilisers	9.3	10.1	10.0	14.2	10.4	6.1	5.9	13.5	6.1	9.8
Wages	21.1	20.1	14	11.8	22.8	16.4	11.2	15.2	2.4	16.9
Rent and Interest	33.3	26.2	14.2	9.1	13	15	19.7	23.9	20.5	20.6
Other	5.9	6.5	20.2	9.2	6.6	13.8	11.5	28.5	15.6	12.7
Total Cash Exes.	69.6	72.9	58.4	44.3	52.8	51.3	48.5	81.1	44.6	60

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RECEIPTS.

In the table on the next page, the various items of income are set out.

BUTTERFAT. Little can be said hereunder in addition to what has been said before. The personal divergencies in return have been dealt with on page 191.

PIGS. Rather wide personal divergencies are revealed here but in general this is due to special circumstances in the farms concerned. The average return of 1.64d per lb. butterfat produced, is probably lower than would have been the case, if certain special individual factors which militated against high returns had been absent. Probably a figure of 1¾d per lb. butterfat would be more nearly a current average if conditions had been normal. The average cash return was approximately £80, this isnequivalent to a return of £1.70 per cow.

OTHER RECEIPTS. The item "calves" is of course, vealer calves (vide chap. Part III page 182), and is of small importance. Other receipts is also of minor importance. The total of these two is less that ¼d per lb. of butterfat raised.

PROFITS. The question of profits is a difficult one owing to the question of interest on the owner's own capital; or on what ultimately amounts to the same thing, interest on all assets involved. If capital is to remain in a particular enterprise, then the return to the farmer must be sufficient to reimburse him for his labour plus interest on the capital he has invested.

In the first place it is proposed to give a table showing how much is available to pay interest on the owner's capital plus labour reward. No 126a. Page 301a The following table gives these particulars.

Table No. 12 C

TABLE SHOWING RECEIPTS IN TERMS OF LBS OF FAT AND THE GROUP AVERAGE

Items	1.	2.	3.	4.	5.	6.	7.	8.	9.	Average.
Butterfat	1/3.88d	1/4.44d	1/5.98d	1/3.77d	1/3.67d	1/3.79d	1/3.92d	1/3.27d	1/5.07d	1/3.93d
Pigs	.89	1.56	1.02	2.02	2.91	1.33	2.74	1.14	1.85	1.64
Calves sold	.25	.18	.04	.13	.02	-	.11	.13	.12	.14
Others	.01	.06	.05	.05	.06	-	.03	-	1.01	.18
Totals	1/5.03	1/6.24	1/5.09	1/5.97	1/6.66	1/5.12	1/6.80	1/4.55	1/6.05	1/5.81

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Table No. 126a.

TABLE SHOWING.

NET PROFIT AVAILABLE FOR

INTEREST ON FARMERS CAPITAL AND REWARD FOR HIS LABOUR.

NO.	1	2	3	4	5	6	7	8	9	Av.
EIPTS.	d	d	d	d	d	d	d	d	d	d
h	17.03	18.24	17.09	17.97	18.66	17.12	18.77	16.55	18.05	17.81
nts	2.33	2.94	3.38	.42	3.69	1.81	3.33	2.25	3.44	2.56
al	19.36	21.18	20.47	18.39	22.35	18.93	22.13	18.80	21.49	20.37
enses										
h	11.86	13.30	9.98	7.97	9.85	8.78	9.06	13.42	8.08	10.69
n	.36	1.74	1.31	1.00	1.38	1.28	1.71	1.16	3.54	1.29
al	12.22	15.04	11.29	8.97	11.23	10.06	10.77	14.58	11.62	11.98
fit	7.14	6.14	9.18	9.42	11.12	8.87	11.35	4.22	9.87	8.39

Table No 124 TABLE SHOWING NET PROFIT AFTER ELIMINATING INTEREST PAID AND ALLOWING 6% ON ALL ASSETS INVOLVED

	1.	2.	3.	4.	5.	6.	7.	8.	9.	Average
Receipts	1/7.36d	1/9.18d	1/8.47d	1/6.39d,	1/10.35d	1/8.95d	1/10.15d	1/6.80d	1/9.89d	1/8.37d
Expenses	6.73	10.73	9.02	7.54	9.20	7.69	7.63	10.93	8.53	8.69
Balance	1/-.63	10.45	11.45	10.85	1/1.15	11.24	1/-.50	7/87	11.96	11.68
Less Interest 6%	7.91	5.11	5.48	4.03	5.00	4.08	5.57	5.90	9.07	4.50
Nett.	4.72	5.34	5.97	6.82	8.15	7.16	6.93	1.97	2.89	7.18

Note. Receipts include adjustments, and expenses include depreciation.

The term, net profit, which includes adjustments as previously defined, and has had allowances, for depreciation deducted was on the average 8.39d per lb. of butterfat. These figures, together with those in the previous section indicate clearly that, with butterfat at 1/4d, farming is profitable on the typical dairy farms.

That is to say, that the average amount available to pay interest on capital and labour reward to the farmer was 8.39d per lb butterfat. On the average of the nine farms, this is equivalent to approximately £409. The average personal capital was £1972. Six per cent interest on this would be £118 approx., That is to say that the average reward would be approximately £291, or £5.12.0. (approx) per week. This was well over the wage of a skilled workman but probably not up to that paid to a manager with the responsibility of a farmer. (1).

The general question of interest in relation to costs of production is a difficult one. If two farms (2) otherwise equal in area and production, and with equal running expenses; are financed, one with a mortgage and the other without a mortgage, then it is not reasonable to ARGUE that costs of production in the one case are higher than those in the other merely because interest is paid to an outsider. Hence for comparative costing purposes it is wise to ignore interest actually paid, and allow a flat rate on all assets.

The following table shows the net profit available after 6% interest has been allowed on all assets. This net profit is really a labour reward.

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(1). This weekly wage is a different figure to that given in the previous section. That was a figure of cash available in the season 1929/30. This is in figures of net profit relative to the general profitableness of the industry.
(2). See " The Relation of Labour costs to total cost of production in Agriculture " Int. Lab. office, especially pp.1 &17.

It remains to discuss briefly the effects of the reduction in butterfat payments from 1/4d to 1/- per lb. With butterfat at 1/4d. pr. lb. on the average, and gross p profits being equivalent to 1/8.37d, and with butterfat costing ~~today~~, 11.98d per. lb. to produce (allowing depreciation and interest actually paid), farming could be made to pay. Not only has butterfat dropped by one quarter, but other receipts have fallen likewise, so that 1/3d per lb. of butterfat produced would be a fairly average figure for the 1930/31 season. The expenses side is fairly steady, the only appreciable fall has been one of about 12½% in wages.

