LINCOLN COLLEGE
(CANTERBURY AGRICULTURAL COLLEGE)
University of New Zealand

Farm Management and Potential Production in Westland County

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TECHNICAL PUBLICATION Number 11 SEPTEMBER, 1954

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Printed by SIMPSON & WILLIAMS LTD., 169 St. Asaph St., Ch'ch.

SUMMARY

The general standard of farm management in Westland county is only fair to average. Production on all farms could be increased by at least 50 per cent. over a five-year period, financed moreover, out of current income.

Dairy farming is characterised by large total areas, but small fully-improved areas. Sharemilking is almost unknown and the majority of farms are one-man units, milking on average, 44 cows. The amounts of winter supplements saved are usually not adequate. Management is weak with regard to provision for shelter and adequate paddock water supply. Pig production is not efficient.

Sheep farms are generally understocked (average carrying capacity 0.95 EE per effective acre). This partly accounts for the high average fat-lamb weight (39.8 lb.) and the high percentage of lambs fat off the mothers (45 per cent.). Wool is regarded as secondary to fat-lamb production, the average fleece weight being 7.7 lb.

The average carrying capacity on cattle farms is one breeding cow per 20 effective acres, with a calving percentage of 92. The fully-improved and topdressed areas are extremely small and supplementary winter feeding is rare.

The financial analysis of 23 farms shows that higher costs of production on the farms with smaller output are due mainly to the disproportionately heavier overhead costs caused in turn by indivisibilities of capital equipment.

The data on labour inputs demonstrated the importance of centrally-situated buildings and the necessity for planning forward and integrating work.

It was found that there were 248,683 acres with some potential. The likely carrying capacity could be (present figures in parenthesis): Dairy cows 26,500 (9,000), sows 1,900 (640), breeding ewes 54,000 (35,000), breeding cows 5,350 (3,600). However, without substantial subdivision of existing holdings it is extremely unlikely that these carrying capacities will be achieved.

A. INTRODUCTION

This survey was originally presented to Canterbury Agricultural College as a thesis for the Degree of M.Agr.Sc. and the present publication is a condensation of the fundamental material. The objectives of the study were as follows:

(a) To describe farm-management practices with particular reference to dairy farms.

(b) To ascertain costs of production and labour inputs on a selected sample of dairy farms.

(c) To endeavour to correlate management practices with net returns.

(d) To endeavour to assess the reasonable farming potential of the county.

In order to assemble data on labour inputs and financial returns, a representative group of 30 dairy farmers in the Kokatahi and Kowhitirangi areas agreed to keep labour diaries for the period 1 April 1951 to 31 March 1952, and to allow access to their accounts. From a statistical point of view this was a biassed selection. One farmer in Grey county, with an extremely high production per cow and per acre also kept a diary. The information he supplied was used only as a basis for comparison and recommendation. The information from some farms was discarded for various reasons, leaving 25 diaries to be used in the analysis of labour inputs and 23 sets of accounts for the financial analysis.

With regard to the information concerning farm-management practices it was decided to collect this by the farm-survey questionaire method. Because of the large area of the county (see Table 1) a 55 per cent. sample of farms was decided upon.

TABLE 1. WESTLAND COUNTY

	Acres
Holdings of one acre or more	733,666
Holdings under one acre	188
Occupied by Crown	1,187
Occupied by local bodies	19,522
Occupied by Maoris (communal system)	3,191
Occupied by persons with major area outside county	7,640
Unoccupied Crown land	2,041,767
Less area held by farmers in Ross Borough	1,035
TOTAL AREA	2,806,126

A list of holdings of one acre or more as at 1 April 1952 was compiled from the county rate books, Valuation Department rolls, sheepowners' annual returns and lists of dairy factory suppliers. This was verified by prominent farmers and others. It was found that there were 621 holdings in the county. These were arranged in alphabetical order and numbered consecutively. A table of random numbers was then used to select the sample. Table 2 indicates the breakdown of the holdings.

TABLE 2. TYPE AND NUMBER OF HOLDINGS

Type of holding	Total area (acres)	Area Sampled	Total No. Holdings	No. Holdings Sampled
Mainly butterfat	95,049	47,533	190	117
Mainly sheep	92,004	74,861	49	25
Mainly cattle	434,140	318,390	39	16
Mainly town supply	2,839	1,231	11	5
Part-time	31,524	14,945	83	36
House cow only	2,986	1,021	66	37
Idle and unused for agriculture	75,124	47,380	183	109
Total	733,666	505,361	621	344

The field work was carried out at various times between April and December 1952. The base date for stock figures was taken as 31 March 1952. The management details are for the 1951-52 season.

Although management and other details were collected from the selected farms only, field observations regarding cover, soil type and topography were made on all holdings and on all other occupied and unoccupied land in the county, so that an estimate of potential production could be made.

B. THE ENVIRONMENT

1. HISTORICAL

The area between the Karamea River and Milford Sound (about 7,500,000 acres) was purchased from the Maoris in 1860, but except for the few Maoris and one or two parties of transient prospectors it was practically uninhabited until the gold rushes of 1864-65 and onwards. The present county of Westland was created in 1876. The northern boundary is the Taramakau River and the southern one a line drawn from the northern end of Big Bay to Mount Aspiring.

2. CLIMATE

The annual rainfall is heavy (Hokitika 110 inches) but fairly evenly distributed, summer droughts being almost unknown. Winters are somewhat drier, while the maximum monthly fall of from 12 to 14 inches usually occurs in October and November. The coldest month is July (43.6° F.) and the warmest January and February (58.1° F.). Compared with the Lincoln average (2013 hours) Hokitika is only 115 hours behind in bright sunshine hours. The prevailing winds are moderate south-westerlies.

3. TOPOGRAPHY

The county is made up of three well-defined regions.

(1) A mountainous region of about 2600 square miles. This is extremely well defined by a major earth fracture known as the alpine fault which runs north-east to south-west at a distance of from 10 to 15 miles west of the main divides.

(2) Coastal range country. On emerging from the mountainous region the rivers spread over the valley floors and it is on this alluvial soil that practically all the farming is carried out.

(3) A narrow coastal plain of consolidated sand-dune country. No extensive use is made of this for farming.

4. VEGETATION

The cover over the greater part of the county is dominantly rimu or kahikatea sub-tropical rain forest. On land that has been cleaned but is reverting the trees are usually fuchsia, ribbonwood, five finger, wineberry, broadleaf, tutu and the coprosma species. A short bushy fern (Polystichum vestitum) known locally as niggerhead is also very prevalent. Blackberry is common in the north as is gorse on the riverbeds. Bidibidi is a serious problem on partially developed sheep country.

5. SOILS AND EROSION

(This section is based on the work of the Soil Bureau "Soils and Agriculture of Westland N.Z." D.S.I.R. Soil Bureau Bulletin No. 2, 1950.)

The major groups of soils occurring in the country are: Recent, Podzolic, Organic, Brown Loams and Skeletal.

The Recent soils constitute the major farmed area of the county. They are found as the flood plains of all rivers. The Podzolic soils are extensive in area and are typical of the terrace, rolling, and moderately hilly land. In this group is found the "pakihi" country. The Organic soils are limited in extent and are really wet swamps. The

Brown Loams are also restricted in area and are infertile. The Skeletal soils cover all the steep, bush-clad hill land. The normal rate of erosion is rapid. There is little soil erosion caused by occupation of the land.

C. FARM MANAGEMENT PRACTICES

1. MANAGEMENT ON BUTTERFAT-SUPPLY DAIRY FARMS

(1) GENERAL

The average size of butterfat-supply dairy farms in Westland county is large (500 acres) but the average area of improved land is small. The effective coverage (actual grazable area) is only 235 acres while the milking acreage is only 127. This explains why the average carrying capacity is only 11 cows per 100 acres. For the 1951-52 season the production per cow (at the factory) was 246 pounds of butterfat compared with the New Zealand effective average production of 242 pounds.