The following table shows the estimated net profit, that is, the amount available for interest on owner's own capital, and for labour reward for the 1929/30 season.

Table No. 128 TABLE SHOWING ESTIMATED NET PROFIT AVAILABLE.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	Average.
Receipts.	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3
Expenses.	11.5	1.1	9.5	7.6	9.5	8.5	8.7	1/1	7.7	10.2
	4.5d.	.2	5.5d.	8.6d.	5.5d.	6.5d.	6.5d.	2	7.3d.	4.8d

The average amount is equivalent to £234 (approx), Allowing £118 as interest on capital as before, this leaves as a labour reward £116, or £2.4.7 (approx.) per week, which is much less that the wage of urban unskilled worker.

Costs have not fallen to any extent, and the present plight of the farmer is very serious unless prices rise or costs fall.

The above figures give some indication of this serious position.

Part IV Chapter. V

Land Values

LAND VALUES.

The problem of land values, bristles with difficulties, and the expression that " the value of the land is merely the capitalisted value of the net product ", is a truism which does not help in a specific study which aims in finding out the value of a piece of land at any particular time.

This is so, even when the value of the net output is relatively stable over long periods, but particularly in agriculture where owing to general conditions of supply, the net output fluctuates enormously not only in the short run, but also in the long run.

To get a normal value - which would be of little value as a guide to what should be paid for a farm - there would need to be a prolonged study of the true net output, quantitatively in order to ascertain managerial factors ~~were ascertained~~, and in addition there would need to be an investigation into normal returns per unit of output, and normal rate of interest. Each of these problems of quantitative output, and normal rate of interest, introduce so many possible errors as to make any calculation mere guesswork.

The market value of the land tends to equal the capitalised value of the net output. As the only real knowledge is of the past then land values tend to project into the future, the conditions of the present, or to (1). put the same thing another way, land values tend to lag behind produce values.

The implications of this lag are very serious in times of falling prices. In 1920, after a period of high produce prices, a great deal of land was changing hands, It is estimated that over 50% of the occupied land changed hands between 1915/24. (2) Up to 1924, produce prices were rising and persons who bought land during the inflated prices of 1919/20, are in an intolerable position today. as far as the fixed charges (3) on the farms are concerned.

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(1). See Rodwell, "Land values in Canterbury"
(2). Belshaw, "The present economic position of the Farmer."
(3). ibid.

For the Waikato, the point is of enormous importance, for the Waikato began to develop just prior to the War, and there was a " Land Boom " there in 1919/20, when butterfat was bringing 2/6d per lb. The tremendous fall in price in 1922/3 severely tested the industry, and weeded out numerous farmers on the margin. The position today, when produce prices are down, to the pre War level means that since hardly any farms have been held since earlier than 1919, that the burden of fixed charges is much heavier (1) today than in previous years of the past decade.

In the following pages, an attempt has been made to arrive at a value for each of the nine farms. The method adopted was as follows:-.

1. Profits on stock and losses on stock were eliminated from the net profit. This is a managerial factor. If the farm were properly stocked, then stock would be reared only for replacements, and losses would counterbalance gains.

2. Interest already paid, was added to net profit.

3. A wage of £3.10. per week in eight cases, and £2.10. per week in farm No.9. was allowed to the farmer. This with house rent, milk, cream, and other farm products, would bring his wage up to £5 per week.

4. The resultant figure shows the net return available for return to capital invested.

5. The rate of interest ruling for the past few years has been between 6% and 7%. FOR Bank overdrafts. On first class MORTGAGES RATES HAVE BEEN ruling between 6% and 6½% . Hence 6% will be an average rate of interest. The return as per papa.4 was capitalised at 6% , and the following table gives the results of the nine farms, and the average.

Two assumptions are made herein:-.

(a). The quantitative return is normal.

(b). The money return is normal.

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(1). See chapter 4 Part IV

Table No. 128a. Table of Land Values.

Table showing the estimated value of the nine Farms.

Farm No.	Value of Farm as a going concern.		Value of Land and Improvements		Value of Land without Improvements.	
	Total	Per acre	Total	Per Acre	Total	Per Acre.
	£	£	£	£	£	£
1.	11633	38.8	9352	31.2	6817	22.7
2.	3883	16.7	2099	10.1	610	2.9
3.	2516	23.5	950	8.9	Minus260	- 2.4
4.	6416	63.3	5243	51.9	4378	43.3
5.	4833	47.8	3631	35.9	2576	25.5
6.	4733	51.4	3536	38.4	2466	26.8
7.	3200	34.8	2050	22.3	1015	11.0
8.	1033	12.8	28	3.3	minus1077	- 13.5
9.	1250	18.7	636	9.4	" 560	- 8.4
Total	40008	34.9	28034	24.4	16565	14.4

Below is a table comparing the above values with Government valuation.

Table No 129

TABLE OF COMPARATIVE LAND VALUES.

TABLE SHOWING GOVERNMENT LAND VALUES COMPARED WITH THE ABOVE:

Farm No.	Govt. value.	Unimproved value This investigation	
1.	£2390		£6817
2.	1438		610
3.	1575	minus	260
4.	1600	plus	4378
5.	1600		2576
6.	1000		2466
7.	1315		1015
8.	2000	minus	1077
9.	1450	minus	560

Note. Government values are generally much lower than real values.

The individual items vary so widely due to managerial questions, as to make a discussion valueless. For instance, Farm No.3. was over-farmed, The farmer was extremely careful, and spent so heavily, that diminishing returns had set in. Farm No.8. shows an opposite managerial tendency. In farm 4. profits were high on account of (a) High producing cows, and (b) cheap family labour, Other factors suggest that the real profit over a long period would not have been as high as this year. Farm No.5. is a typical farm, well managed. The values found by the methods of this paper, correspond roughly with a valuation made by a bank manager for bank purposes during the year under review, and on the basis of butterfat at 1/3d per lb.

It will be noticed that farms Nos 1, 5, and 6, closely approximate each other in value per acre. These would give a fair idea of value of land in 1929/30, that is, the real value of land. The selling price was usually in the vicinity of £40 per acre for good farming land but any general rate would be so broad as to be valueless.

The next table shows the capital position of the nine farmers, after mortgages on land have been deducted (note that the value arrived at in this investigation for capital value is used.)

Table No 120

TABLE OF FARMERS' CAPITAL INTEREST.

TABLE SHOWING NET INTEREST OF THE FARMER IN HIS LAND.

Farm No.	Capital value.	Mortgages.	Net.
1.	(x)		
2.	£2099	£2720	minus £ 621
3.	950	591	359 (Æ)
4.	5243	1700	3543
5.	3631	2120	1511
6.	3536	1000	2536
7.	2050	963	1087
8.	28	2100	minus 1087
9.	636	1000	" 364

(x). Not applicable. (Æ) The capital interest of this farmer is really much higher because of the factor mentioned on page 3-8.

Little value can be got by carrying this type of of investigation, with hypothetical assumption as to prices and returns, into the future. It suffices to day that if costs were to remain the same as in this investigation, or even fell up to about 10%, with butterfat at 1/- as it was in the 1930/1 season, with a similar prospect for this season, then the unimproved and capital value of the land worked out on the above methods, would in EVERY case but one, be a minus quantity. This really means that the owner's equities, are wiped out and even mortgagees are losing their equities. This would serve to reinforce the point as to the heavy burden of fixed charges on the dairying industry.

The industry is faced with a period of falling land values, to bring them into line with the reduced normal price ~~level~~. level.

Part IV Chapter VI

The Temporal Distribution of Receipts and Payments.

THE TEMPORAL DISTRIBUTION OF RECEIPTS AND PAYMENTS.

The fact that receipts and payments do not synchronise is important not only in connection with farm management, but also has implications in regard to farm credit.

The following table shows the percentage distribution of receipts and payments throughout the year on the nine farms.

Table No. 131

TABLE SHOWING PERCENTAGE DISTRIBUTION OF RECEIPTS AND PAYMENTS THROUGHOUT THE YEAR.

ON EACH OF THE NINE FARMS.

PAYMENTS.

Aug.	Septr.	Octr.	Novr.	Decr.	Jany.	Feby.	Mch.	April.	May.	June.	July	Tot.
2.2	10.4	7.9	8.8	26.9	9.4	9.2	8.8	4.9	6.6	2.6	2.3	100
10.5	8.	12.3	4.9	9.1	9.0	8.9	7.5	8.7	10.6	3.9	6.6	100
.9	15.0	7.4	9.8	6.4	17.4	3.5	6.6	12.3	1.0	4.0	15.7	100
6.7	3.7	9.9	13.3	11.5	12.5	7.3	1.1	12.3	5.2	3.0	13.5	100
1.8	9.5	2.8	9.3	5.0	20.3	6.8	12.8	5.5	3.5	16.8	4.9	100
12.7	16.0	12.8	11.4	6.6	9.9	9.6	4.8	1.7	2.4	4.1	8.0	100
19.6	13.4	10.4	11.0	9.2	7.4	3.6	3.9	6.9	3.0	7.0	4.6	100
1.0	9. 5	6.1	27.9	8.7	13.0	1.1	7.7	4.1	16.4	4.5	-	100
7.4	17.6	4.4	12.1	2.8	4.8	2.7	21.6	8.0	8.0	6.6	4.	100
6.1	10.7	8.5	11.2	12.1	11.7	6.6	7.7	7.4	6.6	5.2	6.2	100

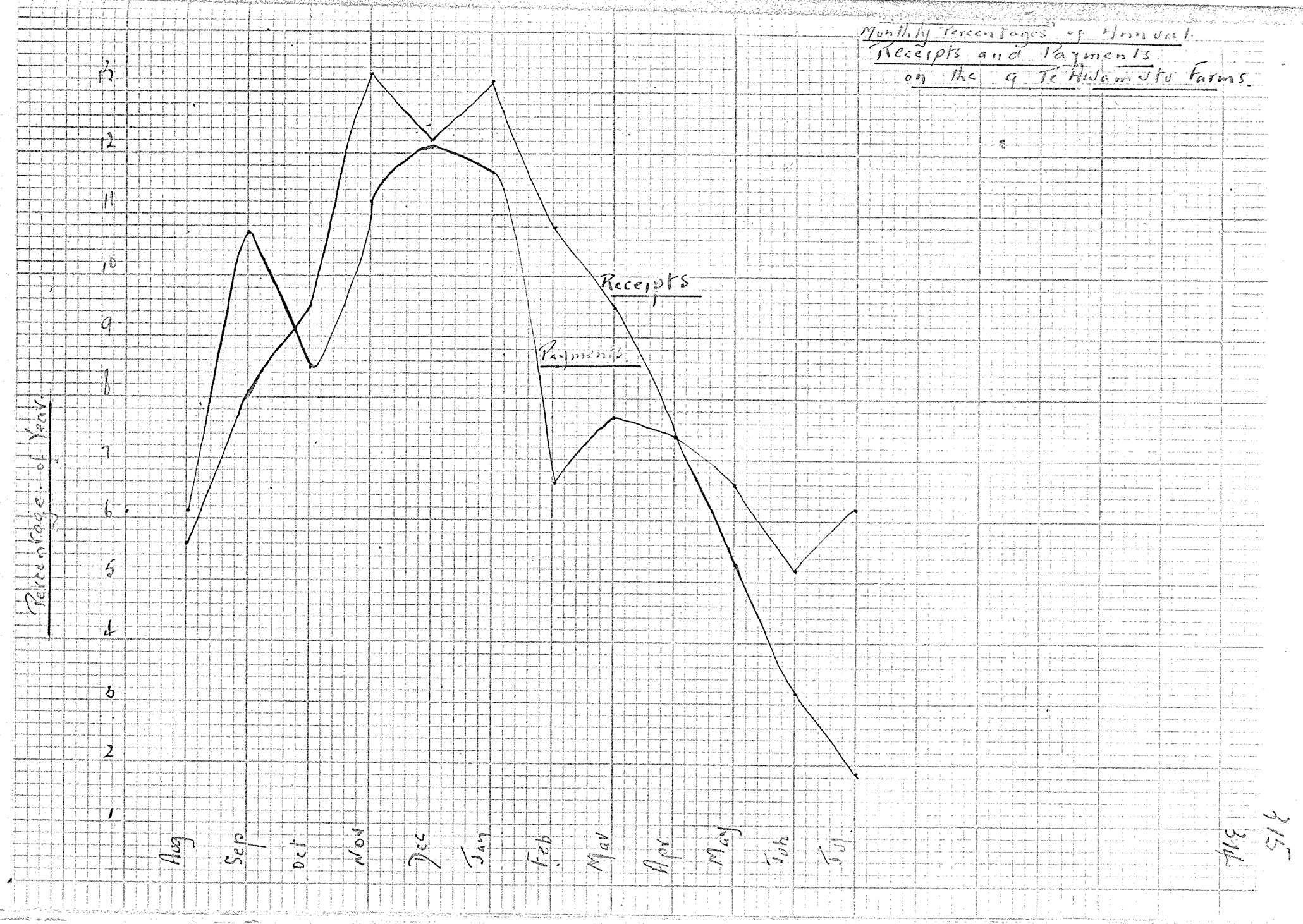
3/2

Table No. 132. TABLE SHOWING PERCENTAGE DISTRIBUTION OF RECEIPTS AND PAYMENTS THROUGHOUT THE YEAR ON EACH OF THE NINE FARMS.