(2) STOCK MANAGEMENT

(a) Cows

Forty-three per cent. of herds are Jersey-cross, 23 per cent. Jersey-Shorthorn cross, 19 per cent. straight Jersey, seven per cent. Shorthorn-cross, while the remainder are various crosses of Jersey, Ayrshire, Shorthorn and Friesian. The herd size varies from 14 to 92 with an average of 45. With regard to wintering cows 59 per cent. of farmers shut up some milking paddocks, and allow the cows to graze the remainder in conjunction with other rough country, 23 per cent. put the cows on rough bush runs or riverbed country, 12 per cent. make no provision for saved grass for or after calving, while six per cent. allow the cows to eat the milking paddocks right out and then put them on rough country until they calve. Fourteen per cent. of farms have commenced calving their cows by 10 August, 44 per cent by 20 August, 62 per cent by 30 August, 88 per cent by 10 September and 100 per cent. by 20 September. The median date for calving is 20 September. (For cows under Group Herd Test in the 1949-50 season the median calving date was 13 August.)

By the end of July only 42 per cent. of farmers have commenced winter feeding. The length of the winter feeding period is short (only 52 days). The amounts of supplements fed per cow are also less than found elsewhere. Some farmers believe that the extensive areas of roughage compensate for the lack of other winter feed, but this is not correct (see section D). Table 3 indicates the average amounts of supplements fed per cow.

TABLE 3. AVERAGE AMOUNTS OF SUPPLEMENTS PER COW.

Type	No. of farmers	Average amount (tons)	Variation (tons)
Hay only	79	0.20	0.04 to 0.64
Hay + silage	12	0.22 hay + 1.23 silage	—
Silage only	8	1.06	0.47 to 1.8
Hay + turnips	6	0.32 hay + 2.0 turnips	—
Hay + chou	1	0.45 hay + 2.1 chou	—
Nil	11	—	—
	117		

The average culling percentage (excluding deaths) is 15.2 and varies between seven and 40.

(b) **Calves**

Calves are fed whole milk for an average of 4.2 weeks and a further 3.2 weeks elapse before they go on to all skim milk. The average age at weaning is 17.1 weeks and varies between 11 and 26 weeks. Only 49 per cent. of farmers feed supplements with the milk, calf meal being the most common. Seventy-six per cent. of calves are vaccinated against abortion.

(c) **Pigs**

Pig production is not efficient. The sow : cow ratio averages 1 : 13.7 with each sow farrowing on average 1.5 times per year. The average number of piglets born (dead or alive) is 9.1 and varies between six and 13. On average 6.8 of these survive to sell. For fattening pigs during the milking season, 73 per cent. of farmers use skim milk only, 13 per cent. add a little meal to the milk while 11 per cent. feed meal only for the last three or four weeks. The remaining three farmers feed skim milk and scraps, skim and buttermilk and skim and flour sweepings respectively. Almost 70 per cent. of all pigs are disposed of as baconers. Forty-four per cent. of farmers have Canterbury-type sties while the remainder are of various designs and states of repair (mainly wooden). On only 37 per cent. of farms is the cleanliness of the pigsties satisfactory.

(3) PASTURE MANAGEMENT

(a) **General**

Fifty per cent. of farmers renew pasture each year. The average acreage is 8.1 and varies between three and 20. Table 4 gives the cultivation operations.

TABLE 4. CULTIVATION OPERATIONS FOR PASTURE RENEWAL

	No. of farmers	Average No. of strokes
Plough . . .	50	1
Disc (bush and bog) .	9	2.7
Disc (ordinary) .	53	2.8
Harrow . . .	57	2.8
Roll before . .	28	1
Roll after . .	28	1

Most farmers commence cultivation operations in January (36 per cent), November (27 per cent.) or December (13 per cent.). Fallowing of paddocks for weed control is not normal or practicable. February is the most popular month to sow down pastures (32 per cent. of farmers do so), followed by January (28 per cent.) and December (19 per cent.). Sowing of seed by rotary topdresser is the accepted practice. Fifty-nine per cent. of farmers use this method. Twenty-four per cent. sow their seed through a box topdresser, ten per cent. sow by hand, and seven per cent. sow through a seed box on the roller. Ninety-seven per cent. of farmers save, or shut up the new grass for feeding in the autumn.

(b) Yields of Hay and Silage

On average, hay paddocks are shut up for 8.4 weeks (variation six to twelve). The average yield per acre is 1.48 tons. Paddocks for silage are shut up for between six and twelve weeks with an average of 8.6 weeks. The average yield is 5.0 tons. With regard to the source of hay used for winter feeding 56 per cent. of farmers buy in all their requirements (mainly from Canterbury). Twenty-seven per cent. make their own hay from grass shut up for that purpose, while seven per cent. buy in and make some also. Eight per cent. rely on toppings only, and a further two per cent. buy some in, as well as saving toppings.

(c) Topdressing

Eighty-nine per cent. of farmers sow lime each year. The commonest time for sowing is during the drier winter months (63 per cent.). Ninety-seven per cent. of farmers topdress with superphosphate each year, mainly in the spring (46 per cent.). It is not usual to topdress with other manures. Table 6 gives the rate of application of fertilisers.

TABLE 6. RATE OF APPLICATION OF FERTILISER.

LIME			SUPER	
Variation per cent.	Per cent.	Av. area as per cent. of milking acreage	Per cent.	Variation Per cent.
5-100	37		63	12-100
16-100	45	Av. area as per cent. of area ever top-dressed	77	24-100
Variation 6-20 cwt	Amount 15.7 cwt	Av. rate of application per acre	Amount 188 lb.	Variation 112-336 lb.
Variation 5-120	Area 42	Av. area topdressed (acres)	Area 75	Variation 10-200

On the 850 dairy farms in W. M. Hamilton's Waipa survey the average area limed was 47 per cent. and the average area topdressed was 75 per cent.

(d) **Weeds**

Rushes are the most widespread and troublesome. Good control can be achieved by mowing in November and again in March. Buttercup and self heal are common in the poorer pastures. Californian and other thistles are not as common as elsewhere in New Zealand. Ragwort is fairly well distributed. Rabbits have been known to eat out new paddocks, though this is not usual. Deer likewise sometimes venture out on to paddocks along the fringes of the bush. Evidence of the presence of grass-grub is seen occasionally.

(e) **Shelter and Water Supply**

Shelter is not adequate on 44 per cent. of farms, and even on the remainder reliance is usually placed on patches of native bush. In the event of a dry spell the paddock water supply on 60 per cent of farms is likely to prove unreliable and these farms have to abandon or curtail rotational grazing to allow the stock access to water at the milking shed or nearby streams.

(f) **Cropping**

Cropping is almost non-existent. Five per cent. of farms sow an average of five acres of turnips for winter feed for cows and sows.

(2) LABOUR UTILISATION

Table 7 summarises the labour position on dairy farms. Twenty-three per cent of farmers work the farm entirely on their own.

TABLE 7. LABOUR UTILISATION ON DAIRY FARMS

	Number	Per cent.
(a) Occupier's Labour		
Owner-occupier	114	97
Manager	2	2
Lessee	1	1
	117	100
(b) Permanent Labour (in addition to (a))		
Family	17	
Other	8	
Family and other	1	
Sharemilker	1	
	27	i.e. 23 per cent of (a)
(c) Casual Labour		
Neighbour	42	
Contract	10	
	52	i.e. 44 per cent of (a)
(d) Milking Labour		
Occupier only	46	40
Occupier + permanent (b)	27	23
Occupier and family other than (b)		
(i) Wife	38	32
(ii) Other	6	5
	117	100

(3) SIDELINE ENTERPRISES

Forty-four per cent. of dairy farmers have sideline enterprises. These are outlined in Table 8.

TABLE 8. NATURE OF SIDELINES ON DAIRY FARMS

Type	Per cent. of farmers
Sheep	29
Store/fat cattle	19
Store/fat cattle and sheep	19
Sheep and weaner calves	15
Weaner calves	10
Store/fat cattle and weaners	6
Store/fat cattle, weaners and sheep	2
	100

2. MANAGEMENT ON SHEEP FARMS

(1) GENERAL

The average size of all sheep farms is 1878 acres, but the effective acreage is only 694 acres. In the 1951-52 season each sheep farm included in the survey sold on average 342 fat lambs, 4,360 pounds of wool and 38 store and fat cattle.