R E C E I P T S

Aug.	Septr.	Octr.	Novr.	Decr.	Jany.	Feby.	Mch.	April.	May.	June.	July.	Total
1.3	12.1	8.2	11.2	13.1	14.9	11.9	9.1	9.1	4.6	3.5	1.0	100
4.5	8.	11.6	13.9	12.0	13.1	11.1	8.5	8.3	7.3	4.6	2.3	100
9.2	10.6	10.3	13.7	12.	13.7	9.3	7.1	6.1	4.3	1.9	1.8	100
6.7	5.2	11.4	12.7	12.8	10.7	11.1	10.9	7.2	7.2	3.2	.9	100
6.9	3.5	9.2	11.2	11.4	17.5	10.5	11.2	6.4	6.8	3.2	2.0	100
7.0	10.3	10.1	14.7	10.7	10.5	8.6	11.9	6.7	6.0	2.1	1.4	100
1.8	6.4	7.0	17.9	11.6	11.7	11.3	7.8	9.9	5.2	7.4	2.0	100
3.9	4.0	9.1	13.	18.0	11.0	12.7	13.8	6.5	4.0.	2.4	3.6	100
7.6	5.6	9.3	13.9	13.6	13	11.2	9.0	7.4	5.3	3.0	1.1	100
5.6	8.1	9.5	13.3	12.2	13.2	10.8	9.5	7.4	5.3	3.2	1.9	100

Monthly Percentages of Annual Receipts and Payments on the 9 Te Hiwa Mutu Farms.



Graph No 21 ~~(5)~~ gives an illustration of the average of the above two tables.

The following table shows percentage of payments to receipts in each month of the year, on the average of the nine farms.

Table No. 13 TABLE SHOWING PERCENTAGE OF PAYMENTS TO RECEIPTS ON EACH OF THE NINE FARMS.

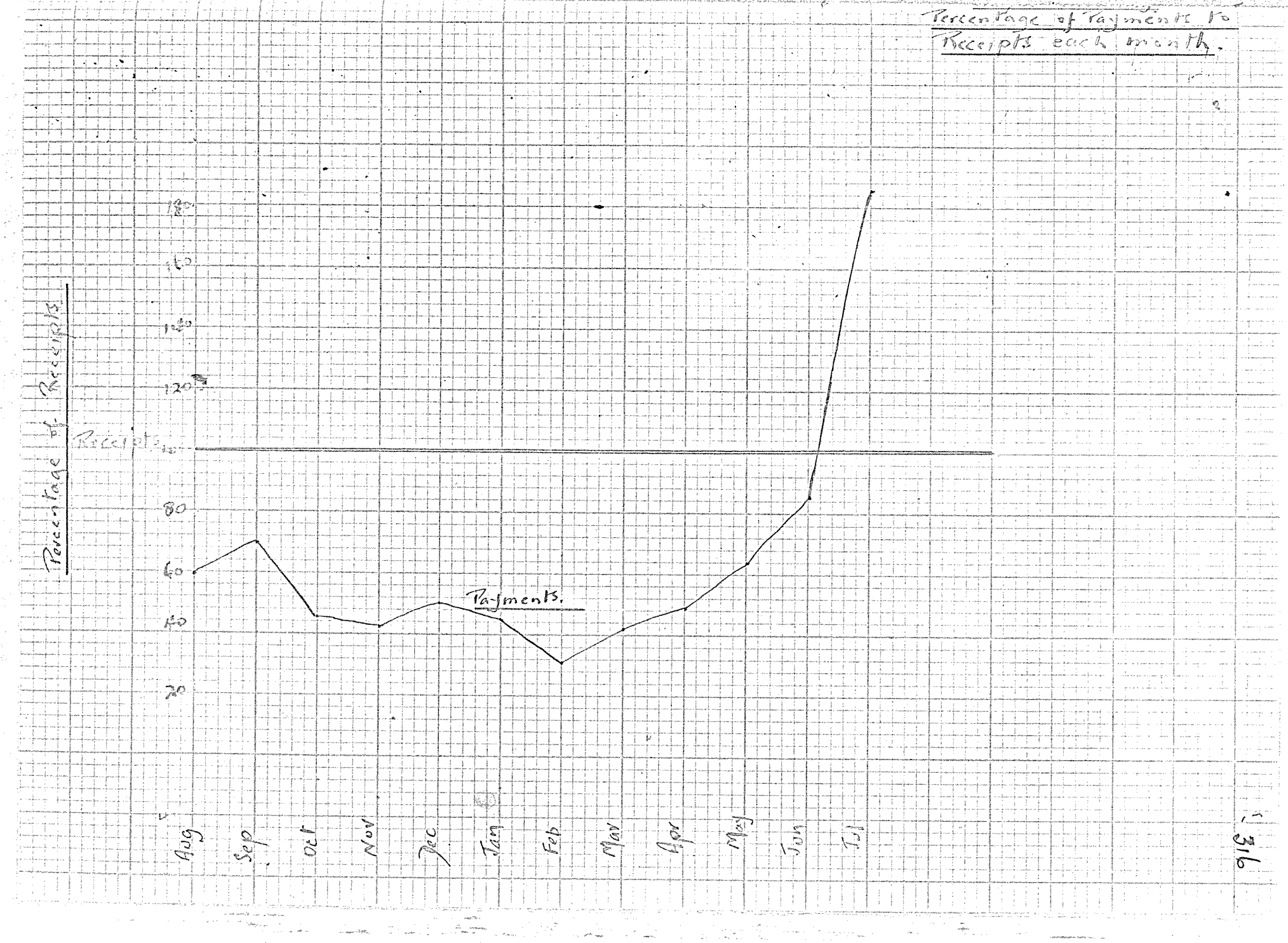
Month.	Percentage of payments to receipts.	Month.	Percentage of payments to receipts.
August	60.2	February	31.3
September	70.4	March	42.2
October	46.1	April	49.6
November	43.6	May	64.0
December	50.6	June	85.0
January	45.7	July	185.1

Graph No 22 ~~(6)~~ illustrates this table ~~graphically~~.

Each tables and graph should be ~~used~~ read in the light of the other table and graph respectively.

The point that stands out, is of course, the need for credit facilities from April to September. If the farmer can himself, provide against that period, so much the better, but the average farmer looks to outside assistance at this time as illustrated by the statement in chapter Part IV on Rural credits. (vide p 269).

Percentage of Payments to Receipts each month.



L. 14

Part IV Chapter VII

Prospects for the immediate future

PROSPECTS FOR THE IMMEDIATE FUTURE.

The Dairy Industry in common with the other primary industries of New Zealand is at the present time passing through a period of very severe depression. It is a well known fact, that in times of depression the prices of primary products and raw materials fall much lower than prices of manufactured articles. This fact has important repercussions in New Zealand owing (1) to, the fact that a very large proportion of New Zealand's real income is derived from the land and (2) the primary products so obtained depend for their sale on conditions of the world markets where they are sold. Because of the reduced exchange value of our primary products, the not result is a much more serious fall in the real national income than if (a) New Zealand were less dependent upon outside markets for her primary products, or (b) here exports were manufactured goods.

Since little that can be done by New Zealand can affect the prices received for her primary products New Zealand must concentrate on increased production coupled with lower unit costs if she is to offset the falling prices. Otherwise the margin of profitable production will recede with consequent losses both in capital and income.

While the above discussion is appliable to all New Zealand Primary Industries it has special importance as far as Dairying is concerned for several reasons. First, the capital employed in Dairying is much greater than in any other the other branches of primary industry. Seconaly, the number of individuals employed either as owners or Hired Labourers is greater in the Dairying industry. This of course implies that there are more farms so occupied. Thirdly the summated fertility of the land so used is greater

than the summated fertility of the land used for any other purpose. This means that though there may be areas used say for fruit growing which have a greater individual fertility, yet by and large the land used for Dairying is the best in New Zealand. Fourthly, the State hold a very large proportion of the first mortgages on land used for Dairy purposes. A recent estimate placed this as high as 50%. Consequently any serious recession of the margin would result in serious losses to the State with the additional burden to the Tax Payer. The above discussion therefore will justify an examination of the prospects for the immediate future.

The great expansion in Dairying that took place in the year immediately after the war resulted in such land being brought into dairying cultivation which in prewar times was either not used at all or used for sheep. Much of that land was only farmable while prices were over 2/- per lb for butterfat. Consequently the serious fall in prices which took place in 1921/2 resulted in a great deal of this sub-marginal land going out of production or reverting to sheep. But the margin did not recede to its full extent. The fall in prices stimulated more efficient dairying and the greater use of the milking machine and the more scientific use of fertilisers - particularly phosphatic manures - resulted in much lower unit costs and enabled the very great increase in the number of cows carried as well as/the production per cow. This enabled land which was in below the margin under old methods of usage to remain above the margin under the newer methods. Further falling prices coincided with a great increase in co-operative production and marketing; and while the relative merits of co-operative as against proprietary manufacturing production may be still in doubt as far as the efficiency of the management is concerned, the co-operative movement

did act as check on the proprietary companies and resulted in a return more nearly in accord with current market prices. In the interim there has been, as noted in this essay, a steady improvement in the technique of Dairy Farming, ~~the~~ which has resulted in a great increase in per acre and per cow production, which of course involves, other things being equal , a fall in unit costs of production.

The general trend of prices since 1921 has been downward but this fall has been greatly accelerated in the last two years. In 1928/9 the average pay-out per pound of butterfat was 19d; in 1929/30 , 16d ; in 1930/1, 12d. This represents a drop of over one third in less than two year. If this fall were only temporary the problem would not be so serious but it is generally agreed that prices will not rise permanently above 12d per lb of fat in the near future. Economist are agreed that the present prospects are for a continued fall in world prices, while the leaders of the Dairy Industry who are in touch with the world markets suggest that the technical conditions of their special market make it very unlikely that there will be any appreciable rise.(1) As a consequence the industry is faced with a continued fall in price or at least a period of low prices.

As a consequence of the above one would expect the margin of production to recede both as to the farmers themselves and as to the land which is used for dairying. Either or both of the following factors would tend to offset this tendency. - (a) a fall in the costs of production commensurate with the fall in the price level or (b) an increase in production commensurate with fall in prices but with no extra cost, that is to say a greater production for a given cost

There has been some fall in the costs of production both as to wages and the more material

(1) Interview with Mr. W. Goodfellow, Managing Director Dairy Co. Ltd.

requisites as well as a fall in the costs of living. Dairying
However the fall has been much less than the fall in the cwmtx produce prices and hence has given but little relief to the farmer. Further the policy of heavy tariff protection which is granted to the secondary industries of New Zealand with the consequent reaction on urban wage rates tends to maintain the disparity of costs and returns to the farmer. This whole question is however outside the scope of this paper and it will suffice to say that there is little relief to be hoped for from lower rates of production expenses.

Consequently any remedy must lie along the line of increasing production in terms of a given cost. It was noticed in Chapter 3 of Part 1 that the major factor affecting farmers financial returns was butterfat per acre rather than butterfat per cow. Consequently attention must be paid to butterfat per acre in the first place. In the chapter just mentioned it was found that there were two major factors affecting butterfat per acre; they were (1.) Cows per 100 acres and (2) butterfat per cow.

To very materially affect the aggregate production through increased butterfat per cow involves the long process of careful breeding and intelligent culling of "bad" cows. This involves several years and is much too remote a result to be applicable to the present trouble. It is agreed that the aim of increased per cow production should be the ultimate aim of the industry and this end should never be lost sight of. A return to the old haphazard methods of breeding would be serious retrograde step.

However it is thought that alleviation of the present distress lies rather along the lines of increased cows per hundred acres rather than increased cows production

Increased cows per 100 acres involves (1). More fertilisers per acre, (2). a further development of Rotational Grazing (3) a greater conservation of winter feed (4) increased credit facilities for the above purposes and for (5) the maintenance of more cows. We will discuss the above seriatim.