(2) BREED OF SHEEP, SIZE OF FLOCK AND CARRYING CAPACITY

The majority of farmers (68 per cent.) have straight-Romney flocks, 28 per cent. have Romney-cross ewes, and four per cent. have Border Leicester-Cheviot-cross ewes. The average size of flock is 452 ewes. Eighty-eight per cent. of farmers breed their own replacements and the remainder buy in their replacements. The average carrying capacity is 0.95 ewe equivalents per effective acre with a variation from 0.45 to 1.88. The average number of rams per 100 ewes is 2.6. Thirty-three per cent of the rams are Romney and the rest are fat-lamb sires (mainly Southdown). Sixty per cent. of the farmers obtain their replacement rams from Canterbury (usually at the ram fairs), 32 per cent. buy their replacements from other farmers in the district and the remainder buy rams from both these sources. Seventy-six per cent. of farmers set-stock their ewes, eight per cent. graze them semi-rotationally, and 16 per cent. rotationally graze them. Only 16 per cent. of farmers make special provision for winter feed, two farmers feeding turnips, one feeding hay (30 lb. per ewe) and one feeding moose nuts. The average length of the winter feeding period is seven weeks. Another 20 per cent. of farmers also buy hay but this is to feed cattle only.

(3) SHEEP WORK THROUGHOUT THE YEAR

The ewes are culled in February and March. The average culling rate is 11.6 per cent. If ewe mortality is taken into account (4.6 per cent.) the replacement rate averages 16.2—a little lower than in other areas. Ewes are culled mainly on constitution, wool being secondary. Most cull ewes go as fats to the freezing works or to Addington. Dipping is carried out in February (44 per cent.), March (48 per cent.) and April (8 per cent). Eighty per cent of farmers put the rams out between 1 and 20 March, 16 per cent. put them out between 1 and 10 April, and the remaining farmer allows his rams to run with the ewes all the year (68 per cent of dairy farmers running sheep as a sideline allow the rams to run with the ewes all the time). Fifty-two per cent. of farmers put ewe lambs to the ram. The rams (usually small-headed Southdowns)

go out throughout April. (Ten farmers mate all their ewe lamb replacements, one mates 70 per cent. and two mate 50 per cent.) . Crutching is usually done once only, either in June (29 per cent.), July (62 per cent.) or August (9 per cent.). The majority of farmers (80 per cent.) have commenced lambing by 20 August. The overall lambing percentage varies from 85 to 130 with an average of 108. Most farmers (60 per cent.) shear in November because of bidi-bidi. Twenty per cent. shear twice yearly. The average fleece weight is light (7.7 pounds) due to the hard conditions encountered on most farms, and to the fact that, in general, emphasis is on constitution rather than on wool. The average ewe mortality is 4.6 per cent. due mainly to misadventure. The incidence of disease is not high. It is not usual to dose or inject ewes or lambs as a preventative measure against various diseases.

(4) LAMB FATTENING AND DISPOSAL

No lamb-fattening feed is grown. Forty-five per cent. of lambs go fat off the mother and the remainder are fattened on grass. Lambs may be sent away as early as the beginning of January and by the end of April only eight per cent. of farmers have yet to send their last draft of lambs. All farmers send their lambs to Canterbury, mainly to the freezing works, but also to Addington. The average lamb weight is 39.8 pounds. The percentages of lambs fat off the mothers and the lamb weights are both high. However, this is not as favourable as it first appears due mainly to the low rates of stocking. That the carrying capacity is lower than it could profitably be is also indicated by the common practice of putting ewe lambs to the ram.

(5) CATTLE

The average sheep : cattle ratio is 8.4 breeding ewes to one cattle equivalent but varies from 2.5 ewes to 60 ewes per cattle equivalent. Twenty-six per cent. of farmers sell all their cattle as weaners (average number 21). Most of the remaining farmers sell their cattle as two- or three-year-old fats at Addington (40 per cent.) or local sales (60 per cent.). The average number sold is 48.

(6) PASTURE ESTABLISHMENT AND TOPDRESSING

Each year 40 per cent. of farmers make some attempt to break in undeveloped country by felling, burning and possibly stumping (average acreage is eight) as well as burning some gorse and scrub. Thirty-two per cent. of farmers renew an average of 11.5 acres of old pasture,

usually sowing down in February through a rotary topdresser. Sixty-eight per cent. of farmers topdress with lime. The area limed expressed as a percentage of the effective acreage, averages 11.2 per cent. and varies from two to 50. Eighty per cent. of farmers topdress regularly with superphosphate. The area expressed as a percentage of the effective acreage averages 14.4 per cent. and varies from 0.5 to 50. Winter is the most favoured period for spreading lime and autumn for superphosphate. Bidi-bidi is the most serious weed. The burr ripens from mid-November onwards and in this condition sticks to wool. Shelter and paddock water supply are usually adequate due to the large unimproved area (patches of native bush) on most farms. Cropping is confined to 12 per cent. of farmers who grow turnips for winter feed.

(7) LABOUR UTILISATION

Twenty-four per cent. of farmers are each helped by a son, while 16 per cent. employ a full-time man. The average number of labour units per farm is 1.5. Contracting is confined solely to the shearing operations of eight per cent. of farmers.

3. MANAGEMENT ON CATTLE FARMS

(1) GENERAL

The average size of all cattle farms is 19,899 acres. However, the total acreage of these farms gives no indication of the present or potential carrying capacity which varies according to the amount of bush, second growth and scrub. For instance, the area of the largest holding is about 83,000 acres but the effective acreage is only 9,000 acres and the present carrying capacity 210 breeding cow equivalents. On the same class of country there is another holding of about 40,000 acres (effective acreage 6,000) which carries 1,466 breeding cow equivalents. In the 1951-52 season each of the cattle farms in the survey sold on average 88 fat and store cattle, 2,062 pounds of wool and 152 fat lambs.

(2) CARRYING CAPACITY

This averages one breeding cow per 20 effective acres, while the range of effective acreage per breeding cow is from ten to 44. The sheep : cattle ratio varies from three ewes per cattle equivalent to one ewe per nine cattle equivalents. The small numbers of sheep carried reflect (a) the difficulty of access to markets for farmers south of the Haast River from where lambs would have to be shipped out and (b) the lack of labour. The average size of breeding herd is 116 cows with a variation of from 26 to 500.

(3) TYPE OF STOCK AND BREEDING POLICY

Forty per cent. of farmers run Hereford cows only and a further 20 per cent. run both Hereford and Shorthorn cows. The remaining herds are mixed Hereford, Shorthorn, Aberdeen Angus and their crosses. Sixty-seven per cent. of farmers prefer purebred breeding cows. However 80 per cent. of the farmers breed first-cross cattle for sale, the most favoured cross being an Aberdeen Angus bull over a Hereford cow. All cows are set-stocked. Only one farmer has high enough stocking rates to make it necessary to feed hay in the winter. Calving commences from 10 August to 10 September. The calving percentage is high with an average of 92 per cent. The average age of calves at weaning is 8.4 months. Forty per cent. of farmers feed hay to their calves over the first winter.

(4) DISPOSAL OF STOCK

The average culling percentage is low (9.6 per cent.). Eighty per cent. of farmers sell their cull cows as fats mainly at Addington (33 per cent.), Whataroa (20 per cent.) or the freezing works (20 per cent.).

Except for one farmer who tops off on turnips and grass, beef cattle are fattened entirely on grass. Eighteen per cent. of farmers give their cattle no preferential treatment prior to sale while 74 per cent. shut up their best grass paddocks in order to top off their cattle. Thirty-eight per cent. of farmers send their cattle as fat rising three-year-olds to Addington throughout the winter. These farmers are those in the northern part of South Westland and they truck their cattle to the railhead at Ross. South of the Haast River the cattle have to be driven out and all these together with some off farms from Paringa to Whataroa are disposed of (mainly as forward stores and stores) at Whataroa at the spring or autumn sale. The oldest cattle at these sales are three years (spring) or three years and a half (autumn).

(5) SHEEP MANAGEMENT

The management practices and problems are similar to those already described. The average size of ewe flock is 228. Less emphasis is placed on the use of fat-lamb sires and the lambs are correspondingly heavier (44 lb.). The lower standard of flock management is reflected in the greater number of ewe lambs going to the ram (73 per cent.) and the higher ewe mortality (5.8 per cent.)

(6) PASTURE ESTABLISHMENT AND RENEWAL

Each winter 38 per cent. of farmers cut and burn areas of second growth and fern (average area 37 acres),

and sow by hand five to ten pounds of bush-burn mixture. In addition 19 per cent. turn over old pasture (average area ten acres), although cultivation operations are not as thorough as on dairy farms. One farmer saves three acres of hay. Thirty-eight per cent. of farmers sow an average of 31 acres with lime each year (mainly in the winter) and 63 acres with superphosphate (mainly in the autumn). These areas are negligible in relation to the total effective acreages. The weed problem centres round second growth, blackberry, gorse and bracken fern. Control by burning is generally resorted to. The very small proportion of some farms (some farms none at all) stumped, cultivated and sown to grass each year cannot compensate for the areas slowly reverting to second growth. Cropping is confined to two farmers who grow turnips for winter feed.