Fertilisers. It was noticed that increased butterfat per acre was associated with increasedx cows per 100 acres and that both of these were closely correlated to the per acre applications of phx fertilisers. Hence increase cows per 100 acres involves an increase in fertilising per acre. Leaving for a later section the question of credit for the purchase of such fertilisers, it was noticed in the chapter on fertilisers that there has been a heavy falling off in the use of fertilisers in the last two years. This must affect the butterfat production per acre. ~~xxxxxxxxxxxxxxx~~ For some time the Government has been discussing the question of Fertilisers and on the 10th October announced a subsidy of 12/- (approx) per ton on superphosphate, with a maximum subsidy of £100000 To this the companies have added a price reduction of 6/6 per ton making in all a price reduction of 17/6 per ton of superphosphate. This must have some result in stimulating the use of superphosphate and even if it ~~xxx~~ results only in the maintenance of the rate of use prior to 1930 it will have a benificial effect. It seems however that in addition to the price reduction there needs to be an intensive educational campaign to inculcate the need for the mainten-ance of top-dressing.

Rotational Grazing. Rotational grazing involves of course smaller paddocks and this in turn involves credit facilities. However this latter

It may be said with some confidence that the merits of smaller paddocks and rotational grazing are not understood by the average farmer and considerable education and demonstration is necessary before the system will become the normal practice of the farm. There seems to be some scope for farm planners and it is suggested that this work might with advantage be taken over by the Agricultural Department. At the present time not only is there considerable waste of available feed through non-use but grass is often trodden down through the need to traverse paddocks on the way to the Sheds. Closely allied with this is the problem of grazing sheep after cows. Not only will this result in a more satisfactory growth of grass and a moreeffective use of the grass available but it will provide a source of additional revenue to the farmer. In fact it is probale that the future will see some very considerable development of the mixed Dairy / Fat sheep and fat lamb farm. However for the immediate future the problem of increased per acre production is bound up with the problem of more effective use of what grass there is available. One of the methods of securing this end is of course education.

Conservation of winter feed. It is a necessary consequence of the carrying of more stock that there should be a greater conservation of winter feed. Even assuming that the growth of nitrogenous fertilising will provide more grass that is at present available in the winter months, there is no doubt that there will always be a need for supplementary feed. At present nitrogenous manures are very costly and hence there is a greater need for more hay and ensilage if more stock is to be carried. More hay and ensilage involves of course more fertilising. The policy of making the minimum requirement should be changed to one making the maximum

possible.

Credit Facilities. Much of the above matters has been bound up intimately with the question of adequate credit facilities. There is of course always the assumption that the point of ~~xxxxxx~~ Diminishing Returns is still some distance away in the matter of the application of fertilisers. Given that additional fertilisers, rotational grazing ~~xxx~~ additional conservational of winter feed will enable more cows to be carried so that the unit cost of production will be lowered, there is still the problem of the credit necessary untill the extra returns ~~xxx~~ have come in. Where the farmer has adequate security there is no obstacle but the chapter on Land values has indicated that in the majority of cases not only is there no available security but that in some cases even the farmers own equity has entirely disappeared. Hence it appears that Credit will not be forthcoming from private sources. The problem then arises as to whether the State should undertake the risk. The risk is very high and in the majority of cases the only security will be the managerial ability and personal integrity of the farmer. However on balance it appears that the consequence of any considerable recession of the margin of production will be so, serious to the community as a whole that it is probably that the cost of the risk to the taxpayer will be less than the alternative. The fact that practically the whole of the Dairy Farmer's receipts come to him through his Dairy Company provides a suitable means arrange for payment of interest and principle, in a similar manner to/which that is at present adopted ~~xxxxx~~ in connection with Loans through the Rural Intermediate Credit Board. Further the Dairy Company is ~~xxxxxxxxxxx~~ able to know something of the financial circumstances, ~~xxxxx~~managerial ability and personal integrity of the farmer and whether he would make good if credit were

available. The additional fact that many of the Dairy companies act as agents for Fertiliser Companies and as suppliers to their own shareholders makes it that the necessary channels for the inauguration of a policy as outlined above would have some chance of success

More Cows. The final point of course is that there should be more cows available to take advantage of the greater grass available. Obviously present credit restrictions are such that purchasing in the open market is not possible. Hence the following suggestions based on those of Fawcett to the National Economy Committee seem to provide the basis for the provision of additional cows.(1) "All replacement heifers should be put to the bull irrespective of the quality of the heifer." "Where possible Station cows (Beef cattle) of reasonable type should be drafted into the dairy herds." "No cow should be culled merely for yield." "Yearling heifers should not be destroyed." "If the above recommendations are put into effect, we will enter the new season with a total herd increase of approximately 15%. " "Although per cow production may show a decline, the total increase (of butterfat) resulting from the increased numbers would be considerable." "It is no exaggeration to expect an increase of over 200,00 cows if a special drive were made. A conservative estimate of the resultant butterfat increase would be 40,000,000 lb. which would give a gross return of £2,000,000 at 1/-.....In the light of recent research and present knowledge it can be stated quite definitely that if the above policy were put into practice, prodiction can be raised 50% from the present area utilised, inside five years and probably doubled with eight years."

(1). I am indebted to Mr. Fawcett who forwarded to me a copy of his evidence from which the above is copied.

The above suggestions of Fawcett's provide the extra cows necessary for a greater per acre production.

The net result of the policy outlined in the last few pages would be a definite reduction in unit costs of production . In the course of a few years land values and hence fixed charges which today press very heavily on the farmer would be adjusted to the lower prices. Hence although the present outlook is very serious yet ~~thxxxxxks~~ the ultimate prospects of h the industry are quite bright if the tansition period can be safely passed .

The future holds considerable development in types of fertilisers to be used, in the quantities of their application and in the methods of topdressing. The practice of scientific rotational grazing will developed, as a corrollary to which there will be much smaller paddocks. Finally the ultimate result of this more intensive farming will probably result in much smaller farms, say between 50 and 60 acres.

However the whole development is intimately bound up with the question of management. As stated in the first chapter to this study the farmer is more than a manual labourer. The Farmer is Capitalist entrepreneur and labourer. In the past he has paid far more attention to manual labour ~~xxdx~~ than to management. While there are reasons for this, apart from education , yet it thought that the various institutions interested in the farmers' welfare have ,~~xx~~ in their stress of the more scientific side of Dairying, paid too little attention to education in the matter of business management. Education in the value ~~xx~~ and the methods of use of farm records would be productive of enormous gains.

Attention has been directed in the past rather to the methods of keeping the account

records than to the use of records when kept. I am convinced that the actual method of Bookkeeping is of minor importance when compared with use value to be derived from the use of records.

Finally there should be some means for pooling the information available from the records of individual farmers. "Ad hoc" groups would fulfill the function but there seems to to be some advantage in the co-ordinating body being a recognised institution such as a University College, an Agricultural College or the Department of Agriculture. However I am of opinion that the aim should be that these insitutions should be only co-ordinating authorities and not record keeping institutions. While it may be necessary in the first place for the Institution to keep the actual records, yet farmers as a whole will get greater value out of keeping books themselves than if they were kept by an outsider. When the figures slowly take shape and one can see emerging the final, returns these results seem to live. They become part of the worker and the problemx of farm management, its difficulties and its snares, seems to be living and real.

Hence if the developement of managerial ability enables the New Zealand farmer to take more advantage of the excellent natural facilities which the country affords to the Dairying Industry, the present difficulties will be overcome with a minimum of distress and in the future the growth of the industry will react not only to the advantage of the farmer himself, but also to the benifit of the Dominion as a whole.

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Appendix B

Copy of Questionnaire

Auckland University College.

Department of Economics.

FARM COSTING GROUP.

ALL PARTICULARS AS AT 1/8/29.

Full Name:

Age:

Full Address:

County:

Riding:

District:

Postal:

Particulars on Valuation Roll:

Capital Value:

Unimproved Value:

When did you take over the farm:

Leasehold or freehold:

If lease - Particulars:

Total price paid:

Price per acre:

Rental in case of leaseholds:

Amount outstanding on Mortgage:

At Purchase: 1st.Mort.£.....2nd.Mort.£.....3rd.Mort.£.....

Today: 1st.Mort.£.....2nd.Mort.£.....3rd.Mort.£.....

Rate per cent on Mortgage:

At Purchase: 1st.Mort.£.....2nd.Mort.£.....3rd.Mort.£.....

Today: 1st.Mort.£.....2nd.Mort.£.....3rd.Mort.£.....

Interest payable:

Yearly etc.

Total Acreage:

Was farm all in pasture, or cultivated on purchase:

Acreage not broken in:

At Purchase:

Today:

Could the remainder be broken in:

Acreage actually in use today: Approx;

General idea of country (hilly, flat, etc.)

Have you put any permanent buildings on property since purchase:
Yes or no:

Give particulars and approx.value:

Buildings on Farm - today:

(a) House. Brick, Wood. Rooms.....Value £.....
(b) Milking Shed. Wood, Iron, Concrete, Floors.....
(c) Stable.
(d) Garage.
(e) Implement shed.
(f) Pig Sties.

Do you use milking machines.

Nature of machines:

Name:

Power:

Date of purchase:

Price:

Do you separate at home:

If you do is Separator included in Machines above:

Separator:

Hand or Power:

Capacity:

Cost:

Date of purchase:

Skim Milk Pump (if any)

Cost approx.

Date of purchase.

Is your herd tested:

Motor Car:

Motor Truck:

On what basis do you make and receive payments:

1. In Cash:
2. By Cheque:

How do you finance Household expenses:

Is dairying your chief objective:

What other lines do you follow:

1. Pigs:
2. Sheep:
3. Cropping:

Liabilities other than farm Mortgages at this date:
Enumerate:

Assets other than those on farm at this date:

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PADDOCKS	APPROX. ACRE-AGE	COVER	NUMBER OF YEARS UNDER PRESENT COVER	TYPE OF SOIL	TOP DRESSED THIS YEAR	MANURE	MONTH APPLIED	AMOUNT PER ACRE	DO YOU TOP DRESS EVERY YEAR?
No. 1									
No. 2									
No. 3									
No. 4									
No. 5									
No. 6									
No. 7									

I M P L E M E N T S

	DATE PURCHASED	COST	MAKE	CONDITION
Plough				
Harrows				
Waggons				
Sledge				
Cans				
Top Dresser				
Hay Mower				
Hay Sweep				
Hay Rake				
Drills				

ALL PARTICULARS AS AT 1ST. AUGUST, 1929.

Are you still feeding hay:

Calves:

Do you feed with:

Whole milk:

Skim milk:

Concentrates (Kind):

Pigs:

Do you feed with:

Skim milk:

Other (Name):

Other foods:

How grazed:

Rotation No. of paddocks from which you intend to get hay this season:

M A N A G E M E N T.

Do you manage the farm yourself:

Do you work on the farm:

(a) Whole time:

(b) Part-time:- amount.

Labour employed - Hired (Not domestic help)

1. Number
2. Wages paid - weekly:
3. Amount wages:
4. Found or no:
5. Permanent or casual:

Family help in farm work:

1. Number and sex:
2. Paid or unpaid (Paid to be included above).
3. Full time yes or no:
4. Part-time - amount and work:

Factory supplied:

Kind factory:

Shareholder supplier or supplier only:

Present interest in factory:

(a) No. of shares:

(b) Paid up:

Is cream or milk picked up at your gate:

If not how far do you cart it:

(a) to Factory:

(b) to Dump:

No. of people in household:

Adults:

Children:

(Include labour found)

Bank balance:

(1) Credit:

(2) Overdraft and Rate:

(3) Name of Bank:

On what is overdraft secured:

S T O C K.

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ALL PARTICULARS TO SHOW STOCK AS AT 1ST. AUGUST, 1929.

Dairy: Bulls: Over 2

Number and breed and age purchased or reared.

Dairy: Cows:	No.	Price (Purchased only)
Class:		
Pedigree		
purchased		
reared		
Grade		
purchased		
reared		
Crossbred		
purchased		
reared		
Other		
purchased		
reared		
Breed:		
Jersey		
purchased		
reared		
Shorthorn		
purchased		
reared		
Friesian		
purchased		
reared		
Ayrshire		
purchased		
reared		
Other		
purchased		
reared		

No. of Cows Calved before 1/8/29.