(7) LABOUR UTILISATION

Thirty-eight per cent. of farmers are each helped by a son, or sons, and 31 per cent. have permanent full-time labour. The average number of labour units per farm is 2.2. Only one farmer employs a contractor who clears about 30 acres with a bulldozer.

4. MANAGEMENT PRACTICES ON TOWN-SUPPLY DAIRY FARMS

(1) GENERAL

In most respects management on town-supply farms differs but little from that on factory-supply farms and attention will be confined to the major differences. The average size of holding is smaller (258 acres), as is the average number of cows milked (32). The range of herd size is from 18 to 64.

(2) BREED OF COWS AND CALVING PROCEDURE

On 60 per cent. of farms the cows are predominantly Friesian-Jersey cross while on the remainder they are mainly Friesian-cross. Sixty per cent. of farmers put their dry cows on rough bush runs while the remainder retain the dry cows at the home farm on the poorer pastures not used for milking. The main calving takes place between April and August (the biggest percentage of cows calving in July). The greater price of winter milk more than compensates for the increased feeding and other costs. The remainder of the cows usually calve from February to April.

(3) SUPPLEMENTARY FEEDING

The period for feeding supplements extends from mid-May until the beginning of October. Table 9 indicates the amounts of supplements fed.

TABLE 9. WINTER SUPPLEMENTS PER COW

Farm	Kind and Amount per Cow (tons)
A	Hay 0.6
B	Hay 0.4 + turnips 2.2
C	Hay 0.18 + silage 1.7
D	Hay 0.66 + turnips 2.6
E	Hay 0.54

No supplements are fed in the autumn.

(4) SHELTER AND WATER SUPPLY

Shelter is adequate on only 60 per cent. of farms. As on other dairy farms little provision is ever made for an adequate water supply in the paddocks and only one farmer has a reliable creek to carry his cows through a dry period.

(5) LABOUR UTILISATION

The average number of labour units employed is 1.9. No casual or contract labour is made use of.

(6) SIDELINE ENTERPRISES

One farmer buys about 12 weaner pigs each year, another has a flock of 100 ewes, and another saves about 30 Shorthorn-cross calves which he rears and sells as two-year-old store cattle.

5. MANAGEMENT PRACTICES ON OTHER HOLDINGS

(1) PART-TIME FARMS

In this group there are 83 holdings of an average size of 380 acres. Table 10 gives the occupations of the part-time farmers included in the survey.

TABLE 10. OCCUPATIONS OF PART-TIME FARMERS

	Per cent.
Timber worker	35
Retired	16
General labourer	11
Farm labourer	11
Roadman	9
Publican	9
Miscellaneous	9
	100

Sheep (33 per cent.) and cattle (33 per cent.) were the most popular types of enterprise, followed by dairy factory supply (25 per cent.), bees (six per cent.) and pigs (three per cent.).

Each year 39 per cent. of the occupiers make some attempt to break in undeveloped land from gorse, black-

berry and scrub. The areas range from two to 30 acres. Only 11 per cent. sow seed (by hand) on the areas. Only one occupier turns over old pasture each year.

Eleven per cent. sow an average of 32 acres with lime each year, and in addition topdress 30 acres with superphosphate. Practically all the pastures are unimproved and consist of Yorkshire fog, brown and red top, hairgrass and some Lotus major and buttercup. Gorse, blackberry, bracken fern and rushes offer severe competition. The hours worked by the occupier on his holding average 14 per week and range from two to 50. The grouping below gives some idea of the state of development of these holdings.

Pasture—37 per cent.
Bush and scrub—50 per cent.
Riverbed and swamp—13 per cent.

These holdings are of interest because of the likelihood that some of them may become economic units at some time in the future. Of the holdings included in the sample it is estimated that 22 per cent. could be made into economic dairying units and 11 per cent. into economic sheep units.

(2) HOUSE COW ONLY

In the classification adopted there are 66 holdings on which a cow or cows are kept to supply milk to the house only. The occupier may be working or may be retired. On the 37 holdings selected in the sample the average acreage is 28 acres and the average effective acreage is six acres. None of the holdings sampled could be made into economic units under present-day costs and prices.

D. ANALYSIS OF MANAGEMENT PRACTICES ON DAIRY FARMS

1. ANALYSIS USING EFFICIENCY STANDARDS

(1) SOIL TYPE

In the original study the dairy farms were divided into three groups (based on moisture-holding capacity of the soil) for the description of management practices. These are the groups shown in Table 11.

TABLE 11. FARMS GROUPED ACCORDING TO SOIL TYPE

Soil group	Av. area	Av. m. area	Butterfat per cow	M. cows per 100 ac.	M. cows per 100 m. ac.	Butterfat per acre	Butterfat per m. ac.
Medium	323	129	267	25	67	67	108
Dry	638	126	229	15	32	32	87
Wet	440	133	202	18	30	30	68

As expected in a heavy rainfall area the wet-group farms are least productive in terms of butterfat per cow and acre. The reason why the dry-group farms are not the most productive is that in general they are less well-developed (being further south) and the management practices are not of as high a standard. The bias that total acreage gives to the figures is illustrated in the figures on carrying capacity. The area of one dry group farm is about 15,000 acres thus reducing the average carrying capacity of the group.

(2) PRODUCTION PER ACRE

Table 12 groups farms according to production per acre.

TABLE 12. FARMS GROUPED ACCORDING TO PRODUCTION PER ACRE

Number of farms	Butterfat per acre range	Butterfat per acre average	Butterfat per cow	Milking cows per 100 acres
47	0-33	18	217	10
34	34-66	49	245	21
16	100-	121	296	41

A good correlation is shown between butterfat per acre and production per cow and carrying capacity. Probably the most interesting feature is that while production per cow increased from 217 lb. to 296 lb (26 per cent.) carrying capacity increased from 10 to 41 (300 per cent.), i.e., high carrying-capacity is more important than high production-per-cow in reaching a high production-per-acre.

(3) CARRYING CAPACITY

In table 13 the farms are grouped according to milking cows per 100 acres.

TABLE 13. FARMS GROUPED ACCORDING TO MILKING COWS PER 100 ACRES

Number of farms	Milking cows per 100 ac. range	Average milking cows per 100 ac.	Acreage	Butterfat per cow	Butterfat per acre
46	Up to 14	8	628	222	19
29	15-24	19	263	254	48
24	25-34	30	164	262	79
18	35-	40	161	271	109

As the carrying capacity increases so does production per cow (but to a lesser extent) and production per acre. It appears that the higher producing farms are the smaller farms; this is because they must be farmed more intensively to get a good living. However it has been observed that these smaller farms are usually on the best land.

(4) SIZE OF FARM

TABLE 14. FARMS GROUPED ACCORDING TO ACREAGE.

Number of farms	Area range	Average size	Butterfat per cow	Butterfat per acre	Milking cows per 100 ac.
14	Up to 119	90	262	102	38
44	120-249	179	259	73	27
40	250-499	361	236	32	14
19	500-	1189	218	11	7

TABLE 14 (a). FARMS GROUPED ACCORDING TO MILKING ACREAGE

Number of farms	Area range	Average size	Butterfat per cow	Butterfat per 100 m. ac.	Milking cows per 100 m. ac.
19	0-79	63	238	112	45
42	80-119	98	249	108	44
25	120-159	136	238	81	36
31	160-	206	249	72	28

There is a definite association between size of farm and per-acre production. What Table 14 does not show, but which is demonstrated in Table 14 (a) is that the variation in production per milking acre is associated almost entirely with carrying capacity and not production per cow.

2. ANALYSIS ACCORDING TO MANAGEMENT PRACTICES

Factor interaction makes conclusions about specific management practices open to question. Furthermore the production figures of one particular year may be the result of practices carried out some time previously, e.g., topdressing. However it is felt that with the large number of farms in the sample, deviations from usual practice in the year under consideration will be smoothed over. Further, as managers, farmers are usually consistently good or consistently poor.

(1) DATE OF CALVING

TABLE 15. FARMS GROUPED ACCORDING TO DATE OF CALVING

Commencement of calving	Number of farms	Butterfat average per cow	Lowest butterfat in group	Highest butterfat in group
1-10 August	15	291	206	356
11-20 August	36	260	156	340
21-31 August	21	244	174	306
1-10 September	30	236	144	302
11-20 September	14	196	140	269

There is a definite association between production per cow and date of calving. This is due more to the standard of management than to the length of lactation.

(2) TOPDRESSING

TABLE 16 (a). FARMS GROUPED ACCORDING TO PER CENT. MILKING ACRES LIMED

Number of farms	Range per cent.	Average	Butterfat per cow	Butterfat per m. ac.
24	0-19	5	221	69
53	20-39	28	248	92
25	40-59	51	249	104
15	60-	80	266	126

TABLE 16 (b). FARMS GROUPED ACCORDING TO PER CENT. MILKING ACREAGE SOWN WITH SUPER

Number of farms	Range per cent.	Average	Butterfat per cow	Butterfat per m. ac.
31	0-39	25	214	68
26	40-59	50	238	84
22	60-79	70	243	86
38	80-	94	276	103

In both tables, production per cow and per milking acre both show an increase as the area topdressed increases.

(3) HAY EQUIVALENTS PER COW

In table 17 farms are grouped according to the amount of winter feed saved. This is expressed in tons of hay equivalent (1 ton hay = 3 tons silage).

TABLE 17. FARMS GROUPED ACCORDING TO HAY EQUIVALENTS PER COW

Number of farms	Range Hay equiv. (tons)	Average (tons)	Butterfat per cow	M. cows per 100 m. ac.	Butterfat per m. ac.
44	0-0.14	0.08	228	34	79
34	0.15-0.29	0.21	243	39	96
24	0.30-0.44	0.36	252	40	108
15	0.45-	0.61	275	42	118

As the amount of winter feed increases so does the carrying capacity per milking acre, and the butterfat production per cow and per milking acre. This table is of particular importance because it infers that wintering cows on large areas of unimproved pasture is not nearly as beneficial as feeding adequate amounts of hay and silage.

(4) NEW GRASS AND SAVED PASTURE

On the 59 farms on which new grass is sown each year the butterfat production per cow averages 252 pounds and the production per milking acre averages 100 pounds, as against a per cow production of 238 pounds of butterfat and a production per milking acre of 89 pounds on the 58 farms on which pasture is not renewed each year.

Sixty farmers save pasture for the autumn. The average production per cow on these farms is 248 pounds and the production per milking acre is 97 pounds compared with 242 pounds per cow and 92 pounds per acre on the 57 farms where pasture is not saved for the autumn. Although there is a positive correlation in both cases, this is not as decisive as expected.

(5) SIDELINES

On the 52 farms (average area 590 acres) with sidelines the butterfat production per milking acre averages 85 pounds, while on the 65 farms (average area 239 acres) without sidelines the average production per milking acre is 103 pounds. It is generally found that the farmers with sidelines are not as efficient in dairy production as others, but because of their large area are able to supplement their income in ways which require less work than milking more cows or raising butterfat production per acre.

3. ANALYSIS ACCORDING TO NET RETURNS

The accounts of 23 farmers have been used in this analysis. Table 18 groups the farms according to owners' surplus per cow and Table 19 according to owners' surplus per milking acre.

TABLE 18. FARMS GROUPED ACCORDING TO OWNERS' SURPLUS PER COW.

No. of farms	Surplus per cow range £	Per cent. m. acres topped	Hay equiv. per cow (tons)	Per cent. m. acres sown with super.	Per cent. m. acres sown with lime	Per cent. farmers sowing new grass	Per cent farmers saving grass in autumn
6	10-21	74	0.41	71	41	50	50
9	22-24	89	0.42	66	34	55	55
8	25-	95	0.44	96	45	62	75

TABLE 19. FARMS GROUPED ACCORDING TO OWNERS' SURPLUS PER MILKING ACRE

No. of farms	Surplus per milking ac. range £	Per cent milking ac. topped	Hay equiv. per cow (tons)	Per cent. milking ac. sown with super.	Per cent. milking ac. sown with lime	Per cent. farmers sowing new grass	Per cent. farmers saving pasture in autumn
7	4-8	76	0.40	50	37	55	55
8	9-12	96	0.42	84	41	40	40
8	13-	96	0.45	91	45	66	75

Because of the small number of farms these figures should be treated with caution. There are some discrepancies, due, in the main, to deviations from usual practice in the year under review. Taking the first and last groups in each table there are definite correlations in every case, between superior management practices and high net returns.

E. ANALYSIS OF LABOUR HOURS ON 23 SELECTED DAIRY FARMS

1. GENERAL

The hours worked on the farm and time spent off the farm in connection with the farm enterprise, e.g., business or helping neighbours, have been grouped under 16 main headings. Within these groups a distinction has been drawn between occupier's labour, family labour, neighbour's help and paid help. The hours recorded are the total hours connected with that particular jib, e.g., "Ploughing 4 hours" includes getting equipment ready, proceeding to paddock, ploughing and returning home. The job headings are as follows: 1 Milking, 2 Pigs, 3 Calves, 4 Sidelines, 5 Care of Stock, 6 Topdressing, 7 Maintenance of drainage, fencing and roading, 8 Supplemental feeding, 9 Pasture renewal, 10 Topping and harrowing, 11 Repairs and Maintenance, 12 New buildings, drainage, fencing, roading, 13 New pasture, clearing, 14 House, 15 Work off farm, 16 Business off farm.

2. TOTAL PRODUCTIVE HOURS

This is work done in classes 1 to 13. Table 20 gives the average of total productive hours for the year and Table 21 gives the distribution of these hours per month.

TABLE 20. AVERAGE TOTAL PRODUCTION HOURS PER JOB

Job	Average	Per cent. of Total
1. Milking	1835	54.5
2. Pigs	278	8.2
3. Calves	69	2.0
4. Sideline	30	0.9
5. Care of stock	61	1.8
6. Topdressing	76	2.3
7. Drainage, etc. (maintenance)	243	7.2
8. Supplementary feeding	170	5.0
9. Topping, etc.	125	3.7
10. Pasture renewal	32	0.9
11. Repairs and maintenance	223	6.6
12. Drainage, etc. (new)	134	4.0
13 New pasture, etc.	98	2.9
	3374	100

TABLE 24. AVERAGE TOTAL PRODUCTIVE HOURS PER MONTH

Month	Average	Per cent. of Total
April	295	8.8
May	278	8.2
June	143	4.2
July	146	4.3
August	237	7.0
September	310	9.2
October	336	10.1
November	319	9.5
December	322	9.5
January	345	10.2
February	320	9.5
March	323	9.5
	3374	

The busiest month of the year is January due mainly to the making of hay or silage, pasture renewal and topping (for rushes). Next comes October because of care of stock around calving time.

3. COMPARISON OF AVERAGE PRODUCTIVE HOURS WITH HIGH FARM PRODUCTION

Figure 1 compares the average productive hours of the 23 farms with the productive hours on a farm with high production, both per cow and per acre. On the "high" farm a greater percentage of time is spent in milking in spite of fewer cows and a better layout of the shed. This conflicts with the Petersen theory of pushing the cows through in the shortest possible time. The "high" farmer spends more time with calves and on care of stock generally, in spite of the smaller numbers. Less time is spent on topdressing due mainly to the compact layout of the "high" farm. The greater proportionate amount of winter feed saved, the longer winter feeding period and the large area resown to pasture on the "high" farm, are also reflected in the histograms. The "high" farmer spends less time topping mainly because his utilisation of pasture is better than because of his smaller area. It can be inferred from the time spent on maintenance work, that general farm layout is very important.

Figure 2 gives a comparison of total productive hours per month between the "high" farm and the average of the 23 other farms. The longer April hours on the "high"

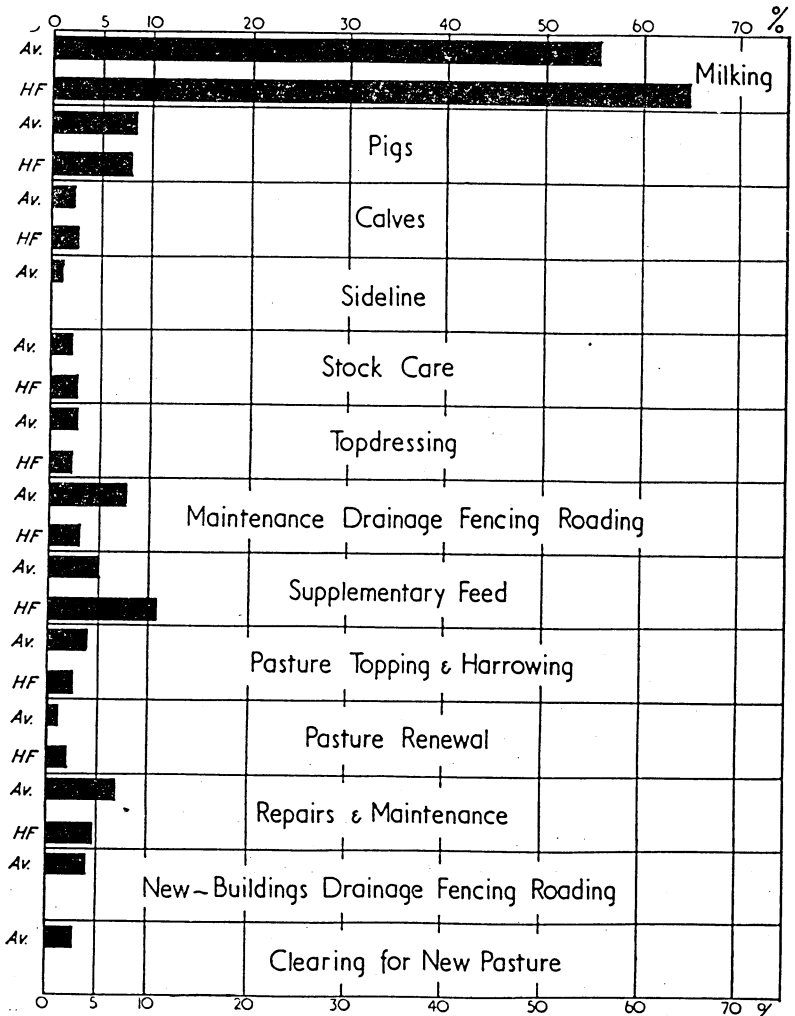


Fig. 1

Av. = AVERAGE OF FARMS
HF = HIGH BUTTERFAT PER COW & PER ACRE FARM

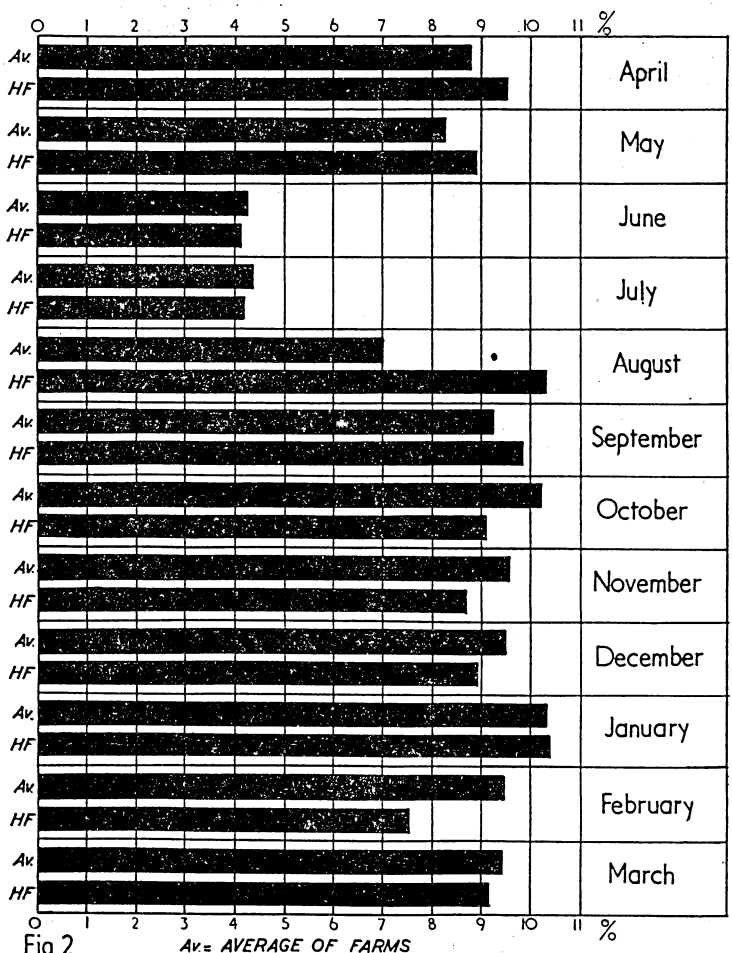


Fig. 2

Av.= AVERAGE OF FARMS
HF= HIGH BUTTERFAT PER COW & PER ACRE FARM

farms are due to topdressing and milking, while the difference in May is mainly due to milking and feeding out. The most striking feature is the number of hours worked in August, September and October. In August the "high" farmer is busy inspecting stock, calving down, bringing cows home and breaking in heifers to shed routine as well as feeding out. However it is not until October that work connected with calving reaches its peak on the other farms, and it is still of importance in November. The longer hours worked on the group farms in November and December are spent in topping and on accumulated maintenance work. The "high" farmer completes all his harvesting in January while on the group farms this sometimes extends into February. Topping for control of rushes is also carried out on these farms in February and March (as well as topdressing which the "high" farmer leaves until April).

4. BUTTERFAT PRODUCTION PER HOUR

The average farmer in the group produced 3.7 lb. of butterfat per productive hour. The variation was from 1.9 to 5.6 lb. per hour. It appears that on a strictly one-man unit the average farmer working reasonable hours should expect to produce about 11,000 lb. of butterfat per year. It had been hoped to show why some farmers took longer to produce a pound of butterfat than others. Due to limitations of data and time it is possible to draw only a few general conclusions. In Table 22 farms are grouped as to whether they are above or below the average of 3.7 pounds.

TABLE 22. BUTTERFAT PER HOUR

	No. below 3.7 lb.	No. above 3.7 lb.
No. of farms	9	13
Milking acreage	87	116
Total output (lb. butterfat)	9093	15277
Butterfat per milking acre (lb.)	111	140
Milking cows per 100 milking acres	44	46
Value of plant (£)	774	1145
Layout—		
Percentage "A" (good)	29	69
Percentage "B" (poor)	71	31
Per cent milking acres limed	42	45
Hay equivalents per cow (tons)	0.36	0.41

The most important fact to bear in mind is that the hours spent on routine work do not increase in proportion as the farm grows larger. For this reason there will

always be a bias against the small farm with regard to measuring efficiency in terms of butterfat produced per hour. Further, this will tend to invalidate other comparisons. Another complicating factor is the stage of development of the farm.

It appears from Table 22 that an important condition if high butterfat per hour is to be achieved, is the layout of the farm, i.e., its shape and the position of fences, milking shed and other buildings. The degree of mechanisation (as reflected in the value of the plant) is greater on the farms producing more butterfat per hour. This probably indicates a higher standard of management as well as an actual saving in time. With regard to farm-management practices, those farms above the average in terms of butterfat per hour, save more winter feed and sow more lime, but the difference does not appear to be very significant due mainly to the bias caused by the size of farm.

5. BREAKDOWN OF TOTAL LABOUR HOURS

Total labour hours are taken as the sum of hours worked in classes 1-14. Figure 3 expresses the total labour hours broken down as follows.

(a) **Occupier hours.** All work done on the farm by the occupier.

(b) **Family hours.** Help given with work on the farm by members of the occupier's family.

(c) **Neighbour hours.** Work done on the farm by neighbours, which the farmer repays in kind.

(d) **Paid work.** Work for which money is paid out, e.g., casual labour. Contract work has not been classed separately because it is unimportant in this area. (The only contract work done on the 23 farms was 24 hours of shearing and 18 hours of rotary hoeing.)

Family help is mainly confined to milking and some topdressing. Neighbours help most at harvesting and also with topdressing, most of their remaining help being confined to developmental work such as helping with the erection of new buildings or fences and sowing down of pastures. Paid help sometimes gets unpleasant jobs, e.g., drainage, and usually reflects poor utilisation, e.g., jobs around house, repairs and maintenance.

6. OCCUPIER HOURS

Figure 4 expresses the average hours spent by the occupier per year on jobs in groups 1-16 as a percentage of total hours per year. The productive hours per week (groups 1-13) average 52.8. Of these 48.8 are spent on routine work (groups 1-11) and three hours on develop-

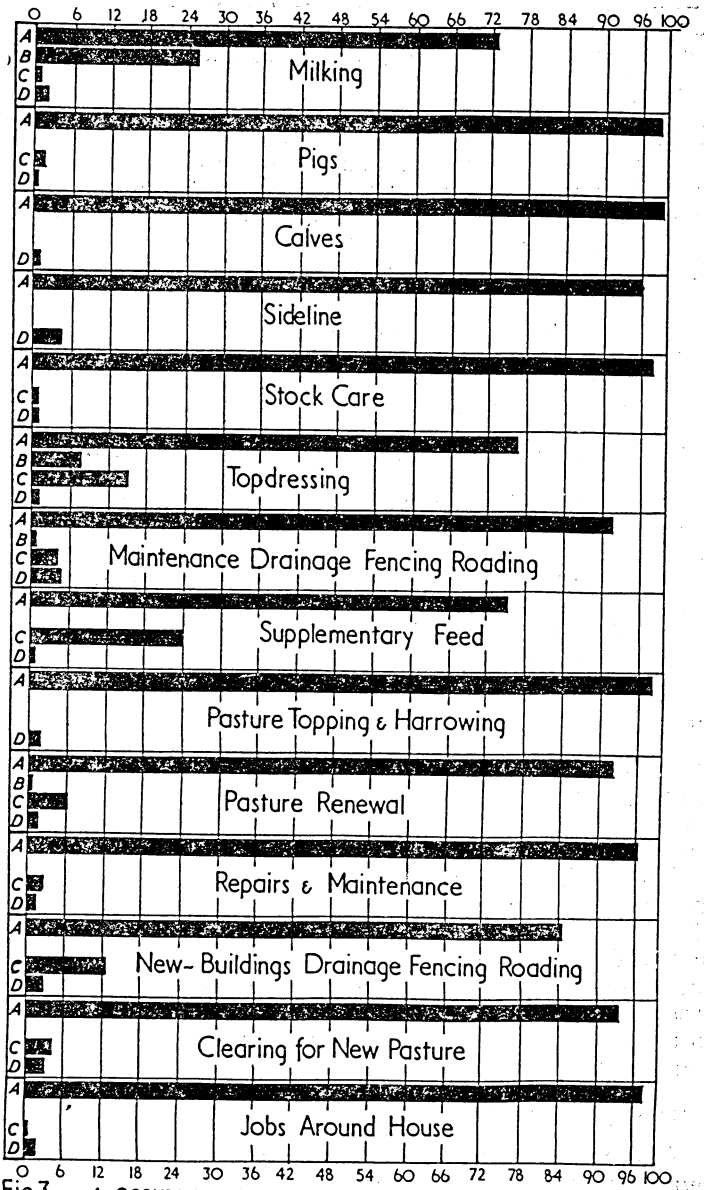
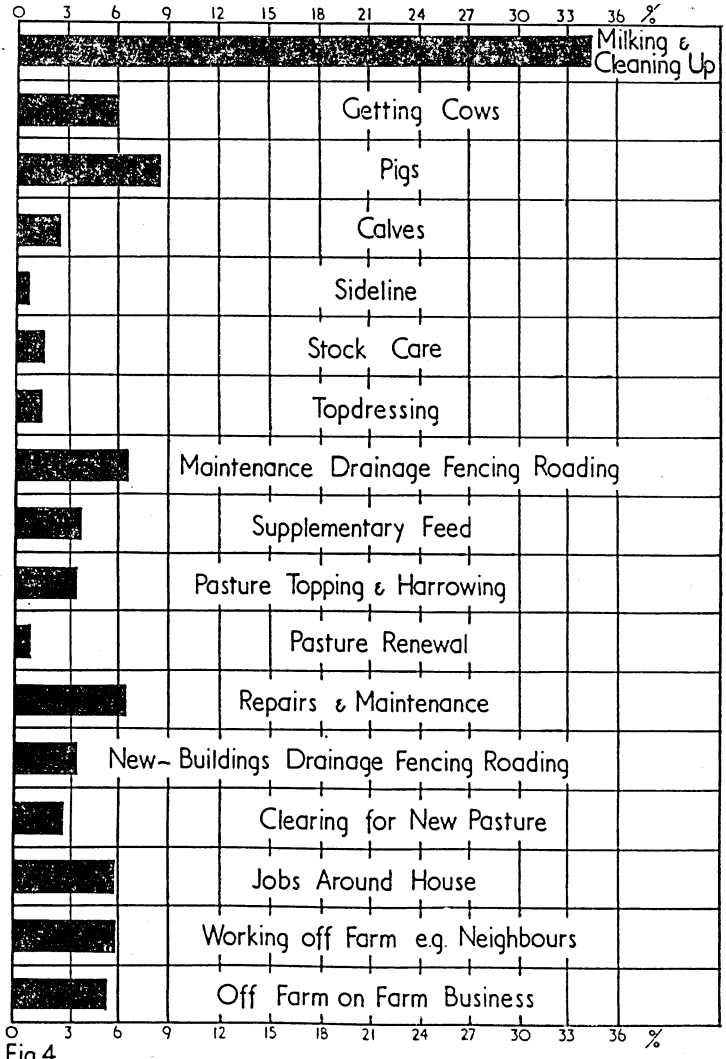

0 6 12 18 24 30 36 42 48 54 60 66 72 78 84 90 96 100
Milking
Pigs
Calves
Sideline
Stock Care
Topdressing
Maintenance Drainage Fencing Roading
Supplementary Feed
Pasture Topping & Harrowing
Pasture Renewal
Repairs & Maintenance
New- Buildings Drainage Fencing Roading
Clearing for New Pasture
Jobs Around House
A OCCUPIER HOURS
B FAMILY HOURS
C NEIGHBOUR HOURS
D PAID HELP HOURS

Fig.3


0 3 6 9 12 15 18 21 24 27 30 33 36 %
Milking & Cleaning Up
Getting Cows
Pigs
Calves
Sideline
Stock Care
Topdressing
Maintenance Drainage Fencing Roading
Supplementary Feed
Pasture Topping & Harrowing
Pasture Renewal
Repairs & Maintenance
New~ Buildings Drainage Fencing Roading
Clearing for New Pasture
Jobs Around House
Working off Farm e.g. Neighbours
Off Farm on Farm Business
0 3 6 9 12 15 18 21 24 27 30 33 36 %
Fig.4

mental work (groups 12-13). In addition 3.5 hours per week are spent on jobs around the house, 3.6 hours off the farm helping neighbours and doing other manual work, and 3.3 hours in visits to town and stock sales during working days. Disregarding trips to town, actual work connected with the farm including returning help to neighbours, works out at 8.3 hours per day over the whole year. On a five-day week basis and allowing for ten days' annual holiday this is equivalent to 12.1 hours per day. Included in work done off the farm (3.6 hours per week) is work done in repayment for help by neighbours. This amounts to 1.99 hours per week which almost exactly balances neighbours' help on the group farms (average 1.98 hours per week). Trips to town, partly or wholly connected with the farm business, average 34 for the year (0.65 per week), the greatest number being 1.3 per week and the least 0.25 per week.

This time study emphasises two things:

(a) If the farmer desires more leisure time then more care must be taken in planning forward and integrating the work.

(b) The ease and efficiency of working of units with centrally-situated buildings, and regular-shaped paddocks planned to relate to the milking shed.

F. FINANCIAL AND CAPITAL ANALYSIS OF 23 DAIRY FARMS

1. GENERAL

The valuations of land, buildings, stock, plant and other improvements are based on fair sale values at 1 April 1951.

2. CAPITAL INVOLVED

The total capital invested averages £8567 or £56 per acre made up as follows: Land, U.V. £1559, buildings £2012, other improvements £2175, stock £1719, plant £1012. (Average acreage 168, average number of cows 45.) The total capital invested is low when compared with dairy farms elsewhere, the reasons being as follows:

(a) Low unimproved value. (Averages nearly £9 per acre).

(b) Smaller number of cows per herd especially in comparison with dairy farms in the North Island.

(c) The partly improved nature of the farms—reflected in the value of "other improvements" which average £13 per acre.

The scope for production on a larger scale is well illustrated in the value of buildings and plant. Stock numbers

could be increased significantly with little increase in overhead.

The capital value of the farms averages £34.2 per acre which is very low for good-quality dairying land. Likely reasons for this are the isolation, lack of knowledge of the area and the legendary heavy rainfall. The average labour units per farm (1.2) emphasise that most of the farms are one-man units.

3. **INCOME ITEMS**

On average, butterfat accounts for 82 per cent. of the total income, and pigs for a further 8.6 per cent. Income from all sources amounts to £50 per cow of which butterfat makes up £41.

4. **EXPENDITURE ITEMS**

Repairs and maintenance account for 19.5 per cent. of the total running costs. Sixteen farmers buy in hay which costs on average £1/16/- per cow, while stock licks and calf meals account for 9/8 per cow. Pigmeal per sow averages £8/13/- which works out at 18/8 per pig sent off the farm. Cost of manure averages 2.3d. per pound of butterfat or £1/4/3 per milking acre.

Average expenses per cow, exclusive of overhead charges, amount to £17/3/10 while inclusive of overhead the average operating costs per cow average £25/6/1 (or 20.9 pence per pound of butterfat, and £6/15/7 per acre).

5. **OVERHEAD**

Farm overhead averages 31.9 per cent. of the total farm-operating expenses. This works out at 6.7d. per pound of fat, £8/2/3 per cow or £2/3/5 per acre.

On the smaller farms overhead expenses form a greater proportion of total expenses than on the larger farms.

6. **OWNER'S SURPLUS**

This averages £1114 before tax is deducted, i.e., 20.4 pence per pound of fat or £24/12/5 per cow. Taxation reduces this at the rate of 3.9 pence per pound of butterfat or £4/13/10 per cow. The highest taxable income was £1804 and 32 per cent. of this was taken in taxes. The question of incentive under heavy tax rates is not as pressing on these farms as on mixed-cropping or sheep farms because of the smaller size of enterprise. Interest earned on the total capital invested (computed on the owner's surplus after wages of management have been paid) averages 6.5 per cent. One farm showed a loss when full wages of management and depreciation were charged. The highest rate of interest earned was 11.9 per cent. On seven farms the interest earned was less than 4.5 per cent.

Analysis of these financial returns (together with comparison of individual farms made in the original study)

emphasise that indivisibilities of capital equipment, i.e., plant, buildings and improvements, reduce the interest-earning capacity of the smaller farms.

G. POTENTIAL PRODUCTION OF THE COUNTRY

1. GENERAL

In any discussion on the likely future production of an area, no real accuracy can be claimed for the figures presented, because of the many assumptions which have to be made, and because of the uncertainty of the future.

The area to be discussed is limited to the land shown in Table 2. Data held by the Valuation Department on all unoccupied Crown and other land was consulted and inspections were made if the area seemed likely to have possibilities for development. It was found that there were possibilities on only 6919 acres (measured by present land-development practices). As the greater part of this was inaccessible or in small areas, it has been disregarded. Land that had potential was assumed to be any land that could be improved by present land-development practices, the returns from which would pay interest on development. On this basis pakihi land is excluded. The "likely" potential is the estimated carrying capacity of the area using the present average carrying capacities as a standard.

The "ultimate" potential is the estimated carrying capacity using the carrying capacities of the best farmers as a standard. There is of course no guarantee that these carrying capacities will ever be achieved; most likely they will not be, but the aim is to show what is possible. It has been assumed that the type of farming on particular areas will remain the same as at present, e.g., no dairy farming south of the Waiho River. Again this is open to conjecture.

2. METHODS OF ESTIMATING POTENTIAL

Detailed notes regarding soil types and cover had been collected for each holding in the country. Using the Soil Bureau map, three soil groups were decided upon, viz., dry, medium, wet (based on moisture-holding capacity). In each group eight classes were made according to cover. These were:

i. Steep bush and mountainous or no potential.
ii. Heavy bush, flat to rolling country.
iii. Light bush or milled bush.
iv. Scattered bush, second growth, scrub, gorse.
v. Riverbed.
vi. Very wet or swamp.

vii. Rough, unimproved pasture not stumped.
viii. Land that has been stumped and sown in pasture which is regularly topdressed.

There were thus 24 classes with land in i, v and vi, being similar in each group. The holdings were then classed as above at the same time being grouped into 14 more or less well-defined areas so that the potential of each area as well as the total potential could be determined.

The areas were:

a. Otira to Dillmanstown.
b. Taramakau-Kumara-Stafford-Chesterfield.
c. Arahura Valley-Hokitika-Kanieri.
d. Kokatahi.
e. Kowhitirangi.
f. Woodstock-South Hokitika-Ross to Mikonui River.
g. Fergusons-Waitaha Valley-Pukekura.
h. Evans Creek-Harihari-Poerua Valley.
i. Mt. Hercules-Tetaho to Whataroa River.
j. Whataroa Flat.
k. Forks-Okarito-Waiho.
l. Fox and Cook River flats.
m. South bank of Karangarua River to Haast River.
n. South of Haast River.

It was found that there are 248,685 acres in the county which could be developed to a greater or lesser extent. Based on present land use there are about 107,000 acres available for cattle farming, 106,000 acres for dairy farming and 36,000 acres for sheep farming. Table 23 summarises the various areas capable of development.

TABLE 23. LAND CAPABLE OF DEVELOPMENT WESTLAND COUNTY

	acres
Standing heavy bush	34,792
Light bush	13,696
Second-growth country	38,889
Riverbed	23,139
Very wet and swamp	51,166
Cleared but not stumped	49,281
Improved pasture	37,722
	248,685

If any developmental plans are envisaged it is obvious that production can most easily be raised on the 49,281 acres of partly-improved land. It is likely that the 38,889 acres of reverting country will offer more scope for development to the individual farmer, than the 51,166 acres of very wet and swamp country for most of which organised drainage schemes will be necessary. The 23,139 acres of riverbed includes some excellent silt but there is always the possibility of flood and erosion damage. The cost of development of the heavy standing bush will be very high.

Table 24 is based on the assumptions in the above sections and on the carrying capacities given below. The carrying capacities are based on the data collected during the survey.

Dairy farms

Average sow : cow ratio 1 : 14.
Best farms sow : cow ratio 1 : 8.
Average carrying capacity 25 cows per 100 acres.
Best farms carrying capacity 35 cows per 100 acres.

Sheep farms

Average carrying capacity 1.5 ewes per acre.
Best farms carrying capacity 3 ewes per acre.

Cattle farms

Average carrying capacity one breeding cow per 20 acres.
Best farms carrying capacity one breeding cow per 8 acres.

TABLE 24. POTENTIAL PRODUCTION WESTLAND COUNTY

	Number at 31 Jan. 1952	Likely potential	Ultimate potential
Milking cows . .	9,000	26,500	37,100
Sows . . .	640	1,900	4,640
Breeding ewes . .	35,000	54,000	108,000
Breeding cows (beef)	3,600	5,350	13,400

It is emphasised that these figures are an estimate only and are based on the assumption that the 248,685 acres in question are as fully improved as the best land is at present. Without further subdivision of existing holdings it is extremely unlikely that these carrying capacities will be achieved. High production per acre cannot be expected while farmers hold such comparatively large areas. Because of the extremely small areas of unoccupied Crown land with any potential, large-scale Government development schemes, similar to those found in the North Island, are out of the question.

There is not a single farm in the county on which production could not be increased by at least 50 per cent. over a five-year period. Moreover, the methods of bringing about the increase could be adequately financed out of current income. However, if production is to be increased even more significantly, a reorganisation of the land pattern, whether voluntary or compulsory, is the only answer.

ACKNOWLEDGMENTS

Thirty-one farmers kept labour diaries for one year and, in addition, spent considerable time in showing the results of their management and explaining their accounts.

Over 200 farmers and land occupiers were most co-operative during the field work. Also, some of these provided accommodation for considerable periods, notably Messrs P. H. Crough, Hokitika; P. J. Nolan, Kokatahi; R. Ferguson, Harihari, and A. Butler, Whataroa.

Several people gave freely of their time in numerous interviews. These were Messrs D. J. Gregan, Valuation Department, Hokitika; J. L. Salvigny and H. V. Algar, Westland Co-op. Dairy Co., Hokitika, and M. Wallace, Kokatahi. Other information was provided by officers of the Agriculture, Land and Survey and Railways Departments, Westland County Council, and stock and station agents.

The work was at first under the general supervision of Dr I. W. Weston, and later of Mr H. E. Garrett, both of Lincoln College.

To all these people I tender my grateful acknowledgment.