No. of Cows still in Milk from last season:

In Calf:

Not in Calf:

No. of cows slipped or prematurely calved before this date:

Dry Cows - not in calf:

Cows in calf:

Calves: (this season) Born alive prior to 1/8/29:

	No. Pedigree.	No. grade.	No. other.
(1) Kept for dairy stock:			
(2) Died:			
(3) Sold:			
(4) Destroyed:			

Calves born dead:

Calving troubles:

(a) Cows died and why:

(b) Mammitis:

(c) Abortion:

(d) Other:

Heifer Calves for dairying at this date:	Rising one year:	Rising two years: (Not in calf).
Pedigree:		
Grade:		
Crossbred:		
Other:		
Jersey:		
Shorthorn:		
Ayrshire:		
Friesian:		
Other:		

Bull calves for dairying:		
Pedigree:		
Grade:		
Crossbred:		
Other:		
Jersey:		
Shorthorn:		
Ayrshire:		
Friesian:		
Other:		

Other Stock:

Cattle: Steers: No.

Bulls:

Cows:

Heifers:

Pigs: Breeding: Boars:

Sows:

Other: Weaners:

Suckers:

Other:

Sheep: Ewes:

Wethers:

Hoggets:

Rams:

Horses: Heavy:

Light:

Do you rug cows
(a) After calving-and time:

(b) In winter:

When a cow calves do you give her any treatment?

Do you allow the calf to suck her?

Do you hand strip cows after machine milking?

Are your cows dehorned?

Do you milk at regular hours?

AUCKLAND UNIVERSITY COLLEGE.

DEPARTMENT OF ECONOMICS.

FARM COSTING GROUP.

M O N T H L Y P A R T I C U L A R S.

MONTH _____

1. Quantity of Butterfat:
   lb. _____
   test _____
   per lb. _____
   total payment _____

2. Accounts paid:

   1. By cheque — Firm — Details — Total

   2. By cash

3. _____
   Details of goods, services etc. procured but unpaid for:

   Firm — Details — Total

4. Wages paid _____

5. Miscellaneous receipts not pigs, calves, etc. _____

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6. Miscellaneous payments:
Rates:

Taxes:

7. Total domestic expenses:

8. Approx. Av. Quantity of milk for house daily:

9. Cream for house:

10. Any other farm products for house:

11. Calves sold:	No.	Price	Total
1. 3 days old			
2. Other			

12. Other stock sold:

13. Pigs sold for baconers:	No.	Dressed Weight	Per lb	Total.
Weaners:				
Other:				

14. Pigs sold for porkers:				
Weaners:				
Other:				

15. Other pigs sold:

16. Calves bought:	No.	Price	Total

17. Other stock bought:	No.	Price	Total

18. Pigs bought:

19. Litters of pigs:
Date

No.

20. Litter weaned:
Age

21. Pigs fed:
Skin milk

Whey

Butter milk

Concentrates and kin

22. No. of pigs feeding on skim milk on
1st. of month

last of month

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	1st. Month	Last of Month
23. Calves fed:		
Whole milk:		
Skim milk:		
Other (Kind):		
24. Approximate amount to calves at feed:		
25. No. of feeds per day:		

SHEEP:

	No.	Price	Total
26. On hand 1st. of Month:			
Bought			
Sold			
On hand last of Month:			

27. How grazed:

1. separately:

2. after cattle:

28. Moved from paddocks how often during month:

29. Horses on hand 1st. Month:

Bought and price

Sold and price

On hand last of month:

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W E E K L Y S H E E T

Cows milked on Sunday morning _____

Cows in for first time on:

Sunday _____

Monday _____

Tuesday _____

Wednesday _____

Thursday _____

Friday _____

Saturday _____

Cows not milked for first time on:

Sunday _____

Monday _____

Tuesday _____

Wednesday _____

Thursday _____

Friday _____

Saturday _____

Cows milked on Saturday night _____

Do you have a definite rotation of fields for grazing? _____

Do you graze in different fields after night and morning feeding? _____

Approximate av. time cows in yards _____

How long are cows in one paddock? _____

Paddocks used this week
Rotation No. _____

Feeds in each paddock:
Rotation No.
Rotation No.
Rotation No. _____

Have you done any work on paddocks this week? (Explain briefly.)

(2)

Take any selected day (say Wednesday) and each week on this same day give the following particulars. It is important that the same day should be kept each week.

Approximate time for morning milking: _____

Approximate time for evening milking: _____

Average time for cleaning up: _____

Time of rising: _____

Time of evening milking: _____

Hours in working day - other than milking: (Exclude meal hours) _____

Approx. time for calf feeding at one feed: _____

Approx. time for pig feeding at one feed: _____

House hours: _____

Did you feed hay to cows? _____

No. of times per day: _____

Was the week under review an average week?
If not, give an idea of work done

_____

Is the day under review a fair sample of the week?

_____

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SPECIAL SHEETS.

TOP DRESSING.

Rotation No. of paddock:

Amount out on
per acre:

total:

Kind:

Hours:

Work done by:

Horses used:

FENCING.

Description:

Paddock:

Amount wire:

Time:

Posts 1. Cut on farm - and time of cutting:

2. Purchased. No. and cost:

HAY & ENSILAGE.

DATE: _____

Paddock No: _____

Time field left to ripen
weeks: _____

How treated: _____

Hours top dressing: _____

Hours harrowing: _____

HAY & ENSILAGE.

DATE:

Paddock No.:

Reaped: Date:

Hours worked. (approx.):

No. of temporary employees:

Wages:

..... at .... per hour

..... at .... per hour

per day

No. of permanent employees at haymaking:

Average hours:

Method of making ensilage:

Did you have any unpaid labour:

Details:

Machinery used in stacking:

CROPPING.

Name of crop:

Rotation of Paddocks:

Whole Paddock: (Yes or No.)

Paddock originally in:

Hours of ploughing:

Hours harrowing:

Hours sowing:

Quantity sowed:
(a) Per acre:

(b) Total:

Time from sowing to reaping:

Hours of reaping:

Quantity approximately reaped:

How disposed of:
If sold, to whom:

Quantity:

Price: (a) per unit:

(b) Total:

BREAKING IN NEW GROUND.

Amount:

Kind:

Swamp:

Titree:

Bush:

Other (Kind)

Work required:

Draining:

Clearing:

Hours in Preparing Soil for Plough:

No. of hands employed:

(1) Self:

(2) Hired labour:

(3) Home labour:

Ploughing:

(1) No. of times:

(2) Hours:

Harrowing:

(1) No. of times:

(2) Kinds of harrows used:

(3) Hours:

Sowing:

(1) Kind of seed:

(2) Quantity:

(a) per acre:

(b) total:

(c) hours:

Time till field available for grazing: