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A STUDY OF LABOUR SAVING TECHNIQUES

ON NORTH ISLAND SHEEP FARMS

by

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TABLE OF CONTENTS.

		Page
CHAPTER 1	INTRODUCTION	1
1.1	Characteristics of the North Island Sheep Farm Labour Problem	1
1.2	Objectives of the Study	2
1.3	Thesis Outline	2
CHAPTER 2	SHEEP FARMING IN THE NORTH ISLAND	4
2.1	Introduction	4
2.2	Analysis of the Industry	4
2.2.1	Ownership and Management	5
2.2.2	Size and Location of Sheep Farms	6
2.2.3	Stock Characteristics	7
2.2.4	Sheep Policies	9
2.2.5	Sheep Farm Operations and Labour Requirements	10
2.3	Changes in North Island Sheep Farming	11
2.3.1	Flock Characteristics	12
2.3.2	Farm Labour	13
2.3.3	Farm Machinery and Equipment	14
2.3.4	Regional Development	15
2.3.5	Innovations on Farms	17
2.4	Summary	20
CHAPTER 3	THE FARM SURVEY AS A RESEARCH METHOD	21
3.1	Farm Management	
3.2	Farm Management Research Methods	22
3.2.1	Methodological Research	22
3.2.2	Empirical Research	23
3.3	Farm Surveys and Farm Management Research	24

			Page
	3.3.1	Motivation for a Farm Survey	25
	3.3.2	Types of Farm Surveys	26
	3.3.2.1	Descriptive Surveys	26
	3.3.2.2	Features of Descriptive Surveys	26
	3.3.2.3	Interview Surveys	27
	3.3.2.4	Features of Interview Surveys	28
	3.3.3	Summary	31
	3.4	A Survey of Labour Saving Techniques	31
	3.4.1	Exploratory Survey	32
	3.4.2	Revised Farm Survey	32
	3.4.3	Revisiting and Collection of Financial Data	33
	3.5	The Survey Method	33
	3.5.1	Location and Selection of Farms	33
	3.5.2	Interviewing Procedures	34
	3.6	Reflections on the Farm Survey	36
	3.6.1	Data Collection	36
	3.6.2	Evaluation	37
	3.7	Summary	37
CHAPTER	4	LABOUR UTILISATION AND MANAGEMENT SYSTEMS	38
	4.1	Introduction	38
	4.2	Factor/Product Relationship	38
	4.3	Subsidary Aspects Concerning Labour Utilisation and Management Systems	41
	4.3.1	Desirable Features of a Management System	42
	4.3.2	Substitutes for Permanent Labour	43
	4.3.3	Motivation of Labour	44
	4.3.4	Under-employment of Labour	46

			Page
	4.4	Summary	47
CHAPTER	5	LABOUR SAVING TECHNIQUES	49
	5.1	Introduction	49
	5.1.1	Theoretical Orientation	49
	5.1.2	Scope of the Chapter	49
	5.1.3	Pattern of Discussion	51
	5.2	Management	51
	5.2.1	Introduction	51
	5.2.2	A labour Saving Management Approach	52
	5.2.2.1	Planning	52
	5.2.2.2	Organisation	53
	5.2.2.3	Evaluation of the Management Approach	54
	5.2.3	Labour Saving Management Aids	55
	5.2.3.1	Map Marking	55
	5.2.3.2	Blackboard	55
	5.2.3.3	The Use of Mirrors in Woolsheds	56
	5.2.3.4	The Use of Sheep Dogs	56
	5.2.3.5	Complete Musters	57
	5.3	Mobility	57
	5.3.1	Introduction	57
	5.3.2	Use of the Perendale Sheep Breed	58
	5.3.2.1	Discussion	58
	5.3.2.2	Farm Survey Data	59
	5.3.2.2.1	Secondary Flocks	59
	5.3.2.2.2	Complete Flocks	62
	5.3.2.3	Evaluation	65
	5.3.3	Access Race	66
	5.3.3.1	Discussion	66

		Page
5.3.3.2	Farm Survey Data	66
5.3.3.3	Evaluation	68
5.3.4	Additional Sheep Yards	69
5.3.4.1	Discussion	69
5.3.4.2	Farm Survey Data	69
5.3.4.3	Evaluation	71
5.3.5	Grouping Ewes for Lambing	73
5.3.5.1	Discussion	73
5.3.5.2	Farm Survey Data	74
5.3.5.3	Evaluation	76
5.3.6	Second Shearing	78
5.3.6.1	Discussion	78
5.3.6.2	Farm Survey Data	79
5.3.6.3	Evaluation	81
5.3.7	Farm Tracking	88
5.3.7.1	Discussion	88
5.3.7.2	Farm Survey Data	89
5.3.7.3	Evaluation	89
5.3.8	Farm Transport	90
5.3.8.1	Discussion	90
5.3.8.2	Farm Survey Data	90
5.3.8.3	Evaluation	93
5.4	Saving Labour during Farm Operations	96
5.4.1	Introduction	96
5.4.2	Controlled Ewe Nutrition	96
5.4.2.1	Discussion	96
5.4.2.2	Farm Survey Data	98
5.4.2.3	Evaluation	101

			Page
	5.4.3	Concentrated Lambing Technique	102
	5.4.3.1	Discussion	102
	5.4.3.2	Farm Survey Data	102
	5.4.3.3	Evaluation	104
	5.4.4	Dagging	108
	5.4.4.1	Discussion	108
	5.4.4.2	Farm Survey Data	108
	5.4.4.3	Evaluation	110
	5.4.5	Footrot Control	112
	5.4.5.1	Discussion	112
	5.4.5.2	Farm Survey Data	114
	5.4.5.3	Evaluation	115
	5.4.6	Docking	117
	5.4.6.1	Discussion	117
	5.4.6.2	Farm Survey Data	118
	5.4.6.3	Evaluation	120
	5.5	Chapter Summary	121
CHAPTER	6	FARMS WITH HIGH NUMBERSOF BREEDING EWES PER PERMANENT LABOUR UNIT	122
	6.1	Physical Description	122
	6.1.1	Location	122
	6.1.2	Sheep Policy	122
	6.1.3	Physical Features of the Farms	123
	6.1.4	Farm Labour	124
	6.1.5	Facilities and Equipment	124
	6.1.6	Stock Wintered	131
	6.2	Management of the Farms	131

		Page
6.2.1	The Farmers	131
6.2.2	Management	132
6.2.3	Husbandry Practices	132
6.2.3.1	Tupping	134
6.2.3.2	Wintering	134
6.2.3.3	Lambing	136
6.2.3.4	Post Lambing Management	137
6.2.3.5	Pasture Management	139
6.3	A Review of the Sixteen Farms	142
6.3.1	Attitude	143
6.3.2	Farm Mobility	144
6.3.3	Simplicity	145
6.4	Case Farm Studies	146
6.4.1	Relative Profitability	147
6.4.1.1	Basis of Comparison	147
6.4.1.2	Accuracy of Comparison	149
6.4.2	Case Farm 1	154
6.4.2.1	Farm	159
6.4.2.2	Farmer	155
6.4.2.3	Labour	155
6.4.2.4	Stock	155
6.4.2.5	Management	155
6.4.2.6	Management System	156
6.4.2.7	Main Contributing Factors	158
6.4.2.8	Financial Summary	159
6.4.2.9	Alternative Labour Policy	159
6.4.3	Case Farm 6	162

		Page
6.4.3.1.	Farm	162
6.4.3.2	Farmer	163
6.4.3.3	Labour	163
6.4.3.4	Stock	163
6.4.3.5	Management	163
6.4.3.6	Management System	164
6.4.3.7	Main Contributing Factors	165
6.4.3.8	Financial Summary	166
6.4.3.9	Alternative Labour Policy	166
6.4.4	Case Farm 10	168
6.4.4.1	Farm	168
6.4.4.2	Farmer	169
6.4.4.3	Labour	169
6.4.4.4	Stock	169
6.4.4.5	Management	170
6.4.4.6	Management System	171
6.4.4.7	Main Contributing Factors	171
6.4.4.8	Financial Summary	172
6.4.4.9	Alternative Labour Policy	172
6.4.5	Case Farm 11	174
6.4.5.1	Farm	174
6.4.5.2	Farmer	175
6.4.5.3	Labour	175
6.4.5.4	Stock	175
6.4.5.5	Management	176
6.4.5.6	Management System	177
6.4.5.7	Main Contributing Factors	178

			Page
	6.4.5.8	Financial Summary	179
	6.4.5.9	Alternative Labour Policy	179
	6.4.6	Case Farm 13	181
	6.4.6.1	Farm	181
	6.4.6.2	Farmer	182
	6.4.6.3	Labour	182
	6.4.6.4	Stock	182
	6.4.6.5	Management	182
	6.4.6.6	Management System	183
	6.4.6.7	Main Contributing Factors	187
	6.4.6.8	Financial Summary	185
	6.4.6.9	Alternative Labour Policy	185
	6.4.7	Case Farm Summary	186
CHAPTER 7		HIGH NUMBERS OF EWES PER PERMANENT LABOUR UNIT ON NORTH ISLAND SHEEP FARMS	187
	7.1	Discussion of the Survey Results	187
	7.2	Ten Questions on High Permanent Labour Productivity	189
	7.3	Summary and Conclusions	191
BIBLIOGRAPHY			
GLOSSARY			
APPENDIX A		CONSTITUENT COUNTIES OF PRINCIPAL SHEEP FARMING REGIONS.	
APPENDIX B		DETAILS OF THE FARM SURVEY.	
APPENDIX C		DESCRIPTION OF A HYPOTHETICAL SHEEP FARM.	
APPENDIX D		PARTIAL BUDGETTING ANALYSIS.	

LIST OF TABLES

		Page
2.1	Description of Principal Sheep Farming Regions	7
2.2	Number of North Island Sheep and Beef Cattle	7
2.3	Changes in Flock Size and Ownership	12
2.4	Percentage of Ewes in Flock by Flock Size	13
2.5	New Zealand Sheep Farm Labour Force	14
2.6	Items of Machinery on New Zealand Sheep Farms	15
2.7	Development of the Principal Sheep Farming Regions	16
2.8	Classification of Fleece Wool Sold at Auction - North Island	18
5.1	Secondary Flocks - Summary of Farm Physical Features	59
5.2	Comparison of Production - 1966 - 67	61
5.3	Stock Wintered - Farm 46	61
5.4	Complete Perendale Flocks - Summary of Farm Physical Features	63
5.5	Stock Wintered - Farm 12	64
5.6	Physical Features of Farms Using Farm Races	67
5.7	Case Studies of the Use of Additional Sheep Yards	70
5.8	Operations Carried Out in Additional Sheep Yards	71
5.9	Time saved through the Use of Additional Yards	72
5.10	Summary of Farm Physical Features on Farms using Ram Harness	74
5.11	Harness Method - Farmer 20	75
5.12	Harness Method - Farmer 40	76
5.13	Comparison of Farm Physical Features on Two Farms Conducting Second Shearing	80
5.14	Comparative Shepherding Time - Long Woolled and Second Shorn Ewes	84
5.15	Break Even Partial Budget - Second Shearing Two Tooth Ewes	87

		Page
5.16	Break Even Partial Budget - Second Shearing Mixed Age Ewes	87
5.17	Basic Features of Types of Transport	91
5.18	Comparison of Time Taken Travelling by Six Different Methods	94
5.19	Additional Ewes Required to Break Even on Vehicle Costs	95
5.20	Summary of Farm Physical Features on Low Shepherding per Ewe Farms	99
5.21	Physical Statistics of Farm 20	103
5.22	Break Even Partial Budget - Concentrated Lambing Technique	106
5.23	Time Saved Using Concentrated Lambing Technique	107
5.24	Comparison of Time Taken for Each of Three Dagging Methods	112
5.25	Comparison of Operational Time	117
6.1	Location and Physical Description of Sixteen High Ewes per Man Farms	127
6.2	Farm Labour	128
6.3	Farm Facilities and Transport Equipment	129
6.4	Stock Wintered at 30 June, 1966	130
6.5	Farmer Age and Education Level	131
6.6	Farmers' Financial Planning and Farm Objectives	133
6.7	Sheep Breeds, Stocking Rates, Lambing Percentages and Wool Production	138
6.8	Farm Fertiliser Usage - 1965-66	139
6.9	Labour Use for Main Jobs on 17 Survey Farms	141
6.10	Farm Working Expenditure Under Two Labour Policies	150 - 51
6.11	Calculation of Farm Taxation	152
6.12	Calculation of Farm Cash Surplus	153
6.13	Basic Statistics of Farm 1 - 1965-66	154

		Page
6.14	Partial Budget for Extra Permanent Labour on Case Farm 1	161
6.15	Basic Statistics of Farm 6 - 1965 - 66	162
6.16	Partial Budget for Extra Permanent Labour on Case Farm 6	167
6.17	Basic Statistics of Farm 10 - 1965 - 66	168
6.18	Partial Budget for Extra Permanent Labour on Case Farm 10	173
6.19	Basic Statistics of Farm 11 - 1965 - 66	174
6.20	Partial Budget for Extra Permanent Labour on Case Farm 11	180
6.21	Basic Statistics of Farm 13 - 1965 - 66	181
6.22	Partial Budget for Extra Permanent Labour on Case Farm 13	185

LIST OF FIGURES

FIGURE	2.1	North Island - Principal Sheepfarming Regions
	2.2	North Island - Total Sheep, Beef Cattle
	2.3	Product Prices - Wool, Lamb, Beef.
	2.4	North Island - Fertiliser
	2.5	North Island - Flock Composition by Flock Size.
	2.6	North Island - Percentage of Sheep Within Flock Sizes - 500 and over.
	2.7	North Island - Total Sheep by Districts.
	3.1	Location of Survey Farms
	4.1	Factor/Product Relationships.
	4.2	Labour Profile for a North Island Sheep Farm.
	5.1	Concentrated Lambing Area on Farm 20.
	5.2	End View of Dagging Race on Farm 49.
	5.3	Diagrammatic Representation of the Operational Movements Involved in Three Dagging Methods.
	5.4	Permanent Docking Fence on Farm 5.
	5.5	Portable Docking Pen on Farm 45
	6.1	Typical Topography on Farm 1
	6.2	Typical Topography on Farm 11

CHAPTER 1

INTRODUCTION

This thesis reports the results of a farm survey conducted to find and evaluate labour saving techniques on North Island sheep farms. The motivation for this study was the hypothesis that many sheep farmers were at least partly restricted in their farming activities because of the availability and price of farm labour.

1.1 Characteristics of the North Island Sheep Farm Labour Problem.

There are three major barriers to the profitable utilisation of labour on North Island sheep farms; - farm size, the nature of the production process, and the location of sheep farming areas. The size of the majority of sheep farms is small enough that additional permanent labour is a major input. In many cases, adding one man may mean doubling the permanent labour force.

The stock husbandry required for many operations requires a degree of familiarity and expertise on the part of farm labour. However the nature of sheep farm production produces characteristic peak demands for labour only at certain times of the year.

The location of sheep farming regions and farms may make casual and contract labour difficult to obtain. People working as employees may find rural life too insecure or lacking in social and educational amenities to stay long.

In summary, increased carrying capacity and production usually involve additional labour Capital restrictions however, and the "lumpiness" of permanent labour inputs may rule against the employment of an extra man. At the same time, considerable uncertainty may be associated with the availability of other forms of labour.

1.2 Objectives of the Study

This study seeks to show ways in which existing permanent labour on sheep farms can be used with maximum effectiveness. This involves a review both of total farm labour management systems and the techniques used to achieve particular jobs common to all, or at least most, management systems.

This thesis is not concerned with sociological considerations, or how to increase the labour supply available to sheep farmers.

The study is based on a farm survey. Fifty-two sheep farmers dispersed widely over the North Island were interviewed by the author. Individual techniques were inspected and evaluated. Sixteen farms, selected on the basis of high numbers of breeding ewes per permanent labour unit, formed a part of the farm survey. Labour productivity on each farm was studied in the context of a management system.

1.3 Thesis Outline

The thesis consists of six chapters. These can be divided into two parts. The first (Chapters 2, 3 and 4) is basically introductory, while the second part, (Chapters 5, 6 and 7) contains the survey results and conclusions.

Chapter 2 describes sheep farming in the North Island in general terms - sufficient to acquaint readers with the nature of sheep farming in the North Island of New Zealand, circa 1966. Chapter 3 discusses the use of farm surveys in research, and describes the farm survey conducted during this study. Chapter 4 provides a theoretical framework for the study, as well as discussing some subsidary aspects of labour utilisation and management systems. Chapter 5 describes and evaluates a selected number of labour saving techniques studied during the farm survey.

Chapter 6 describes labour productivity in the context of the management systems of sixteen survey farms. This chapter also discusses five case farms in detail and a partial budget is calculated for an alternative labour policy on each farm. Chapter 7 contains a summary of the thesis results, and conclusions that have been drawn from them.

CHAPTER 2

SHEEP FARMING IN THE NORTH ISLAND

2.1 Introduction

This chapter outlines some of the important characteristics of sheep farming practices in the North Island of New Zealand. The purpose of this outline is to highlight aspects of sheep farm management which explain present, and likely future trends of labour productivity. A reasonable knowledge of sheep farming under New Zealand conditions is assumed. [1] The specific topics covered in this chapter are; a description of the sheep industry with respect to its constituent farms, management within the industry, the labour requirements of the particular management systems practised, and a summary of the progress of the industry over the last decade (1956 - 1966).

2.2 Analysis of the Industry

The sheep industry is essentially concerned with the production of wool, and meat as mutton, lamb and beef. The individual units of production within the industry are sheep farms, most of which are owned, managed and operated by one or two labour units. In the North Island, there are approximately 15,000 sheep farm holdings, [2]

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1. Readers without this background may be interested to read: Du Faur, R., "Sheep Farming for Profit", A.W. and A.H. Reed, Wellington, 1966; and Stevens, P.G.W., "Sheep", Whitcombe and Tombs, Christchurch, 1960. (Part 1 - "Sheep Husbandry" and Part 2 - "Sheep Farming Development and Sheep Breeds in New Zealand".)
2. The number of holdings is based on: "Report of the Census of Agriculture of New Zealand for the Year 1959-60", Department of Statistics, Wellington, Table 7, p.15, North Island holdings - Principally Sheep Farming.

and these are managed by an estimated 12,000 employers and owners.[3] Most of the 32 million sheep and 3 million beef cattle in the North Island[4] are carried on the farms which make up the sheep farm industry. The balance of the sheep and beef cattle are carried on dairy farms and mixed enterprise farms.

2.2.1 Ownership and Management

Most North Island sheep farms are owned and managed either on an owner-operator basis, or as partnerships. This type of ownership has changed little from pioneering days.

This is partly due to the farm family tradition, but also successive governments have actively promoted closer land settlement.

> "The principle of one man, one farm has been the basis of New Zealand's land settlement policy for many years, with land legislation directed towards the closer settlement of farmland, and the provision of land for the landless, and the prevention of undue aggregation of farm land." [5]

Thus at present within the sheep farm industry an estimated 50 per cent to 60 per cent of farms are managed on an owner-operator or partnership basis.[6] In addition, there is little evidence that major cost economics would result from large "corporate" farms.

---

3. Author's estimate - based on the New Zealand figure of 19,720 for North Island sheep farm employers and owners in 1961: New Zealand Official Year Book, 1965, p.394. The figure of 19,720 was multiplied by the North Island fraction of the total New Zealand sheep numbers in 1966. The average flock sizes for the North Island and the South Island are assumed to be the same. The author considers this assumption to be sufficiently accurate for the purposes of the above description.
4. Stock numbers are based on: Statistics of Farm Production for the season 1965-66 Department of Statistics, R.E. Owen, Government Printer, Wellington, 1967.
5. Scale of Farm Working Party, "Report of the Agricultural Development Conference 1963-64", R.E.Owen, Government Printer, Wellington February, 1966, p.233.
6. Based on survey findings by McClatchy and Nelson, see: McClatchy,D., "Report on a Survey of Farm Labour in Patangata County, Hawkes Bay, 1965-66" Publication No. 34, Agricultural Economics Research Unit, Lincoln College 1966; and Nelson,M. "Sheep Farming in Waipukurau County, Hawkes Bay",Technical Publication Number 10,Lincoln College,October,1953.

2.2.2 Size and Location of Sheep Farms

The size and the location of sheep farms in the North Island reflects the competition for land use. The three major rural land users are dairy farming, sheep farming and forestry. Dairy farming competes with sheep farming at the intensive margin, while at the extensive margin there is some competition with forestry.

The competition with dairying has resulted in sheep farming being located on undulating to steep country, or in areas where the climate is unsuitable for dairying. Sheep farms on the flatter, more fertile soil types or where the dry summers require lower stocking rates are typically devoted to fat lambs and wool production (with holdings ranging from 250 to 600 acres), while the steeper, less fertile areas are used for breeding and wool production (with holdings ranging from 300 to over 20,000 acres).

Many fat lamb farms are situated close to country towns, but the typical breeding farm is more remote from servicing and social centres, with high transport costs and, frequently, contending with greater extremes in weather at the higher altitudes.

The major sheep farming regions [7] are shown in Fig. 2.1., and the number and average size of the regional holdings are given in Table 2.1. With the exception of Northland and East Coast, the average farm size shows relatively little variation, but within regions there is considerable size variation.

---

7. The constituent counties of each sheep farming region are given in Appendix A. Rainfall taken from Garnier. See: Garnier, B.J., "The Climate of New Zealand", Arnold, London, 1958, p.26, Fig.7.

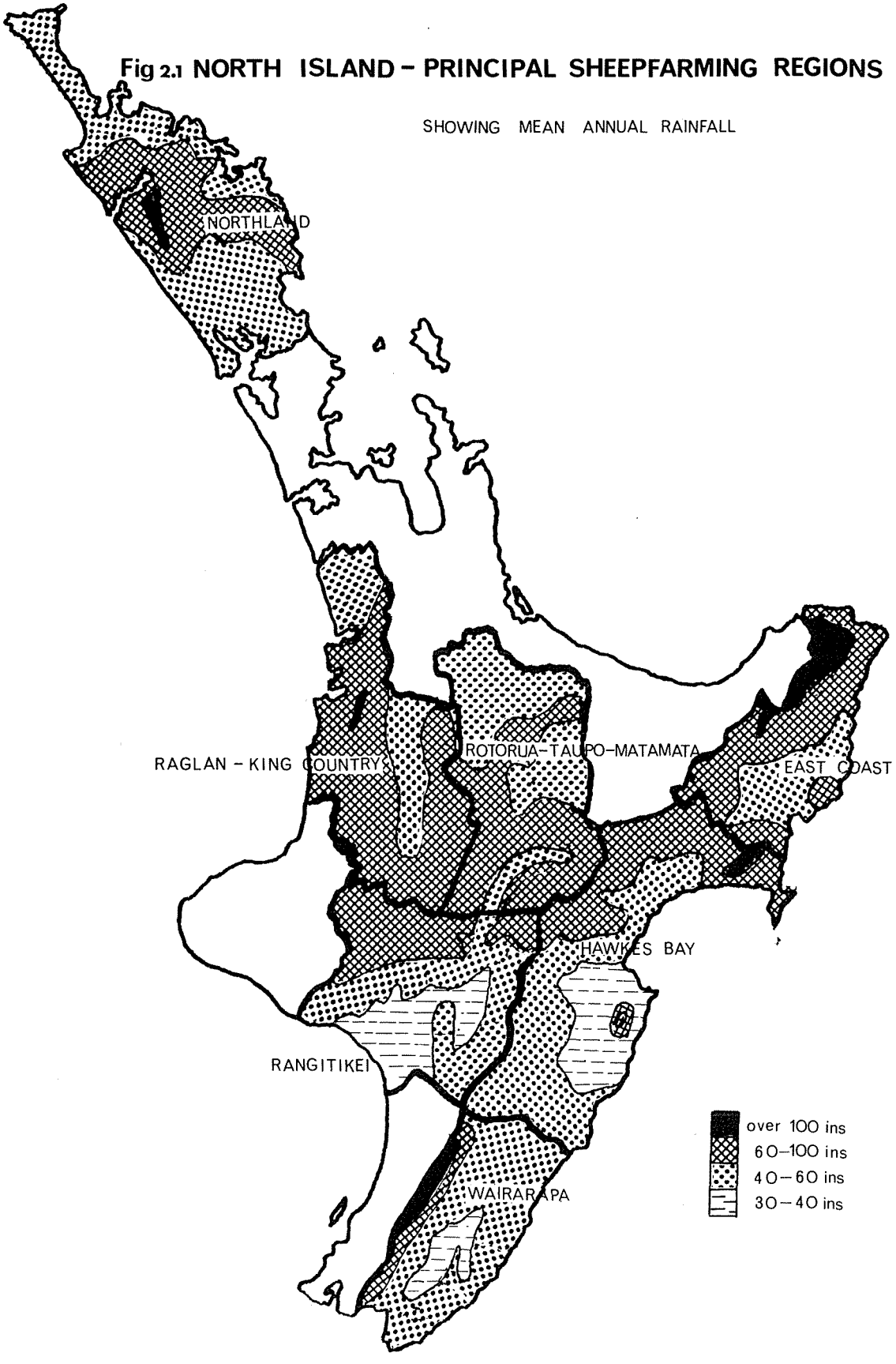

Fig 2.1 NORTH ISLAND – PRINCIPAL SHEEPFARMING REGIONS

SHOWING MEAN ANNUAL RAINFALL

TABLE 2.1 DESCRIPTION OF PRINCIPAL SHEEP FARMING REGIONS

Region	Occupied Area [a] (Million Acres)	Holdings [b] Total No.	% Sheep	% Dairy	Average Area (Acres)
Northland	2.4	7615	22	54	374
Raglan-King Country	2.2	3556	57	17	563
Rotorua-Matamata-Taupo	1.8	2773	23	50	673
East Coast	1.8	1929	50	14	1066
Hawkes Bay	2.8	4484	60	13	652
Wairarapa	1.7	2620	58	26	695
Rangitikei	2.2	3559	65	16	636

Sources: a. New Zealand Official Year Book 1965.
b. Report on the Census of Agriculture for the Year 1959-60.

2.2.3 Stock Characteristics

Most sheep farms carry some beef cattle as well as sheep. On a North Island aggregate basis, the relationship between sheep and cattle numbers has been in the ratio approximately of 10 sheep per 1 cattle beast (Fig.2.2). Thus in 1966 there were 31.8 million sheep and 3.1 million beef cattle.

TABLE 2.2 NUMBER OF NORTH ISLAND SHEEP AND BEEF CATTLE

Year		1956	1966	Percentage Increase
Sheep:	Breeding Ewes	14,607,606	21,442,469	46.8%
	Total Sheep	22,131,688	31,757,694	43.5%
Cattle:	Breeding Cows	718,577 [a]	967,900	34.7%
	Total Cattle	2,363,871 [a]	3,112,000	31.6%

Source: Farm Production Statistics 1955-56, and 1965-66.
a. The cattle numbers refer to the 1957 year. Figures for 1956 are not available.

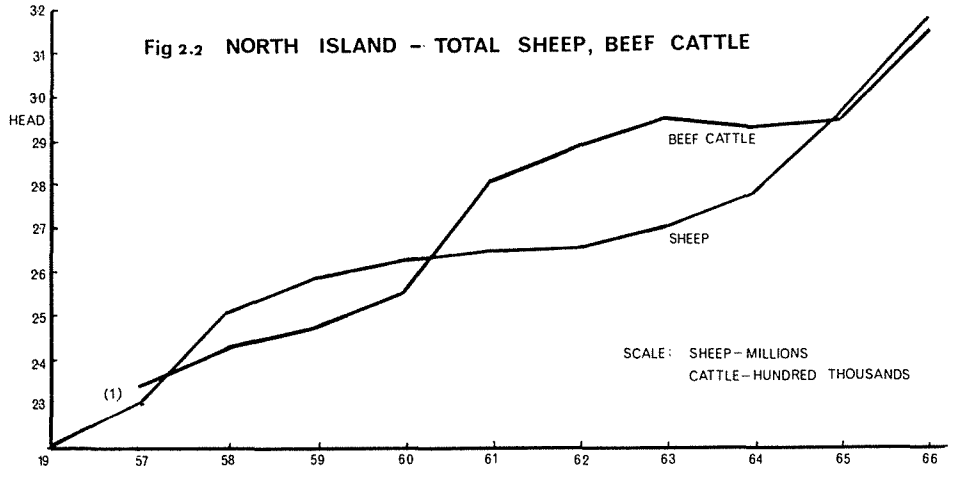

Fig 2.2 NORTH ISLAND – TOTAL SHEEP, BEEF CATTLE

YEAR ENDING: 31 JANUARY – CATTLE (1) UNAVAILABLE
30 JUNE – SHEEP

Source: Farm Production Statistics, 1955-56 to 1965-66.

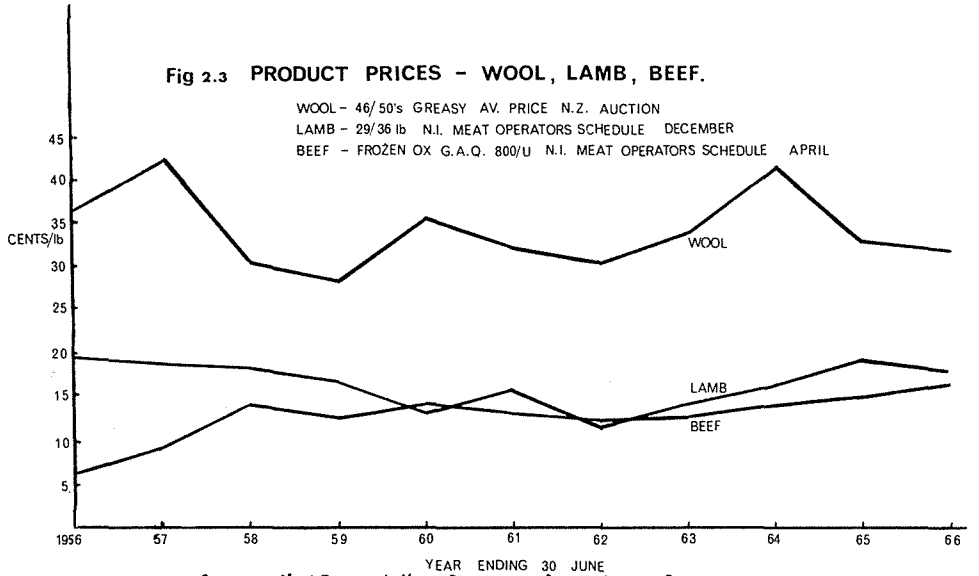

Fig 2.3 PRODUCT PRICES – WOOL, LAMB, BEEF.

WOOL – 46/50's GREASY AV. PRICE N.Z. AUCTION
LAMB – 29/36 lb N.I. MEAT OPERATORS SCHEDULE DECEMBER
BEEF – FROZEN OX G.A.Q. 800/U N.I. MEAT OPERATORS SCHEDULE APRIL

YEAR ENDING 30 JUNE

Source: New Zealand Meat Producers Board Annual Reports 1956-66, and New Zealand Wool Commission 1956-66.

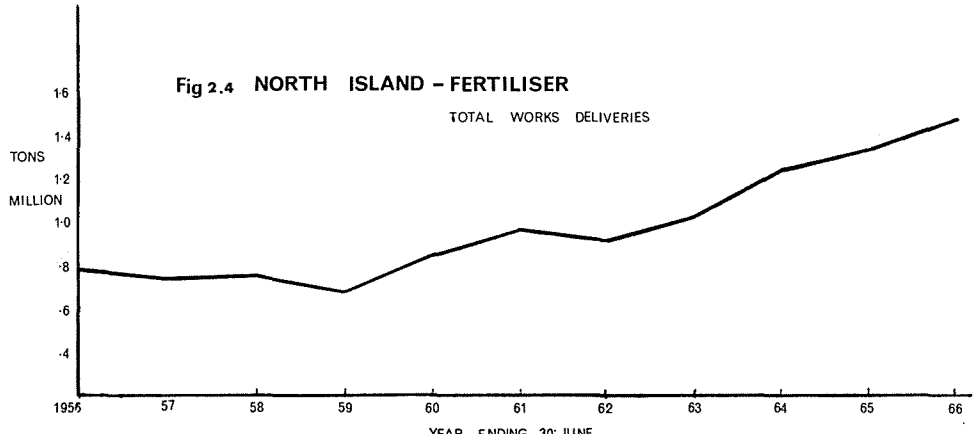

Fig 2.4 NORTH ISLAND – FERTILISER

TOTAL WORKS DELIVERIES

YEAR ENDING 30 JUNE

Source: Farm Production Statistics, 1955-56 to 1965-66.

Sheep Breeds [8]

The Romney is the predominant sheep breed in the North Island. It is grazed under all farming conditions, and is farmed for wool production, store lambs and fat lamb production. Approximately 75 per cent of North Island sheep are Romney, while Romney crossbred sheep (mainly Cheviot rams and Border Leicester rams mated with Romney ewes) account for an estimated further 10 to 15 per cent.

Flock Size [9]

The size of flocks wintering 500 or more sheep varies with some flocks wintering more than 10,000 sheep. In 1966 over 57 per cent of sheep were contained in flocks ranging in size from 1500 to 4999 sheep, while 18.8 per cent of the sheep were contained in flocks of 5000 or more sheep.

The 1500-4999 flock size group accounted for 48.2 per cent of all sheep owners. Only 4.6 per cent of sheep owners had flocks of 5000 or more sheep.

Flock Composition [9]

Although there is considerable variation in the composition of flocks depending upon the sheep policy being followed (section 2.2.4) a large number of flocks carry replacement stock. As flock size increases an increasing proportion of the flock consists of ewe hoggets, wether hoggets and wethers (Fig.2.5).

In flocks of up to 2000 sheep wintered there is a fairly

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8. The description of the breed composition of the North Island sheep flock is based on the New Zealand sheep breed composition figures as at 30 June, 1962, provided by the New Zealand Department of Agriculture every 5 years.

9. The description of flock size and flock composition are figures given by the Department of Statistics in the annual "Statistics of Farm Production" publication.

constant proportion of 71 to 75 per cent of the flock consisting of breeding ewes; but flocks with 5000 or more sheep have only 60 per cent breeding ewes.

2.2.4 Sheep Policies

Sheep farm management in New Zealand is concerned with two basic sheep policies - a breeding policy and a fat lamb policy. The breeding policy consists of farming as a self contained unit, breeding replacement stock, and deriving income from wool and surplus stock. Beef cattle are frequently run in conjunction with sheep, although again the surplus stock sold are usually not fattened.

The fat lamb policy is comparatively simple and is typically practised in areas where lambs and surplus ewes may be fattened during rapid spring and early summer pasture growth and sold before dry summer conditions. No replacement stock are bred and all ewes required are normally purchased as two tooths or cast-for-age 5 year olds from breeding farms. Income is derived from wool, fat lambs, fat cattle, and ewes sold to freezing works. In some areas of the Rangitikei, Hawkes Bay and Wairarapa, sheep farming regions,cash cropping is carried out in conjunction with fat lamb farming.

On improved hill country a combination of the two policies is commonly practised. Many sheep farms on this class of land are in stages of rapid development. In order to increase sheep numbers farmers have to retain most ewes, leaving little opportunity for culling. On many of these farms the poor quality ewes are mated to fat lamb sires. The progeny are easily recognisable and are sold.

These farmers achieve some income diversification in addition to maintaining some selection within the flock. With this type of sheep policy, income is derived from wool, store sheep, fat lambs and

cattle.

2.2.5 Sheep Farm Operations and Labour Requirements

The scheduling and execution of sheep farm operations follows a similar pattern on most North Island Sheep farms. Sheep husbandry operations occupy most of the spring and summer months while other farm operations such as maintenance and development are usually more profitably carried out in autumn and winter months when there is less pressure on the permanent labour force.

In general, sheep (and cattle) husbandry operations are undertaken by the permanent labour force. The reason is that most husbandry operations require familiarity with the farm layout and organisation, initiative when working, a sense of responsibility and dog handling skills. Also some decision making during such operations is based on subjective criteria which depend upon the farmer's sanse of values.

Many farmers take pride in their "stockmanship" and are reluctant to delegate this type of work to others.

Some husbandry operations such as mustering, grazing management, culling and sorting sheep, and mating management are usually restricted to the permanent labour on farms, but other operations including lambing, docking, dagging, drenching and dipping can be performed by casual labour under the direction of the farmer or another permanent labour unit. Some husbandry operations are sufficiently standardised between farms so that they can be performed by contract labour without supervision. These operations include crutching, shearing and sometimes dipping.

Maintenance and development operations are performed by both the permanent staff and outside labour. Usually much maintenance work including fence and gate repairing, and maintenance of buildings and

equipment is done by permanent labour. Although some aspects of development are performed by farmers and permanent labour, a number of operations including fencing, scrubcutting, bulldozing, topdressing and cultivation are frequently performed by casual labour or contractors.

Labour Requirements

To date it has not been possible to mechanise the stock operations that are responsible for the peak labour demands, hence there are characteristic peak labour requirements during the year under conventional farming systems. Further these "peaks" can be directly attributed to the labour demands of stock husbandry operations which are usually carried out by the permanent labour force.

In particular, lambing, preparation for main shearing, and weaning and its associated activities commonly place a strain on the capacity of the permanent staff. This situation, with "labour peaks" is probably one of the main factors in limiting the number of ewes managed by each permanent labour unit.

2.3 Changes in North Island Sheep Farming

Certain changes have occurred in the industry during the 1956-1966 period. The most evident of these changes has been the increase in sheep and cattle numbers, which are shown graphically in Fig.2.2.

Several factors are probably responsible for causing this increase. Some farmers have been forced to increase stock numbers, because of increasing farm input costs without corresponding long term price increases in farm products. Other farmers have been able to invest surplus finance from favourable years to increase production, without entering into a conscious development program. Taxation incentives

and pride in good husbandry have been important motivating forces for some farmers.

A possible relationship can be seen in Fig. 2.2 and Fig. 2.3 between sheep and beef cattle increases and the relative fluctuations in the prices of wool, lamb and beef. However throughout the 1956-1966 period there has been no evidence to suggest that there have been major changes in the ownership and management of the individual farms.

2.3.1 Flock Characteristics

From 1956 to 1966 there has been a 43.5 per cent increase in the total sheep in the North Island. There were large increases in the number of sheep in flock sizes of 1500 or more, while the number of sheep in flocks of less than 1250 sheep declined. These changes are shown in Table 2.3.

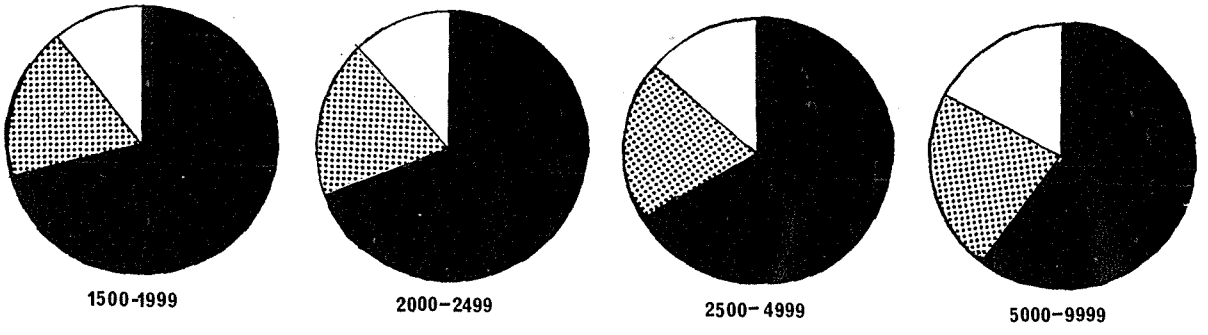
TABLE 2.3 CHANGES IN FLOCK SIZE AND OWNERSHIP

	Sheep (Millions)			Owners (Thousands)			Ewes per Owner	
Flock Size	1956	1966	% Increase	1956	1966	% Increase	1956	1966
500-999	3.35	2.56	-22	4.5	3.52	-22	541	535
1000-1249	2.21	2.06	- 7	1.98	1.83	- 7	807	843
1250-1499	2.00	2.56	27	1.47	1.86	26	963	1014
1500-1999	3.14	5.56	77	1.83	3.21	76	1154	1224
2000-2499	2.16	3.79	76	0.97	1.71	76	1440	1518
2500-4999	4.63	8.18	77	1.39	2.44	76	2045	2208
5000-9999	2.00	3.67	83	0.31	0.56	82	3707	3936
10000-and over	1.07	2.07	93	0.08	0.14	77	7149	8169

Source: Farm Production Statistics 1955-56, and 1965-66.

Fig 2.5 NORTH ISLAND - FLOCK COMPOSITION BY FLOCK SIZE

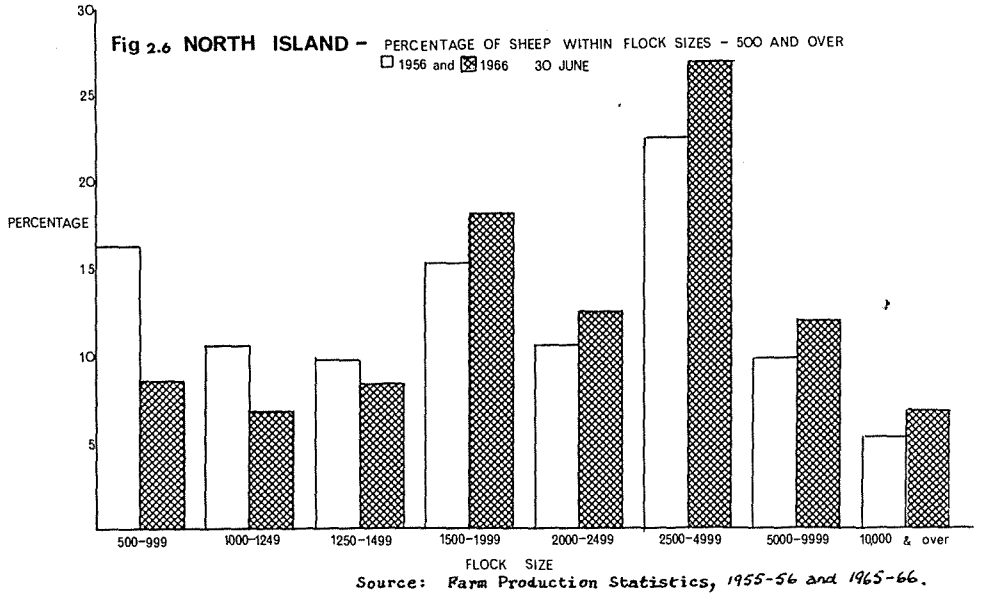
AT 30 JUNE 1966 ■ EWES ⊠ EWE HGTS □ OTHERS



Source: Farm Production Statistics, 1965-66.

Fig 2.6 NORTH ISLAND - PERCENTAGE OF SHEEP WITHIN FLOCK SIZES - 500 AND OVER

□ 1956 and ⊠ 1966 30 JUNE



Source: Farm Production Statistics, 1955-56 and 1965-66.

During the 1956-1966 period, the average flock size per owner increased from 1650 sheep to 1994 sheep, despite a 22 per cent increase in the number of owners. This indicated a change in the distribution of sheep within flock sizes which is illustrated graphically in Fig. 2.6. A corresponding change occurred in the distribution of owners within the range of flock sizes.

The composition of flocks has changed slightly since 1956. Although varying with the particular sheep policy followed, the average flock within each flock size was carrying a higher proportion of breeding ewes in 1966 (Table 2.4).

TABLE 2.4 PERCENTAGE OF EWES IN FLOCK BY FLOCK SIZE

Flock Size	Percentage of Ewes 1956	1966
500-999	73	73
1000-1249	72	75
1250-1499	71	74
1500-1999	67	71
2000-2499	65	68
2500-4999	61	66
5000-9999	57	60
10,000 and over	53	55

Source: Farm Production Statistics 1955-56 and 1965-66.

2.3.2 Farm Labour

While separate North Island sheep farm labour statistics are unavailable, the trends are probably reflected in the New Zealand sheep farm labour statistics. From 1951 to 1956 there was a substantial increase in New Zealand sheep farm labour force. However between

1956 and 1961 there was a decrease in the total sheep farm labour force. The statistical details are given in Table 2.5.

TABLE 2.5 NEW ZEALAND SHEEP FARM LABOUR FORCE

Occupational Status	1951	1956	1961
Employer and Own Account	17,683	20,705	19,720
Wages or Salary Earners	17,012	18,515	19,000
Unemployed and Others	473	507	381
Total	35,168	39,627	39,101

Source: New Zealand Official Year Book, 1965.

There has probably been a significant increase in the contribution of labour through the services available to sheep farms. Agricultural contractors and workers in agricultural servicing industries, farm equipment servicemen, as well as technical, managerial and financial advisory services [11] all may substitute for permanent sheep farm labour. [12]

2.3.3 Farm Machinery and Equipment

On New Zealand sheep farms, an increasing amount of farm machinery has been used. This same situation is probably true for North Island sheep farms.

11. For instance, the number of Farm Improvement Club Advisors aiding North Island sheep farmers, increased from four to twenty-four between 1956 and 1966.

12. Management is mentioned here because not only can management services substitute for farmers to some degree, but also because management has a major influence on the productivity of farm labour. This relationship is examined in later chapters.

TABLE 2.6 ITEMS OF MACHINERY ON NEW ZEALAND SHEEP FARMS

Item	1949-50	1959-60	Percentage Increase
Wheel Tractors	10,040	20,430	103%
Crawler Tractors	2,493	7,421	198%
Farm Trucks*	7,642	12,386	62%
Farm Holdings	23,268	26,609	11%

* Includes four-wheel drive vehicles

Sources: Final Report on the New Zealand Census of Farm Production 1949-50, and Report on the Census of Agriculture of New Zealand for the year 1959-60.

In particular, wheel tractors and farm trucks - both likely to increase the productivity of farm labour - have both increased disproportionately to the increase in sheep farm holdings.

On North Island sheep farms equipment introduced has included portable shearing and dagging plants, gas docking irons, portable yards, docking cradles, footrot cradles, shower dips and tip sprays. New fencing materials have included electric fencing, netting fencing, tanalised wooden posts and light gauge steel wire.

2.3.4 Regional Development

There has been some change since 1956 in the relative importance of the principal sheep farming regions. Hawkes Bay was, and still remains the most important region in sheep numbers in 1966. The percentage increase in sheep numbers in Hawkes Bay was relatively low. The major reasons are probably the early development of the region, the moisture limitations during the dry summers, together with a trend in land use from sheep farming to cropping, and more intensive use.

A summary of regional development is given in Table 2.7 and the relative increases in total sheep numbers are shown in Fig.2.7.

TABLE 2.7 DEVELOPMENT OF THE PRINCIPAL SHEEP FARMING REGIONS

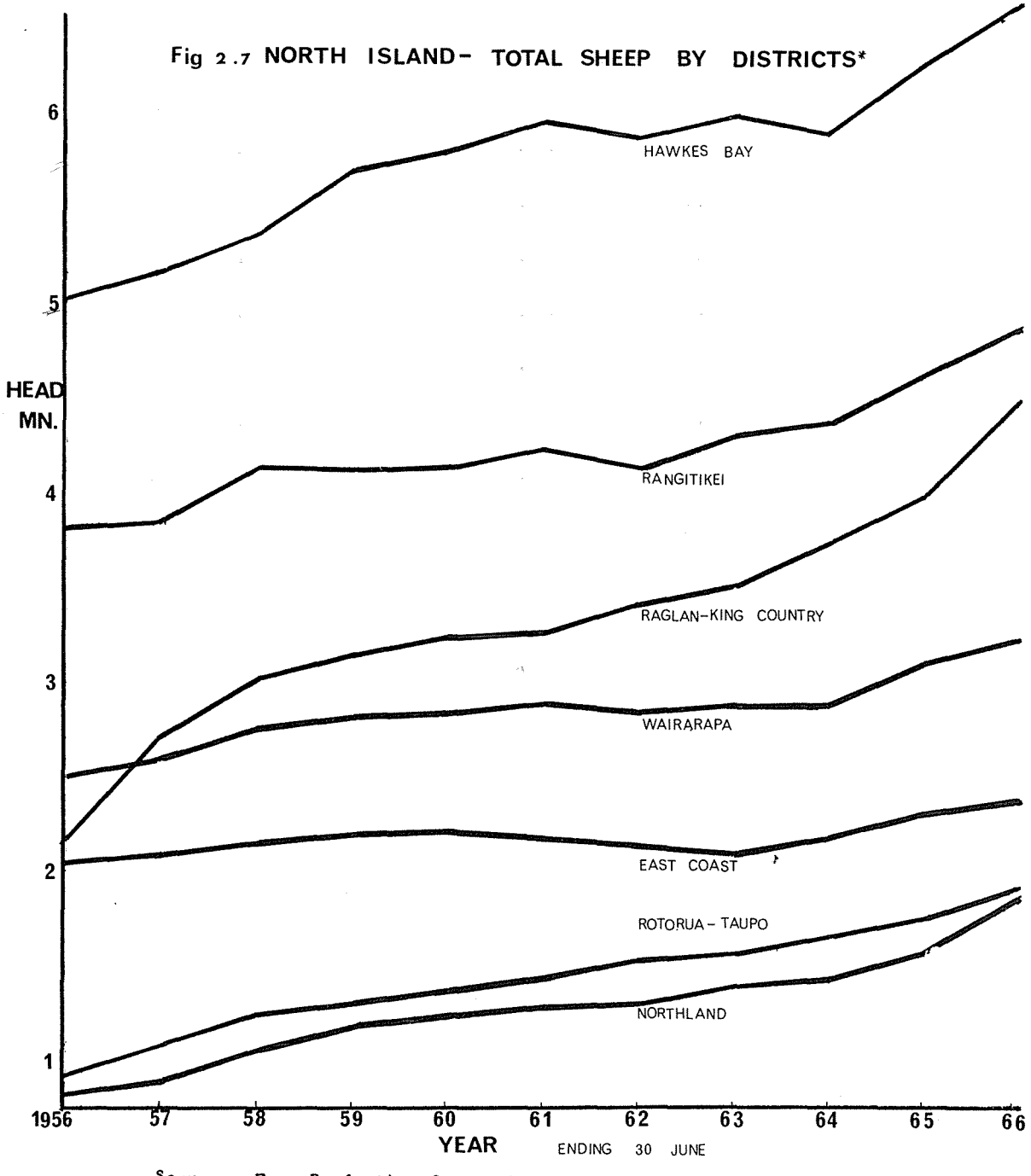
	Total Sheep (Millions).			Sheep:Beef Cattle Ratio	Fertiliser Applied (Tons) Cwt per Acre.	% Increase
	1956	1966	% Increase	1965	1965	1957-65
Northland	0.81	1.88	129	5.8:1	1.40	12
Raglan-King Country	2.17	4.49	106	9.6:1	1.56	38
Rotorua-Matamata	0.92	1.93	110	8.9:1	1.28	58
East Coast	2.05	2.38	16	6.3:1	0.42	46
Hawkes Bay	5.00	6.55	31	11.9:1	1.07	12
Wairarapa	2.50	3.22	29	11.9:1	0.87	-10
Rangitikei	3.81	4.87	28	12.5:1	0.84	12

Source: Farm Production Statistics 1955-56, and 1965-66.

The three "established" regions: Hawkes Bay, Wairarapa and Rangitikei, show great similarity in terms of the relative importance of sheep farming, the average size of holdings, and the percentage increase in sheep numbers during the 1956-66 period. Three regions, Northland, Raglan-King Country, and Rotorua-Matamata-Taupo show rapid percentage increases in sheep numbers, ranging from 106 per cent to 129 per cent. Each region also had a relatively high fertiliser application rate.

The East Coast region showed little progress in sheep numbers between 1956 and 1966, and indeed the sheep numbers dropped between 1960 and 1963, as shown in Fig. 2.7.

The most important feature of the North Island regional



Source: Farm Production Statistics, 1955-56 to 1965-1966. (* PRINCIPAL SHEEP FARMING REGIONS ONLY)

development in the last decade has been the emergence of the Raglan-King Country region as a major sheep farming region. In 1956 Raglan-King Country had a similar number of sheep to the East Coast region, but by the end of the decade it had almost as many sheep as the Rangitikei region, and a greater number of beef cattle.

2.3.5 Innovations on Farms

Since 1950 innovation covering a wide range of farm operations have been available and adopted by sheep farmers. Although some innovations have originated in other industries, many have been developed by farmers themselves. Some of the important ones are discussed below.

Management systems have been adapted to include higher stocking rates, second shearing and the use of cross breeds. The stocking rate trials at Te Awa [13] have indicated possible performance from high stocking rates on moderately steep hill country. These trials indicated that while per ewe performance fell as the stocking rate increased, not only was per acre production likely to increase (the extent depending also on seasonal growth patterns and fertiliser applications), but also there was likely to be:

> "easier management of the flock, with lighter, more vigorous and healthy ewes, and less lambing and bearing trouble." [14]

Second shearing has become a common management practice throughout the North Island, but particularly in the northern part of the North Island. In the 1965-66 wool auction season more than half of the fleece wool [15] sold at auction was second shear and early shorn fleece.

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13. Suckling, F.E.T., "Stocking Rate Trials at Te Awa", Sheep Farming Annual, Massey University, 1964, pp.18-32.
14. Ibid., p.32.
15. Definitions of the three types of fleece wool are given in the Glossary.

TABLE 2.8 CLASSIFICATION OF FLEECE WOOL SOLD AT AUCTION-NORTH ISLAND

Fleece Type	Percentage of Total Fleece Wool
Main Fleece	44.7
Early Shorn Fleece	14.5
Second Shear Fleece	40.8
	100.0

Source: New Zealand Wool Commission - 1965-66 Season.

Although the Romney is still the most numerous breed in the North Island, a number of farmers have mated their Romney ewes with rams of other breeds - principally the Cheviot and the Border Leicester. The main advantages sought in the crossbred sheep have been higher per ewe (and per acre) production with a lower shepherding and husbandry requirements. In many instances crossbreeding is claimed to have enabled a less labour intensive and a more profitable management system to be adopted.

The cost and effectiveness of pasture establishment and management has been assisted by more productive and suitable grass and clover species, a greater range of available fertiliser mixtures, aerial topdressing and oversowing, chemical pasture renovation and improved knowledge of grazing techniques.

Stock husbandry has been improved by a greater range of more effective drenches, stock vaccines and antibiotics. Plastic ear tags have allowed accurate identification and grouping of sheep. Tupping [16] harnesses have enabled farmers to sort ewes into mobs based on the date of lambing.

16. "Tupping" is defined in the Glossary.

A range of farm transport has become available and includes not only "conventional" two and four wheel drive vehicles, but also specialised two wheel drive farm vehicles, a three wheel vehicle, and several types of farm motor bikes. A greater variety of farm tractors is now available. Aeroplanes and helicopters can be hired for carrying farm materials as well as for topdressing, oversowing, and spraying operations.

In spite of these innovations there has been little change in techniques available for management. Budgetting is still the main management tool, although relatively sophisticated mathematical programming methods developed are now used in other industries. The possible reasons for this relative non-adoption of advanced management methods in farm management have been recently reviewed by Stewart. 17/

However it is doubtful whether even budgetting is used to great effect by North Island sheep farmers. Some evidence for this view was given in a survey by Cartwright.

> "Nine (45%) of the Random Farmers did not use budgetting as an aid to management, while four others relied on rudimentary 'tobacco-packet' budgets." 18/

The use of budgetting may historically have often been associated with the exercise of control imposed by outside agencies, tending to build up prejudices amongst farmers against any form of financial planning. However the lack of budgetting is probably also due to the inability of many farmers as financial managers. In a survey of

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17. Stewart, J.D., "Significance of New Techniques in Farm Management Analysis", New Zealand Agricultural Science, March 1968, 2, 5, pp. 136-139.

18. Cartwright, R.W., "The Potential for Increased Production on Sheep Farms in Wairoa County", Unpublished M.Agr.Sc. Thesis, Massey University, 1967, p.79.

hill country farms in the Rangitikei sheep farming region Wright observed that:

> "It was evident from the survey that the greatest overall lack of information was in the field of economics. Few farmers are capable of making more than a cursory evaluation of proposed (development) plans." 19/

While budgetting is the main management tool available to the sheep industry, even its use may be limited by the ability of individual farmers and the financial advice available.

2.4 Summary

The North Island sheep industry consists of many small production units, which have little direct influence on the processing and marketing of the industry products. Considerable physical growth, mainly in terms of stock numbers, has occurred during the 1956-1966 period. Many technical innovations and new husbandry techniques have been adopted from 1950 onwards.

Little structural change has taken place within the industry; farms appear to be owned and managed in a similar manner over the last 20 years. Hence the progress in technical and husbandry aspects of sheep farming does not appear to have been matched by, or resulted in, changes in the methods of management.

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19. Wright, A., "The Development of Unploughable Hill Country", Unpublished M.Agr.Sc.Thesis, Massey University, 1963, p.104.

CHAPTER 3

THE FARM SURVEY AS A RESEARCH METHOD

This chapter considers the role of surveys in farm management research. It is divided into six sections. The first is concerned with the functions of farm management, the second discusses methodological and empirical farm management research, and the third considers the role of farm surveys in farm management research. Sections four, five and six discuss the labour saving survey.

3.1 Farm Management

Resource allocation in agriculture is the responsibility of many individual farm managers. Each individual farmer makes the decisions necessary to manage his own "farm firm".

The management process can be divided into four basic functions:

(i) Planning,

(ii) Organising,

(iii) Control, and

(iv) Communication. 1/

These functions may be aggregated into two basic activities:

(i) Co-ordination, and

(ii) Supervision. 2/

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1. Johnson, Richard A., Kast, Fremont E., Rosenzeig, James E., "The Theory and Management of Systems", McGraw - Hill, Inc., New York 1963, Chapter 1, p.14.

2. Heady, E.O., "Economics of Production and Resource Use", Prentice-Hall, Inc., Englewood Cliffs, N.J., 1952, Chapter 16, p.465.

'Co-ordination' involves planning and organising whilst 'supervision' involves control, communication, and implementation. Co-ordination may, however, generally be regarded as synonymous with management. The need for co-ordination grows out of change and inability to predict the future with certainty.[3]

Decision making is implied since a decision is the resolution of alternative conflicting choices. Consequently before any new scientific knowledge or other idea is introduced into the production process it must be evaluated by the manager and a decision made as to its usefulness. It has been argued that in a dynamic agriculture

> "Farm Management Research should be concerned with problems arising from changing technology". [4]

3.2 Farm Management Research Methods

Farm Management Research Methods may be arbitrarily classified into two broad categories [5]:

(i) Methodological research, and

(ii) Empirical research.

Though both categories attempt ultimately to aid the farm manager, they differ in their approach to problem solving

3.2.1 Methodological Research

Methodological research covers a wide range of activities in farm management research. It consists of developing analytical techniques

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3. For one comprehensive discussion on the function of management see Heady, op.cit., Chapter 16.

4. Candler, W.V., "Production Economics and Problems of Animal Production", Proceedings of the New Zealand Society of Animal Production, 22, p.142, 1962.

5. Candler, Wilfred, and Sargent, David, "Dairy Farm Management and Economics Research Needs", Discussion Paper No. 37, Department of Agricultural Economics and Farm Management, Massey University, Appendix A.

to facilitate better decision making, such as the solution of complex problems involving large numbers of variables.

The success of methodological research methods in ultimately aiding the farm manager depend mainly upon the relevance of the problems studied, and the availability of appropriate empirical data when the methodology comes to be applied.

3.2.2 Empirical Research

Empirical research is largely concerned with defining and evaluating the outcome of changes in actual farm practices and management systems. The main areas of empirical farm management research are: 6/

(i) Evaluation of the results from technical experiments.

(ii) Management Research Farms.

(iii) Farm Surveys.

(i) Evaluation of the results from technical experiments. While results from such experiments may be used as data in farm management research, it is often difficult to relate technical research results to the conditions likely to apply to a particular management system. Two evaluation methods are budgetting and simulation.

(ii) Management Research Farms. This area of research is concerned with evaluation of new technology and management systems on a farm scale - the final test of any innovation. In many districts, farmers are experimenting with new techniques and management systems. Research farms attempt the same type of experimentation, but on a more formal basis.

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6. See Cartwright, R.W. op.cit., Chapter 3, for a discussion on the areas of Farm Management Research.

The expense involved in operating such research farms may limit their size. With present research facilities, therefore, such experiments are likely to be 'small farm experiments'.[7] Waimate West Demonstration Farm and Ruakura Dairy No. 2 may be so classified.[8]

(iii) Farm Surveys. Properly conceived, directed and evaluated, farm surveys are a valuable yet relatively inexpensive method of conducting empirical farm management research. This method may be the only source of information at the farm level.

3.3 Farm Surveys and Farm Management Research

A survey has been defined as follows:-

> "a more or less comprehensive enquiry into numerous aspects of a situation ..... As such it may utilise any or all known methods of investigation". [9]

In farm management research, the farm survey is a recognition of the amount of knowledge and factual experience that can be gained on farms. This view point was first and aptly expressed by Warren:-

> "Every farm is an experiment station and every farmer the director thereof". [10]

A farm survey involves the collection and analysis of data from farms and farmers.

Farm surveys may assist farm management research in a number of ways. These include:

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7. For a definitive exposition on the uses of small farms in research, see: Brougham, Ray, Candler, Wilfred, and Wright, Alan, "Small Farm Experiments", Discussion Paper No. 11, Department of Agricultural Economics and Farm Management, Massey University.
8. Waimate West Demonstration Farm; and Ruakura Dairy No. 2 are discussed by: Smith, B.A.J., "Four hundred and Ninety-Five Pounds of Butterfat per Acre on Waimate West Demonstration Farm", New Zealand Journal of Agriculture, 107, 6, December 1963, pp. 543-545; and McMeekan C.P., "Grazing Management", Proceedings of the Eighth International Grassland Congress, 1960, pp. 21-26 respectively.
9. Katona, George, "Psychological Analysis of Economic Behaviour", McGraw-Hill, New York, 1951, pp.3-42.
10. Warren, G.F., and Livermore, K.C., "An Agricultural Survey", Cornell Agricultural Experiment Station Bulletin 295, March 1911, p.385.

(i) exploration of possible fields for research

(ii) as a basis of farm recording studies,

(iii) in evaluating new technology and new management practices (not commonly used on farms), and

(iv) as a basis for studying barriers to increased production.

3.3.1 Motivation for a Farm Survey

A farm management research worker may have one of several reasons for conducting a farm survey. The research worker may have:

(i) a need to have more information about a particular topic - a descriptive or exploratory survey [11],

(ii) a need to determine the likely success of a proposed new management system - a research survey [12],

(iii) an interest in innovating farmers' experiences with new methods and techniques and attempting to evaluate the potential of these methods and techniques for widespread adoption - an early adoption survey [13], or

(iv) a desire to know farmers' reasons for not adopting [14] profitable practices - a non-adoption or behaviourist

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11. New Zealand examples of these are: The New Zealand Meat and Wool Boards' Economic Service Reports (e.g. see Bulletins Nos. 11,12 and 14), The New Zealand Sheep and Beef Cattle Survey, and The New Zealand Romney Survey.

12. For research based on a survey of this nature see: Frampton, A.R., "The Economics of Growing Sugar Beet on Farms in South Otago", Discussion Paper No. 35, Department of Agricultural Economics and Farm Management, Massey University, 1965.

13. For an example of this type of survey see: Graham, J.W., "The Economics of High Rates of Fertiliser on South Taranaki Dairy Farms", Unpublished M.Agr.Sc.Thesis, Massey University, 1964, Chapter 4.

14. Schapper, has used the terminology of 'Enumerative Survey' for the first (descriptive) class of survey. The other three types of survey are described as 'Interview Surveys' by Schapper. See: Schapper, H.P., "Uses and Limitations of Farm Surveys", Review of Marketing and Agricultural Economics, 25, Nos. 1-2,1957, p.54.

survey.[15]

Although all of the above can be correctly described as farm surveys, they involve quite different research procedures with variations in the number of farmers to be visited, and the form of the interview, and the necessary qualifications of the research worker.

3.3.2 Types of Farm Surveys.

3.3.2.1 Descriptive Surveys

These surveys may be of a descriptive, exploratory, or recording nature, being mainly concerned with recording conditions as they exist at the time of the survey. Enumerative surveys collect facts about farms and farmers, and may be used for:

(i) calculating costs of production,

(ii) estimating resource productivity,

(iii) collecting farm production records,

(iv) collecting data to supplement social statistics, and

(v) collecting more information about a particular topic.

Thus it can be seen that enumerative surveys are only appropriate when the motivation is for a descriptive survey giving "more information about a particular topic".[16]

3.3.2.2 Features of Descriptive Surveys

The most significant feature of a descriptive survey is usually the questionnaire. The questionnaire design reflects all phases of the survey method. The orientation of the questionnaire is determined by the survey objectives, while the structure and comprehensiveness of

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15. Cronin's farm survey had this motivation. See: Cronin M.B., "A Study of the Factors Hindering Increased Production on the Rangitaiki Plains and in Galatea", Unpublished M.Agr.Sc. Thesis, Massey University, 1968.

16. See section 3.3.1, (i), above.

the questionnaire are determined by the sample characteristics and the method of analysis.

The data may be collected by the following methods:

(i) personal interview,

(ii) telephone interview, or

(iii) mailed questionnaire.

In each method data is collected only in response to questions contained in the questionnaire. Any useful data and relationships not noted as a result of the questions asked are likely to remain unacknowledged. (Exploratory survey methods may collect such data, but, being exploratory surveys, the objectives are not usually clearly defined and hence there is little possibility of "collecting the 'right' information"[17].

Enumerative surveys may ignore differences in organisation between farms or fail to allow for inter-farm differences due to such factors as climate and financial circumstances, hence "the actual use of these survey results may not be easy".[18]

Enumerative surveys sometimes provide useful aids to farm management research, but due to the inflexibility of using a predetermined questionnaire, they tend to be best suited to the provision of superficial information.

3.3.2.3 Interview Surveys

The farm management research worker may be interested in obtaining subjective non-quantitative data in addition to data of an enumerative nature. Subjective data is necessary in attempting to

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17. Candler, W.V., "The Role of Farm Management Surveys", Discussion Paper No. 39, Department of Agricultural Economics and Farm Management, Massey University, p.5.

18. Schapper, H.P., op.cit., p.57.

understand the goals of the farm manager. If the research worker is interested in the viability of a management system, he is likely to be just as interested in the farmer's reasons and justifications for decisions as in the actions actually taken. Interview surveys may be motivated by any of the objectives mentioned in subsections 3.3.1 (ii) through (iv). In particular, these surveys may be used to study:

(i) farming methods which are achieving (profitable) increases in production,

(ii) new, present or proposed farm practices,

(iii) institutional problems affecting management decisions,

(iv) factors contributing to differences in levels of production between farmers which cannot be attributed to farm size or total resource availability,

(v) attitudes to farm development.

In general, these surveys attempt to collect facts from farmers, not about farmers.

3.3.2.4 Features of Interview Surveys

The most important factor contributing to the success of the interview survey is likely to be the ability of the interviewer;

> "A high degree of interviewing skill and appreciation of interviewing as a scientific procedure are prerequisites for reliable results". 19/

Secondly, the interviewer should have a clear understanding of the issues involved 20/ and a knowledge of the background against which the

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19. Ibid., p.57.

20. Payne, Stanley L., "The Art of Asking Questions", Princeton University Press, Princeton, N.J., 1951, Chapter 14, p.228.

problem is to be viewed; farm interviews that require intensive questioning can best be accomplished by interviewers trained in agriculture [21].

The research worker may collect data through a varied interview pattern. He may:

(i) adhere to a basic questionnaire pattern of interview,

(ii) collect the necessary enumerative data and then allow the interview to range freely, or

(iii) allow the interview to follow an informal pattern discussing topics that most interest the farmer.

The interviewer may start with general free answer questions in which the respondent is free to offer any ideas he may have. The replies to such questions provide the background for more detailed and specific questions. These questions may be of several types. Three of the more frequently used are:

(i) follow-up questions,

(ii) reason-why questions, and

(iii) argument-type questions.

Follow-up questions can be used when further elaboration is required as an aid in understanding an answer. An example is: "In what way?" A reason-why question seeks an explanation, or a reason for a previous answer, and may be asked in the form: "Why do you do that?" An argument-type question usually starts with an introductory statement in the form of an argument. In the free form type of interview, this type of question may state the opposite argument to that of the respondent. The respondent may be induced into refuting this

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21. Schapper, H.P., op.cit., p.55.

argument and justifying his own case or practice.

Such questions not only collect more specific data, but they may also be used to check that the questions have been correctly understood. Thus although in common with the enumerative survey method, the wording of the question is important in determining the accuracy of the answer [22], the interview survey method allows attempts to verify data. The interviewer is likely to have opportunities to evaluate and check data collected in the following ways:

(i) a visual appraisal of the production unit (the farm and the stock),

(ii) examination of farm accounts and records,

(iii) discussion with other persons acquainted with the farm such as accountants and farm advisors, and

(iv) conducting at least part of the interview in the presence of farm staff, i.e., the farmer's wife or an employee. [23]

The type of data collected from an interview survey is thus likely to vary considerably. Processing such data for analysis is likely to present many difficulties. Invariably the results and conclusions will reflect in part the research worker's interpretation of the data collected.

The research worker himself then is an important factor in determining the usefulness of this research method.

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22. Payne, Stanley L., op.cit., pp.3-237.

23. The author found that interviews conducted at least partly in the presence of a third person tended to make the farmer more careful in description and in giving farm data. The third person also helped the farmer to recollect events.

3.3.3 Summary

Whilst ultimately the research worker will determine the respective values of descriptive and interview surveys as research methods, the descriptive survey is always restricted in depth and completeness by the limitations imposed by the questionnaire. On the other hand, the interview survey is restricted in sample size and possibly in accuracy and the success of the survey as a farm management research method is largely determined by the skill and thoroughness of the interviewer.

3.4 A Survey of Labour Saving Techniques [24]

The original objective of this survey was to find and evaluate labour saving devices currently in use on North Island sheep farms. [25] The survey was exploratory in the sense that there was little published information on which any hypothesis could be formulated, other than the observation that labour efficiency varied greatly among farms. The survey was partly descriptive.

An attempt was made to make a "census" of those North Island sheep farmers with a novel approach to labour efficiency. In attempting to carry out this "census" the author travelled 6,500 miles and visited 52 farms over a period of 3 months.

A free form type of interview was used, with the research worker attempting to obtain a thorough understanding of the individual farm organisation and management, as well as some of the attitudes of

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24. For a summary of the details of the survey see Appendix B.

25. As a fuller understanding of the problem of obtaining efficient labour utilisation on sheep farms was obtained in the course of the survey, the objectives were modified to include a study and evaluation of management systems with a low permanent labour input.

the farmer himself. A full day was allocated to each interview.

The survey evolved into three phases as it progressed. [26] This occurred because the author had to decide what aspects of labour saving were important and could be usefully studied before the survey proper could begin. The three phases were:

(i) an exploratory phase,

(ii) a revised phase,

(iii) a phase involving revisiting farmers and collection of financial data.

3.4.1 Exploratory Survey.

In the exploratory survey six farms [27] were visited to give the interviewer some idea of the style of interview required, and to gain a first impression of the types of labour saving ideas that would appear.

3.4.2 Revised Farm Survey

Following this initial investigation, the author broadened the scope of the survey to include the location and evaluation of management systems on high ewe per man farms as well as studying individual labour saving techniques. The reason for this modification was that the author became convinced that, although very helpful, labour saving techniques *per se* were not of as much significance in managing high ewe per man farms as the management system, the importance of which was graphically illustrated by the second farm visited. On this farm one man managed 3000 ewes, 4000 dry sheep, and 700 cattle. This was

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26. This has been a feature of many interview farm surveys to date, according to Schapper, H.P., *op. cit.*, p.55.

27. Selected with the assistance of Government departments and farmers' agencies in Palmerston North.

evidently not the result of labour saving techniques being applied within a conventional management system, rather it represented a complete change in the approach to farm management.

3.4.3 Revisiting and Collection of Financial Data

The final phase of the survey involved obtaining follow up information on farms which had already been visited. Ten farms were revisited for one or more of the following reasons:

(i) to inspect the management system at a different time of the year,

(ii) to collect additional physical information,

(iii) to collect financial information,

(iv) to check the author's previous data and impressions.

Financial data was collected for a comparative financial analysis of five separate management systems. In three cases, this necessitated a visit to the farmer's accountant, and a return visit to the farmer to identify the nature of some expenditure items.[28]

In one of the other two cases, the accountant supplied financial data by mail, and in the other, the farmer supplied the financial data himself.

3.5 The Survey Method

3.5.1 Location and Selection of Farms [29]

Requests for information about labour saving techniques or management systems were sent to 101 advisory officers, veterinarians

28. Notably wages, where the accountant could provide the amount paid and the name of the employee, but not the nature of the work.

29. Details of the number and occupation of the people who received requests for information are contained in Appendix B, Table 2.

and other people connected with farms. In particular, requests were sent to 35 Farm Advisory Officers, covering every district of the Department of Agriculture in the North Island, as well as to 29 Farm Improvement Club Advisors distributed over most of the North Island. The 52 replies received named 67 instances of 38 labour saving techniques currently practised and 43 farms as carrying 2000 or more ewes per man. 30/

The selection of labour saving techniques and high ewes per man farms to be visited was based on several criteria.

Labour saving techniques were selected according to their unusualness, possibilities for more widespread use, the type of farming system they were being used in, and the travelling distance required to inspect them.

For high ewes per man farms, the author decided to study farms as well dispersed as practicable throughout the North Island - particularly the main sheep farming areas. Hence the main criteria used in selecting these farms were:

(i) the number of ewes per man,

(ii) the locality of the farm,

(iii) the number of cattle and dry sheep per man, and

(iv) the intensity of production per acre (ewe equivalents per acre). 31/

Other criteria used were the type of management system and whether the author considered it was unusual compared with most North

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30. As indicated in Appendix 3, Table 3, only 26 farmers were in fact recommended on the basis of managing more than 2000 ewes per man. Also 17 lower figures were advanced, probably because they were close to 2000 ewes per man, or high for the district.

31. The term "ewe equivalent" is defined in the Glossary.

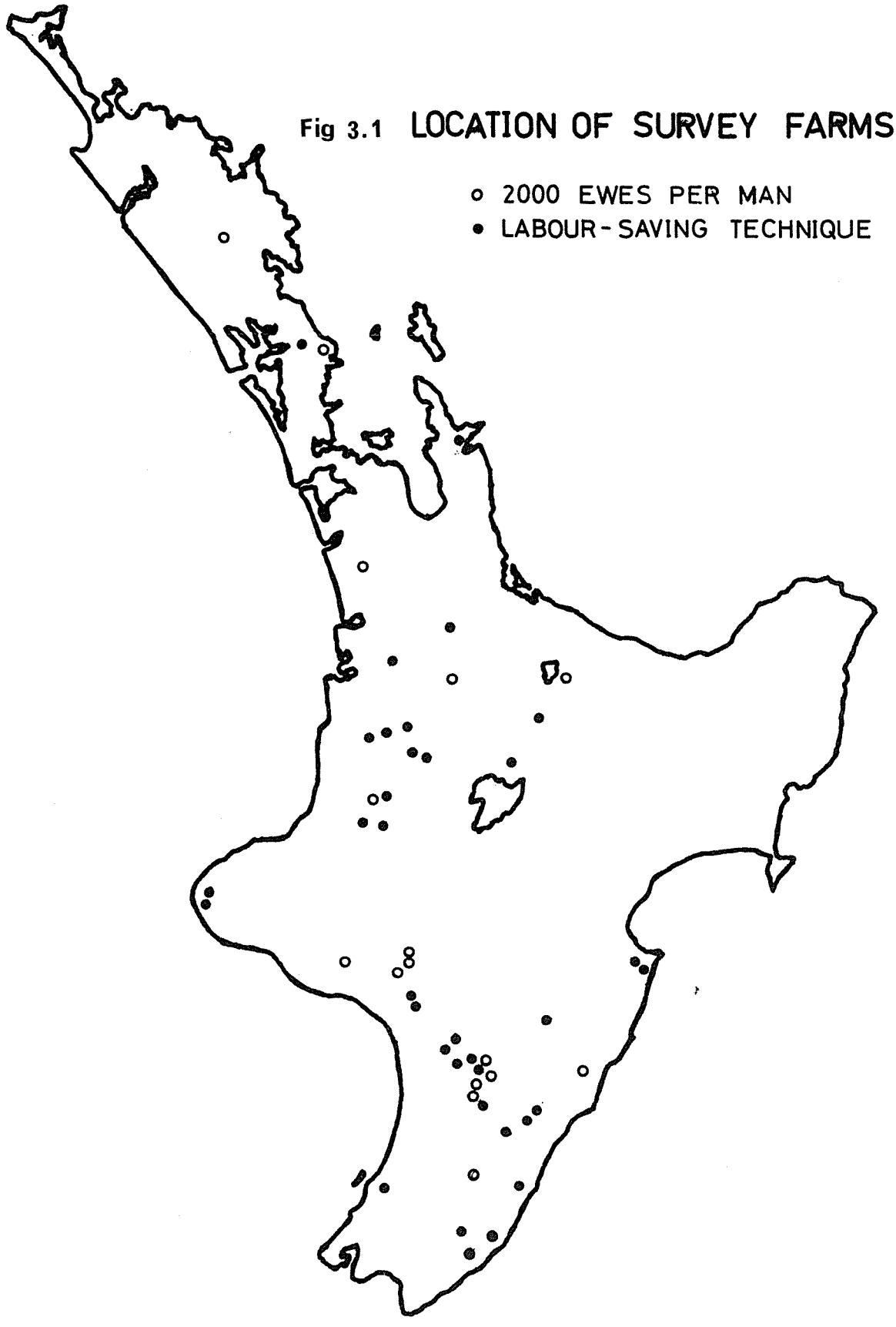
Fig 3.1 LOCATION OF SURVEY FARMS
o 2000 EWES PER MAN
• LABOUR-SAVING TECHNIQUE

Island sheep farm management systems. This flexible approach to the selection of farms to be visited, allowed the author to study the management methods used by high ewes per man farmers over a range of environment and management systems.

3.5.2 Interviewing Procedure

A letter was sent to each selected farmer two to four weeks before an intended visit. One to three days prior to the intended visit each farmer was contacted by telephone, and a day and time was arranged for the interview. Interviews followed a free form pattern.

When evaluating labour saving techniques, the first hour was spent in general discussion concerning the technique. At this stage if it was still of interest and not common in North Island sheep farming, the farmer was questioned about it in more detail and where possible he was asked to provide physical and financial records.

If the technique was not considered useful by the author, he made cursory notes recording the visit, and then either discussed with the farmer his management methods or other labour saving practices used. 32/ The author was keen to avoid the offence which might have resulted from abrupt termination of interviews where the labour saving technique was found to be unsuitable for inclusion in the survey. The interview usually lasted several hours.

The visits to high ewe per man farms were of longer duration. The initial stages of the interview were spent establishing

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32. Farmers were usually exceedingly co-operative, volunteering anything they thought might be of interest.

the eligibility of the selection. [33] An inspection of the farm, lasting one to four hours, followed. During this inspection the author and farmer discussed the farm. A basic check list [34] was completed during the interview and the farmer's description of his management system during the year under study (1965/66) was recorded.

3.6 Reflections on the Farm Survey

During the farm survey, the author was confronted with the difficulties inherent in the interview survey as a method of farm management research. Several observations are discussed below.

3.6.1 Data Collection

The author found that the interview survey required much thought by the research worker during the interview. This is a characteristic feature of "free form" interview surveys. However, since a large part of each interview took place out on each farm, the working conditions differed markedly from the physically undemanding conditions of offices or lecture rooms. The author found that it was more difficult to be objective while on farms.

Secondly, data was difficult to collect. It was observed that farms are not designed or operated to provide research information; data may not be available because of lack of farm records, or because the farmer is not accustomed to thinking in the same terms as the research worker. Farm data may also be aggregated (e.g. combining several farm operations to economise on farm travel), or erroneous (e.g. stock losses, where the farmer rarely has accurate figures, and makes a guess).

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33. Four of these farms visited were ineligible due to permanent labour being under-estimated by Farm Advisory Officers.

34. See Appendix B, Table 6.

Consequently the research worker has to collect what data is available to him, and in so doing he may have to compromise on its intended relevance and accuracy in order to have useable data.

3.6.2 Evaluation

In the author's experience, the first impression of a technique or management system was frequently accurate. However, in an unconstrained problem objective evaluation often proved difficult.

The author had to attempt to go beyond the simple superficial judgement that for example, a particular farmer was "a good manager". Rather, the author had to attempt to identify what the farmer had done (or had not done) which resulted in the subjective judgement by the author that the farmer was "a good manager". In the author's experience it is much easier to observe that a farmer is a good (or poor) manager, than to identify the reasoning which leads to this judgment.

3.7 Summary

Farm surveys are a legitimate farm management research method. Using them, research workers have a unique opportunity to study farm problems as they are. While descriptive surveys are limited in scope, interview surveys allow analysis in depth - the success of this form of interview is very dependent on the interviewer's skill.

Various problems are likely to be encountered by the research worker in reconciling academic training and theoretical concepts with the physical realities of farm situations.

CHAPTER 4

LABOUR UTILISATION AND MANAGEMENT SYSTEMS.

4.1 Introduction

The purpose of this chapter is to lay a "theoretical framework" to which the empirical results of the thesis can be related. The thesis is fundamentally concerned with the Permanent Labour/ewe factor/product relationship. This relationship is examined in the first main section of the chapter. The second section discusses some subsidary aspects of the study of labour utilisation and management systems.

4.2 Factor/Product Relationship

The permanent labour/ewe factor/product relationship may be examined theoretically in a simple manner. In the theory of production economics [1], it is possible to:

(i) hold "all other factors fixed",

(ii) vary the amount of labour continuously, and

(iii) get a known and continuous response in terms of ewe equivalents.

In actual situations, these assumptions do not hold. In particular, on sheep farms,

(i) it is frequently impractical to vary one factor alone,

(ii) it frequently is not possible to vary the amount of a factor used continuously - an example being the use of

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1. For a standard production economics text, readers are referred to: Heady, E.O., "Economics of Agricultural Production and Resource Use", Prentice - Hall, Englewood Cliffs, N.J., 1964.

permanent labour, and

(iii) the response function for alternative levels of factor use is not known.

Thus the "real world" factor product relationships can be represented conceptually at least as:

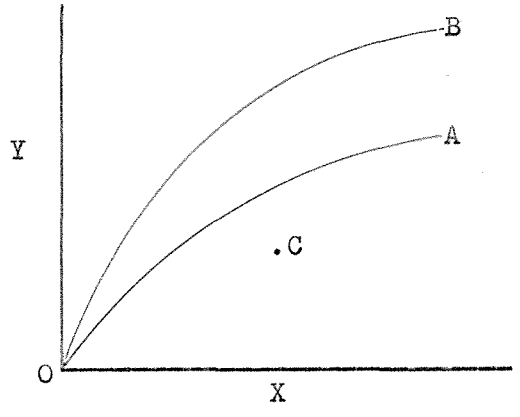

Fig. 4.1 Factor/Product Relationships.

In Fig. 4.1, X is the variable factor labour (with "all other factors fixed"), and Y is the product. Actual production may be taking place at C, even though the (unknown) production function (with the given management system/level of fixed factors) is OA.

Thus in the "real world" most farmers produce below the production function to which most theoretical analysis refers. One objective of the survey was to discover ways of moving from C (i.e., accepted farming techniques) towards OA (i.e., by using efficient production methods).

The theory of production economics recognises that by a major change in the level of other factors used (i.e., tracking, fencing, scrub-clearing, and other farm improvements), it may be possible to move from production function OA to a higher production function such as OB. In the real world there may be a much more significant

possibility of moving from OA to OB, with some relatively minor changes in the levels of other factors employed. In addition, through a major change in the management system (substituting Perendale for Romney ewes and dropping the use of cattle), it may be possible to double the number of ewes per man with little change in the total investment in livestock.

In practice, it is almost impossible to draw a rigorous distinction between the above types of adjustment in the real world. Any move from C towards OA will almost always involve some change in the level of "other factors employed". Similarly, any major change in the level of other factors employed usually implies some change in the management system; and a major change in the management system usually involves some change in the level of other factors employed.

Although a rigorous distinction cannot be drawn between the three types of change in Fig. 4.1, it is possible to distinguish the general effects of the different types of change in the factor/product relationship.

This thesis has not been concerned to study the possibility of major changes in the total amount of other factors used, so as to achieve increased labour productivity. Rather the study has been concerned with:

(i) Changes in production techniques (which can be utilised without a major change in the management system) which would allow farmers to move from C towards OA, and

(ii) Changes in the management system (which do not involve a major change in the amount of other factors used) and imply shifting the production function from OA to OB.

4.3 Subsidary Aspects Concerning Labour Utilisation and Management Systems.

4.3.1 Desirable Features of a Management System.

The profitability or success of any farm management system will depend upon many features. The most important features are likely to include reliability, simplicity, flexibility, and mobility.

(i) Reliability - High productivity management systems are likely to have little excess capacity in labour, land, or equipment. In such situations reliability is an important feature in firm operations. Some examples of reliability are, fences that are stock proof, allowing control of stock condition and pasture growth, sheep dogs that perform adequately under all working conditions, and farm transport that allows farm transport without mechanical and operational difficulties.

(ii) Simplicity - A simple management system is likely to be understood better and learnt faster. In addition "there is usually a direct positive correlation between simplicity and reliability. In other words there are fewer things to go wrong". 2/

On sheep farms simplicity may be incorporated into the management system through specialisation and decreasing the number of farming operations. Buying-in replacement ewes rather than rearing them will simplify on-farm management as well as decreasing the number of husbandry operations. "All grass farming" can eliminate

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2. Johnson, Richard A., Kast, Fremont E., Rosenzeig, James E., op.cit. p.105.

haymaking and cropping operations.

(iii) Flexibility - to maximise profits, a management system should be capable of being modified to adapt to changed price ratios, new technology or unseasonal conditions. Flexibility and simplicity may be difficult to incorporate together in a management system.

Flexibility may be achieved through diversification of enterprises, though this will limit the simplicity of a system, or by constructing management strategies that allow alternative actions. Fertiliser applications may be delayed until after the year's income is accurately known. Credit arrangements with a bank permit buying and selling stock at more profitable times.

(iv) Mobility - one of the most desirable features of a sheep farm management system is mobility. The operation of a sheep farm frequently involves large areas and always considerable travelling by labour and stock. Profitable utilisation of labour is likely to involve considerable travelling by farm vehicle.

The above discussion provides a list of the factors contributing to the success of a management system. The measurement of reliability, simplicity, flexibility and mobility in any given empirical situation is difficult. As pointed out in the discussion of survey procedure, it is easier to recognise that a farmer has a good management system, than to identify why his system is good.

4.2.2 Substitutes for Permanent Labour

Within a management system, substitutes for permanent labour can be used for given tasks. Three types of substitution are possible; capital, other types of labour, and better utilisation of labour.

(i) Capital - The capital used to substitute for permanent labour can enable the same number of ewes to be handled with less labour, or additional ewes to be handled with the same labour. In both cases, the capital is likely to be used for additional sheep yards, fencing, farm transport, and equipment for husbandry operations. Substitution is possible for many operations including, mustering, droving, drafting, drenching, dipping and dagging.

(ii) Other types of labour - Casual and contract labour can both be used for certain farm operations in place of permanent labour. The most important feature concerning casual labour is that no fixed costs are involved for weekly wages and accommodation. However this type of labour may have an uncertain supply, be frequently unskilled and restricted in the number of operations that can be performed without supervision, and may lack familiarity with the farm layout and facilities.

The use of contract labour is restricted to relatively few operations. In addition the availability at required times of the year may be uncertain. Speed and job quality are advantages that it is possible to obtain with contract labour arrangements.

Where the employment of casual and contract labour enables the management system to handle additional ewes, increasing the number of ewes handled per permanent labour unit, then substitution has increased

the productivity of permanent labour.

(iii) Better utilisation of labour - Because of the seasonal nature of sheep farm operations outlined earlier [3], better utilisation can substitute for permanent labour. The farm manager requires organising ability to ensure that planned labour inputs are available when required. He must have a methodical approach to labour hiring by:

(i) preparation of work to be done before labour is hired,

(ii) clearly stating the nature and extent of each operation, and

(iii) co-ordinating the operations so that labour services hired spend most of the time working.

The role of the manager in labour utilisation is concerned with having a thorough understanding of the management system so that planning and operational scheduling may be accurate. However with the uncontrollable variations, particularly in weather conditions, the weekly and daily co-ordination of hired labour services is likely to be the most important factor concerning labour utilisation within the particular management system.

4.3.3 Motivation of Labour

Many farm operations are performed with limited supervision. In these operations, the quality of the work accomplished cannot be immediately checked by the farm manager and the quality of the job done is likely to depend upon the efforts of labour.

Motivation of labour is likely to have a large effect on the quality of work accomplished. Attributes of labour; personal effort, interest, initiative and the sense of responsibility displayed, are

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3. See Section 2.2.5.

closely related to motivation.

These attributes become important in operations such as grass sowing, dipping and castration where results cannot be assessed immediately and mistakes may not be apparent for some time afterwards, when remedial action is too late or can only be done at high cost.

In planning labour utilisation, the farm manager must be able to recognise the goals and sense of values of workers. As well as a fair system of payment, the conditions of employment may require provision for opportunities for workers to achieve status, and job security as well as rewards for the use of initiative and for risk taking.

4.3.4 Peaks in Demand for Permanent Labour

The characteristic peak permanent labour requirements during the year under conventional management systems are illustrated in Fig. 4.2. The labour profile refers to jobs which have to be done within the nominated time period.

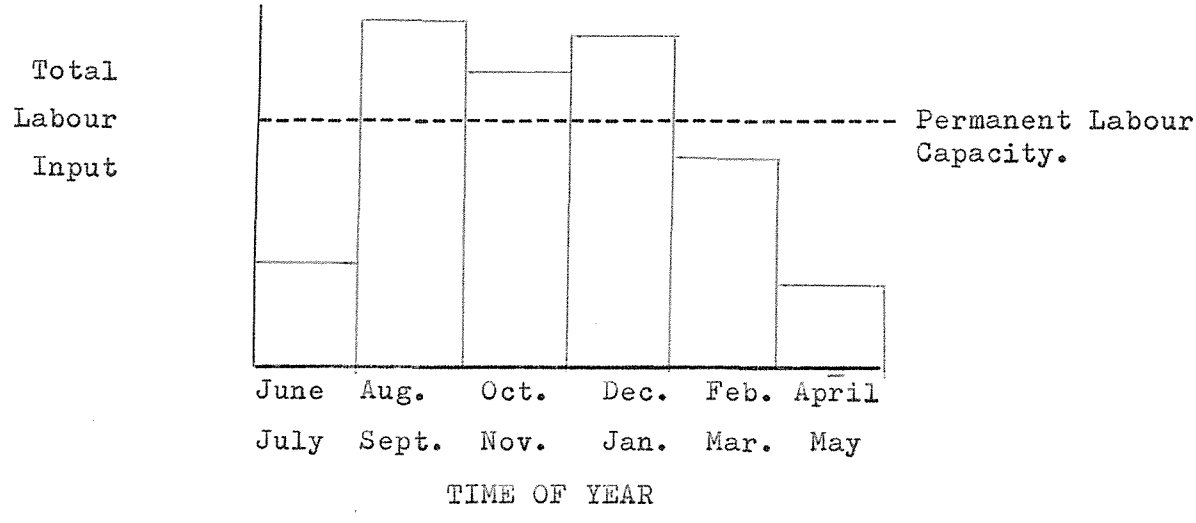

Fig. 4.2 Labour Profile for a North Island Sheep Farm.

Changes in management systems should attempt to lower these peaks in terms of permanent labour/ewe. This may be achieved by

substitution for permanent labour (see section 4.2.2) and by the adoption of different production techniques.

4.3.5 Under-employment of Labour

Measurement of labour output may be difficult. Some operations are relatively standardised: fencing, shearing, top-dressing, and cultivation. Because the output can be measured easily, specialised contract labour is usually more profitably employed. Most farm operations, however, have a more complicated and varying relationship between input and output.

Difficulty of measurement contributes to situations where farm labour is under-employed. The farm manager's contribution in carrying out "supervisory" tasks is difficult to ascertain.

These tasks range from going to town "to sell" sheep in the saleyards [4], "supervising" aerial top dressing operations and "keeping an eye" on shearing. At shearing time in particular, farmers may cease other farm operations even if this is not necessary.

Because of the difficulty in measuring the work to be done, and because of the peculiarities of the labour involved, a task may ostensibly seem to be efficiently accomplished. In fact the job may be a prime example of Parkinson's Law:

> "Work expands so as to fit the time available for its completion' .... Thus an elderly lady of leisure can spend the entire day in writing to her neice at

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4. Even though transport costs preclude taking stock home and resubmitting them at a later sale.

> Bognor Regis. An hour will be spent in finding the postcard, another in hunting for the spectacles, half an hour in a search for the address, and an hour and a quarter in composition, and twenty minutes in deciding whether or not to take an umbrella when going to the mailbox in the next street. The total effort that would occupy a busy man for three minutes all told may in this fashion leave another person prostrate after a day of doubt, anxiety and toil". 5/

Parkinson's Law is quite applicable to sheep farming, with its uneven labour demands, and particularly under poor management, whether on an owner-operator farm or larger farm. Because there is little else to do, the farm worker may spend the entire day sorting sheep, a job which could be done in half a day. In doing this he would not plan the operation, walk to get the sheep, work at half pace, roll twice as many cigarettes, and be just as tired at the end of the day.

4.4 Summary

The permanent labour/ewe factor/product relationship can be examined theoretically in a simple manner. However in real farm situations it is only possible to distinguish the general effects of the different types of change in the factor/product relationship.

The farm manager should be primarily concerned with whether it is possible to get more output from given permanent labour. This is not answered per se by knowledge of the present output of permanent labour.

Two ways of increasing the output of permanent labour form the basis of this thesis. The first is changes in production techniques (with a given management system and level of fixed factors) which would enable farm managers to move closer to the production function. The

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5. Parkinson, C. Northcote, "Parkinson's Law, or the Pursuit of Progress", Houghton Mifflin, Boston, 1957, p.2.

second way is through changes in the management system, without major changes in the level of other factors, which would allow shifting to a higher production function.

There are several important features that need to be considered when designing and constructing a management system. Several types of labour may be used on farms, but there are special characteristics associated with the employment and use of labour which should be considered by the farm manager.

CHAPTER 5

LABOUR SAVING TECHNIQUES.

5.1 Introduction

This chapter discusses and evaluates some of the techniques encountered during the farm survey. The techniques which are included in the chapter are those considered by the author as being of most use in saving labour at "peak" time periods.

5.1.1 Theoretical Orientation

The chapter is primarily concerned with movements from C to OA (see Fig. 4.1). These are movements towards the surface of the feasible set of production possibilities without shifting to an entirely new production function.

There is no clear analytical distinction between the topics in Chapters 5 and 6. However there are important conceptual distinctions. These distinctions are discussed in Chapter 4.

5.1.2 Scope of the Chapter

Three major topics make up this chapter:

Management,

Mobility, and

Labour efficiency, or

deciding what tasks to do, minimising the time getting ready to do them, and minimising the time actually doing them.

This may not be a really satisfactory analytical classification of topics. For example "concentrated lambing" (c.f. section 5.4.3)

reduces both the time to get, and to do the job. However the classification should give some element of coherence to the discussion.

In addition there is substantial interaction between "labour saving techniques". Thus a central race may be justified with Romneys and a single set of yards, but not justified if the farmer opts for Perendales and/or decentralised yards. (The selection of labour saving techniques so that they fit together into a complementary system is, of course, the subject matter of Chapter 6). Here it is noted that the gains from a change of breed alone or a central race alone may be quite different from the gains from a central race and change of breed.

Apart from the "labour saving management aids", little of Section 5.2, Management, is based on actual survey farms, but rather is a listing of practices necessary to efficient farm planning. This review is included to provide a rounded picture of available techniques of saving labour.

The work simplification approach [1] has not been used in evaluating techniques. The work simplification approach would have involved the author in a very detailed study of the movements involved in particular farm jobs.

These movements vary depending upon the equipment available and may vary with size, sex and wooliness of sheep being handled. Thus a work simplification approach would have involved the author in a very much closer study of far fewer farm tasks than were actually considered

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1. Readers interested in the work simplification approach may read: Branston, B. "Time and Motion on the Farm", Faber and Faber, London, 1953; and, in an industrial context: Mundel, M.E., "Motion and Time Study", Prentice-Hall Inc., Englewood Cliffs, N.J., 3rd Edition, 1960.

by the survey method used.

5.1.3 Pattern of Discussion

Throughout the chapter, the discussion of various labour saving techniques follows the pattern of a general introduction, followed by discussion of the particular technique. The discussion and evaluation of each technique follows the format:

(i) brief review of the standard practice and purpose of the operation,

(ii) discussion of exceptional practices observed on survey farms,

(iii) an attempt, synthetically, to evaluate numerically the likely cost and/or time saving of the practice, and an evaluation of the technique.

5.2 Management

5.2.1 Introduction

Management is likely to be the main factor in determining profitable labour utilisation. In this section a management approach to labour utilisation is suggested. The section consists of two parts; the first considers farm planning and organisation as a management approach, while the second part contains some labour saving aids to management. These aids consist of farm maps, blackboards, and mirrors, as well as the use of sheep dogs, complete musters, and sheep proof fencing. The topics which make up part one of the section review are common sense methods to assist good labour scheduling. The aids contained in part two are ideas collected during the farm survey.

5.2.2 A Labour Saving Management Approach.

5.2.2.1 Planning

The first step in profitable labour utilisation is farm planning. The manager must set some immediate and long term goals. The objectives may be expressed in various ways (such as higher stock numbers, or post tax profit), but they should be checked for physical and financial feasibility by budgetting, if necessary by a farm extension officer or accountant.

While labour problems concerning discrete inputs of extra permanent men are best solved in the context of a longer term programme, problems of determining and meeting labour requirements for individual operations occur within each year. Therefore the manager must also set yearly objectives.

Scheduling Farm Operations

The second step in labour utilisation is to determine the farm labour requirements for the year's operations. Farm operations and development activities for the year should be listed. The manager should estimate the approximate labour and material requirements for each operation. A schedule of operations may then be drawn up with the important farm operations having prior call on the available labour.

Budgetting

A tentative farm budget should be constructed from the farm operational plan. This budget should be compared with the farm objectives. The budget may show that adjustments are required in both the farm operational plan and the farm objectives.

Following the necessary alterations, the year's operations

should be budgetted in detail. To produce a detailed budget, the manager should estimate every item of income and expenditure throughout the year.

A monthly cash flow budget [2] may then be constructed, showing monthly cash expenditure, cash income, and the net cash bank balance. This cash flow budget can be used as an important management tool in controlling and supervising the year's operations.

5.2.2.2 Organisation

Organising is a "follow up" activity. In labour utilisation it consists of ensuring that labour is arranged to meet all operational requirements. For North Island sheep farm managers, labour organisation consists of two parts:

(i) detailing labour requirements for each operation, and

(ii) arranging a labour supply from the available permanent, casual and contract sources.

(i) Detailing Farm Labour Requirements

Using the schedule of farm operations, the farm manager can then construct a "labour demand profile" which shows:

(i) the operations for which labour is required,

(ii) the time of year when labour is required, and

(iii) the type and amount of labour required for each operation.

(ii) Arranging a Labour Supply.

The farm manager should start by making an inventory of the casual and contract labour known to be available, and the times of the year when it is available. From this he may construct a "labour supply

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2. For an example of a monthly cash flow budget, readers are referred to: Fountaine, H.R., "Accounting as an Aid to Efficient Agriculture" Fifth Conference of Asian and Pacific Accountants, New Zealand Society of Accountants, Wellington, 1968, Statement "D".

profile". He may then compare the labour demand profile with the labour supply profile.

Should insufficient labour be known to be available then formal arrangements could be entered into with several "labour organisers" to obtain labour for specific farm operations. The labour organisers should be people hired by the farm manager, who are able to recruit labour from nearby villages and towns, as well as from Universities and other "labour pools".

These labour organisers should be people known personally by the farm manager, or suggested to him, as being reliable, resourceful, and able to recruit suitable labour for farm operations when required.

Hiring reliable labour organisers is likely to provide the farm manager with several advantages. First, if a labour organiser is the only person familiar with the farm operations and the labour available, then he is the best qualified person to choose the most suitable labour. Secondly, personal recruiting is likely to be more reliable than advertising in newspapers. Thirdly, by delegating what can be a skilled management task to people known to the farm manager, he can have reasonable confidence in the type of selections they will make.

5.2.2.3 Evaluation of the Management Approach

The suggested management approach involves considerable mental work, planning, and conferring with an accountant and a farm extension officer. In addition, the planning and budgetting done is unlikely to be based on accurate estimation and may require revising several times during the year.

The advantage of the management approach is that it forces

the farm manager to consider all aspects of the year's farming operations in advance. In order to plan and budget, the farm manager must define the management problems, consider the alternative courses of action, and take decisions related to the specified farm objectives.

A formal management approach is thus likely to allow the farm manager to consider labour utilisation as part of the overall management problem, rather than as a specific labour problem.

5.2.3 Labour Saving Management Aids

5.2.3.1 Map Marking

A large aerial photograph of the farm can be framed to serve as a farm map. To do this a sheet of heavy thickness celluloid should cover the map. A crayon may then be used to mark on the celluloid, without marking the map and with great accuracy, various places on the farm. The crayon marks can be erased with a damp cloth. Using this aid, it is possible for a farmer to mark accurately the position of various farm jobs to be done. These may include fence repairs, sheep to be buried and patches of scrub to be cut or burnt. The advantage of an aerial photograph over a drawn farm map is that a recent photograph gives details of the complete farm. The celluloid covering enables the photograph to be used indefinitely.

5.2.3.2 Blackboard

A blackboard is a means of recording a lot of data, and can be a useful place to put instructions on for employees and casual labour. A blackboard has the advantage that mistakes and unwanted information may be quickly and easily rubbed off. The blackboard may be most usefully sited in a frequented place such as the sheep yards or wool shed.

5.2.3.3 The Use of Mirrors in Wool Sheds

The author noted the use of a mirror to assist in shedding up sheep. Farmer 44 had mounted a 3 foot by two foot 0.5 inch glass mirror at the end of the race pen behind the shearers' catching pens in the wool shed.

He maintained that it was of considerable benefit in penning up sheep. The sheep were encouraged to move by their mirror images, which gave the impression of other sheep in the pen or race.

5.2.3.4 The Use of Sheep Dogs 3/

Sheep dogs can be used to assist in carrying out almost every stock operation. The usefulness of individual dogs is likely to vary greatly. A poorly trained and poorly controlled dog may easily hinder operations, while a well trained and directed dog can enable time to be saved, on all operations where a dog is required. On some operations a dog may substitute for a labour unit.

The operations where a well performed dog enables time to be saved are mustering, droving and yarding. Such a dog may also be able to catch and hold ewes or lambs. This can make lambing shepherding markedly quicker. The operations where a dog may be able to clearly substitute for a labour unit include working with sheep in the sheep yards, penning up and drafting sheep, and droving mobs of sheep without direction from a shepherd.

The cost of a well trained dog may range from $100 to $300. Together with an annual cost of less than $50 for housing and feeding, the time taken for many stock operations may be decreased. Also less

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3. A useful reference concerning training and handling sheep dogs is: Broad, E.G., "Rearing and Training a Sheep Dog", New Zealand Department of Agriculture, Bulletin No. 308, 1960.

additional casual or permanent labour may be required for stock operations.

5.2.3.5 Complete Musters

During the survey, two farmers told the author that one way they saved time during stock operations was to leave a few sheep behind during mustering. Farmer 20, who managed 1100 effective acres of moderate to steep hill country, said that mustering a paddock and leaving a few stray sheep behind sometimes saved over an hour.

Farmer 11, who managed 1100 acres of flat to rolling country, left straggler ewes behind when shifting mobs during rotational grazing. He maintained that on easy country such as his, and under high stocking rates the sheep became accustomed to being shifted between paddocks. The stragglers usually found their way through to the next paddock of the gate was left open, while the rest of the sheep remained in the paddock with better feed. The farmer shut the gate between the "old" and "new" paddocks one or two days after shifting the mob.

5.3 Mobility

5.3.1 Introduction

This section on mobility is concerned with the time it takes for either men or sheep to get ready to carry out (and finish up after) husbandry operations. The aspects of mobility discussed in this section are: the use of Perendale sheep, access races, additional sheep yards, grouping ewes into mobs at lambing time, second shearing, farm tracking, and farm transport.

There are at least three major strategies concerning mobility:

(i) how fast the sheep move (breed, second shearing),

(ii) how far the sheep move (additional sheep yards), and

(iii) how far and fast the farm labour moves (method of transportation, farm tracks).

5.3.2 Use of the Perendale Sheep Breed

5.3.2.1 Discussion

The Perendale sheep has been developed from Romney and Cheviot parent stock. Careful selection from the half-bred flock has stabilised new breed characteristics. The objectives in developing the Perendale breed were to breed sheep with a 20 per cent to 30 per cent higher lambing percentage than the Romney under hard hill country conditions, with a fleece of reasonable weight and quality, with a low mortality rate, and with a body type that would

> "give adequate lamb production, hardiness and ability to move easily and forage well under hill conditions". 4/

An experimental trial at Massey University indicated that these objectives were feasible. Annual recordings from 1944 to 1950 compared the performance of the half-bred and the Romney showed that the half-bred had a lower death rate, a higher lambing percentage, better milk yield, stronger store lambs and better grown hoggets and two-tooths. 5/ It was noted however, that Romneys produced a greater weight and value of wool during the trial. Although the emphasis of the trial was in comparing production and gross financial returns of the half-bred and the Romney, the lower labour requirements of the half-bred were noted.

> "Mr Ballard and the shepherds at Tuapaka are unanimous in stating that the half-breds require far less attention and are much easier to work than the Romneys. In the main, they are more or less able to look after themselves." 6/

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4. Rae, A.L., "The Establishment of the Cheviot X Romney Half-bred as a Breed", Sheep farming Annual, Massey University, 1957, p.116.
5. Peren, G.S., Hewitt, W.R.R., Ballard, H.V., Phillips, T.O., "Cheviot Half-bred versus Romney Trials on Poor Hill Country", Sheepfarming Annual, Massey University, 1951, p.137.
6. Peren, G.S. Hewitt, W.R.R., Ballard, H.V., Phillips, T.O., op.cit.,p.135.

The lower labour input required for the half-bred has been confirmed by farmers managing flocks under commercial farming conditions [7]

5.3.2.2 Farm Survey Data

The role of Perendales in saving labour was studied on four farms. On two of these farms Perendales were run as a supplementary flock to the main Romney flock, being grazed on less developed and less manageable country. The other two farms had complete Perendale flocks, both farmers having changed over from Romney flocks between 1961 and 1966.

5.3.2.2.1 Secondary Flocks

TABLE 5.1 SECONDARY FLOCKS - SUMMARY OF FARM PHYSICAL FEATURES

	Farm No. 29	Farm No. 46
Effective Acreage [8]	850	1800
Topography [8]	Moderate	Rolling to Steep
Sheep Wintered 1966	3500	8500
Ewes - Romney	1300	4600
Perendale	1400	1400
Permanent Labour Units	1	3.5
Sheep Policy	Breeding and Fat Lambs	Breeding and Store Lambs

On both farms the Perendale ewe flocks were grazed on particular areas of the farm. On Farm 29, Perendale ewes were grazed on a 314 acre block of land that was 5.5 miles away by road from the rest of the farm. The block was purchased in 1965.

7. For example see: Poulton, E., and Poulton, M., "Profitable Farming of the Cheviot X Romney Half-breds on the Waewaepa Range Kumeroa District", pp. 87-101; and Bremner, C.C., "Cheviot X Romney Sheep on the Matemateonga Range", pp. 77-86. Sheepfarming Annual, Massey University, 1957.
8. Definitions of Effective Acreage and the classifications of Topography are given in the Glossary.

On Farm 46, Perendale ewes were grazed on a 300 acre block of steep hill country which had reverted to bracken fern. This block adjoined the rest of the farm, but had previously been grazed by Romney wethers.

For both farmers the reasons for farming Perendales were to increase the lambing percentage, to reduce shepherding labour throughout the year and particularly at lambing time, and because both farmers thought that Perendale sheep would thrive better on the respective types of country.

In both cases the Perendale ewes were purchased in one consignment and increased the total farm ewe numbers. In neither case did Perendale ewes substitute for Romney ewes. On Farm 29 the Perendale ewes were stocked on newly purchased land, while on Farm 46 Perendale ewes were substituted for Romney wethers. However on each farm the existing farm permanent labour force was able to manage the increased total ewe numbers.

Case Study - Farm 46

In February 1966 the farmer purchased 1400 mixed age poor quality Perendale ewes. They were mated and set stocked on 300 acres of steep hill country. Based on his experience with Romney wethers on the block, the farmer would have only stocked it with 700 Romney ewes. Because the Perendales were cheap and of poor quality, and partly as an experiment, they were purposely stocked at a high rate.

The actual production of the Perendale ewes and the farmer's estimate of the production of Romney ewes is given in Table 5.2

TABLE 5.2 COMPARISON OF PRODUCTION 1966-1967

	Romney (Estimated)	Perendale (Actual)
Ewes Wintered	700	1400
Ewe Equivalent Per Acre	2.3	4.6
Ewe Losses	70	70
Lambing Percentage	80	93
Wool per Ewe - lbs	8	5.5

Farmer 46 said that the Perendale ewes were faster and easier to muster and drove compared with Romneys. Moving Perendales around the sheep yards during sorting and drafting took only half as long as the time taken for Romney ewes. In addition, little or no shepherding at lambing was required for Perendale ewes.

Prior to 1965, Farmer 46 had been increasing stock numbers by 200 to 400 Romney ewes per year. From 1965 he intended to increase the farm stocking rate per acre to 6.8 E.E.'s per acre by 1967. (Table 5.3). This was a relatively rapid increase.

TABLE 5.3 STOCK WINTERED - FARM 46 - (1800 Effective Acres)

Year	1965	1966	1967
Sheep: Ewes - Romney	4600	4600	5600
Perendale	-	1400	2000
Hoggets - Mixed sex	2500	2500	2500
Beef Cattle - Cows	275	300	350
Weaners	350	350	375
Total E.E.s Per Acre	4.8	5.7	6.8

With the exception of 25 beef cows all of the initial stock increase in 1966 consisted of Perendale ewes. Subsequently in 1967 however the farmer proposed to increase all classes of stock, including an extra 1000 Romney ewes. This suggested two things to the author. First, the farmer had realised that he was able to increase ewe numbers substantially using Perendales without requiring extra permanent labour. Secondly, because the Perendale ewes performed well under arduous conditions, the farmer concluded the rest of the farm could be stocked more heavily.

5.3.2.2.2 Complete Flocks

On two farms, 12 and 52, the sheep flocks had been changed completely from Romneys to Perendales. The reasons for this decision were substantially the same. Farmer 12 considered that the Perendale was more suitable for the type of country, and also changed because he thought that Perendales did not require as much shepherding and general stock husbandry as Romneys .

Farmer 52 chose Perendales to obtain a higher lambing percentage, to obtain higher wool production than the Romneys (which was decreasing on a per head and per acre basis), and because he considered that Perendales would be more suitable for the type of country.

TABLE 5.4 COMPLETE PERENDALE FLOCKS - SUMMARY OF FARM PHYSICAL FEATURES

	Farm No. 12	Farm No. 52
Effective Acreage	1200	1500
Topography	Rolling to Moderate Hills	Moderate to Steep Hills
Sheep Wintered 1966		
Ewes - Romney	800	350
Perendale	2750	1055
Total Sheep	4170	1850
Permanent Labour Units	1.0	1.0
Sheep Policy	Wool and Store Sheep	Wool and Store Sheep
Production 1965-66		
Lambing Percentage (1966)		
Romney (No Two Tooths)	80	100
Perendale (All Ages)	90	112
Ewe Losses (1966) (Per Cent)		
Romney	5	Not Available
Perendale	1½	Not Available
Wool Production Per Ewe		
Romney	Not Available	9.1
Perendale	Not Available	9.8

Case Study - Farm 12

This farm was in a state of rapid development with the main farm expenditure being on increased stock, fertiliser and some fencing. The ewe numbers had increased from 1200 mixed age Perendale

ewes wintered in 1963 to 3550 mixed age Romney and Perendale ewes wintered in 1966.

The fertiliser programme was carried out on a systematic basis, with two hundred acre blocks being given an initial application of 5 cwt of superphosphate, followed by 3 cwt the next year, and 2 cwt per year in subsequent years. Some new fencing was carried out, and many of the existing fences were repaired. The farm was subdivided into eighteen grazing paddocks.

Up until 1966 Romney and Perendale ewes were being bought and sold without any apparent planning, due to the farmer's stock dealing activities. Farmer 12 bought and sold Romney and some Perendale ewes depending upon the current market prices at the time.

TABLE 5.5 STOCK WINTERED - FARM 12

Year	1963	1964	1965	1966	Target
Sheep:					
Ewes - Romney	-	800	-	800	-
Perendale	1200	1500	3000	2750	5000
Hoggets	450	-	600	750	1500
Cattle	80	-	-	-	50

The farmer stated that when most farm development was completed and stock numbers stabilised, he would like to produce his own $\frac{1}{4}$ crossbreds - $\frac{3}{4}$ Romney x $\frac{1}{4}$ Cheviot.

Casual and contract labour was employed for many farm operations, but the farmer did the lambing, drenching, weaning and mustering. No permanent labour was employed.

Farmer 12 maintained that Perendale ewes gave much less

trouble than Romney ewes at lambing time. He estimated that only about six ewes each day required lambing assistance.

He also stated that mustering and drafting operations took half as long with Perendales, as with Romneys. The farmer stated that the busiest time during the year's operations was from docking in the spring to tupping in the autumn. This period was involved with stock operations, which took less time for Perendales, than for Romneys.

The farmer estimated that, with the addition of one permanent labour unit, he would be able to cope quite easily with the stock target figure of 5000 Perendale ewes.

5.3.2.3 Evaluation

Experimental evidence has shown that a production difference exists between Perendales and the Romneys under a range of conditions. On good hill country however, the Perendale does not respond as well as the Romney with respect to wool production. On poor hill country where the overall performance of both breeds is depressed, that of the Perendale is not depressed to the same extent as the Romney.

The lower labour requirements of the Perendale applies on most land types - but becomes important on country that is not easily shepherded, either because of topography or because of accessability. Thus Farmer 29 grazed Perendales on a block of land that was 5.5 miles from the rest of the farm. The amount of shepherding carried out was a maximum at lambing of once a week.

The four farms surveyed,all carried Perendales to obtain the relative advantages that were stated as the objectives of the formation of a breed. In each case the farmers were able to increase ewe numbers without extra permanent labour. Three of the farmers claimed that

they were obtaining higher production than would be the case with Romney ewes.

Because Perendale ewes are likely to out produce Romney ewes particularly under poor hill country conditions, it is a most suitable way of increasing the labour productivity of the permanent labour force. This is particularly evident where farmers with relatively small ewe flocks (1200 to 1500 ewes) can not afford extra permanent labour, or where the type of country limits the amount of shepherding and consequently the number of ewes per permanent labour unit that can be achieved by the more "labour intensive" shepherding required for Romney ewes.

5.3.3 Access Race

5.3.3.1 Discussion

Although long recognised as an essential part of dairy farm layouts, farm access races are uncommon on sheep farms. Part of this infrequency is probably due to the extensive nature of sheep farming and the manner in which sheep farms are managed, compared with the daily stock movements on dairy farms. However part of the reason is probably the greater cost of a sheep farm race compared with a dairy farm race, because of the extra costs involved in making a fence "sheep proof", and because of the greater distances involved on sheep farms.

5.3.3.2 Farm Survey Data

Two farm race systems were studied. The function of each race was the same - to provide fast and easy access around the farms for vehicles and stock. In each case both the fences constituting the race were sheep proof.

TABLE 5.6 PHYSICAL FEATURES OF FARMS USING FARM RACES

	Farm No. 15	Farm No. 17
Effective Acreage	1120	520
Topography	Flat to moderate	Rolling to Moderate
Sheep Wintered 1966	8190	1980
Ewes - Romney	6200	1890
Perendale	400	-
Permanent Labour Units	3	1
Sheep Policy	Breeding	Breeding and Fat Lambs
No. of paddocks - grazing	65	17
holding	31	3
No. of Woolsheds	1	1
No. of sheepyards	5	1
Transport equipment	Wheel Tractor (2), Motor bike (2), truck, 3 wheel vehicle	Wheel Tractor, Motor Bike

On Farm 15 the farm race was 1.5 miles long, and subdivided to form 28 holding paddocks. The race was an essential part of the management system. It was used daily for vehicular transport and frequently when shifting sheep. In addition it linked three of the five sheep yards together. Because it was well maintained, the race could be used at all times of the year.

Farm 17 was in a stage of development that included fencing, scrubcutting, and the construction of additional sheep yards. The farm race was partially completed, and was 1 to 2 chains wide. It began

at the yarding paddocks surrounding the woolshed, and extended into the farm. Its final length was intended to be 0.3 miles. From this race one-quarter of the total farm area could be directly reached.

5.3.3.3 Evaluation

The use of access races on sheep farms are likely to be of increasing importance with more intensive farming. The reason is that access is likely to play an increasingly important part in determining labour productivity.

The advantages of using a farm race as access are:

(i) Farm labour is able to travel faster, on a better surface and with fewer gates to open.

(ii) Stock can be more easily driven to other farm areas since the route is clearly defined, and there is no need to clear a path through stocked paddocks for mobs of sheep.

(iii) The race can be used as a series of holding paddocks for mobs of sheep.

(iv) The race provides access for carting farm materials.

The main disadvantages of a farm race are the initial cost of one extra fence, extra gates and the necessary culverts and metalling required to allow ready access.

The use of a farm race is particularly important when linked with the centres of farm operations. Thus around frequently used sheep yards and in heavy stocked areas of the farm, there is likely to be far greater stock and farm labour movement. In these areas a farm race serves as a servicing lane, allowing specific operations and stock movements to be carried out independently of otherfarm operations.

5.3.4 Additional Sheep Yards

5.3.4.1 Discussion

While sheep yards are required in conjunction with the woolshed and dipping facilities on farms, in many cases one set of yards is likely to prove inadequate in handling increasing stock numbers.[9]

There are three main reasons for decentralised operations:

(i) The increased stock numbers on some sheep farms have resulted in a changed stocking distribution over the farm. More remote, less developed areas have had relatively faster increases in stocking rates. On other farms, areas once considered as grazing areas for cattle and dry sheep have been stocked with ewes. In both of these situations the site of the original sheep yards, designed to service the stock in the original stocking distribution, may need to be supplemented.

(ii) More intensive sheep farming and higher per animal production have created the need for more stock husbandry operations. This has meant more mustering and droving, frequently with larger mobs which are more difficult and slower to muster and drove.

(iii) The portable equipment now available, together with farm vehicles and access has made it possible to shift men and materials quickly and easily to various parts of the farm.

5.3.4.2 Farm Survey Data

The use of extra sheep yards was studied on two farms during the farm survey. Although both farms were above average size [10] and hence the need for more than one set of sheep yards correspondingly

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9. A case for additional sheep yards is presented by Ralph du Faur. See: Du Faur, Ralph, op.cit., p.187.
10. Refer to Table 2.1 for a comparison of the average sheep farm acreage in the principal North Island sheep farming regions.

greater than on smaller farms, the author considered that the rationale behind the use of the extra yards was identical with their use on smaller farms.

The additional yards were sited to serve between 370 and 450 acres each. On Farm 44 the main sheep yards served an area of 800 acres of moderate hill country, which had a much lower carrying capacity than the two areas served by the additional yards.

TABLE 5.7 CASE STUDIES OF THE USE OF ADDITIONAL SHEEP YARDS

	Farm No. 25	Farm No. 44
Effective Acreage	1300	1540
Topography	Rolling to moderate	Rolling to moderate
Sheep Wintered 1966	6470	4200
Ewes - Romney	4300	2500
Permanent Labour Units	2.5	3.0
Sheep Policy	Breeding	Breeding
No. of sheep yards - Main	1	1
- Additional	2	2
Farm acreage served - per yards:		
Main	400	800
Additional	450	370
Cost per set of additional yards	$600	$500

On Farm 25 the topography within each area was similar and each set of yards served a similar number of sheep. Most sheep husbandry operations were performed on each farm in the additional yards.

The only operations for which the main sheep yards and woolshed facilities were necessary were shearing and dipping. This meant that the ewe flocks in particular were not mustered and driven to the main yards more than three times a year, i.e. for shearing, second shearing and dipping.

TABLE 5.8 OPERATIONS CARRIED OUT IN ADDITIONAL SHEEP YARDS

	Farm No. 25	Farm No. 44
	Time of Year	
Drenching - lambs	November	November
	January	Twice in Autumn
	February	
	March	
Dagging - Ewes and Lambs	November	November
Ewes	April	-
Sorting ewes	Late tupping	Pre lambing
Vaccination	-	Pre lambing
Tupping management	April	April
		May

5.3.4.3 Evaluation

Where sheep are returned to the same area after some husbandry operation the time spent in droving is preparation time. Efforts should be made to reduce or eliminate this time since it is not essential to the completion of the operation.

On farms where the sheep yard facilities are inadequate, the peak periods for sheep husbandry operations are likely to be

accentuated. This is because the amount of droving increases in fairly direct proportions to the operations performed.

TABLE 5.9 TIME SAVED THROUGH THE USE OF ADDITIONAL YARDS

Hypothetical Sheep Farm - Appendix C.

Operation Performed - dagging wet ewes prior to main ewe shearing, and drenching lambs at the same time.

Activity	Facilities	
	Main Sheep Yard Only	Two Additional Yards
Travelling to paddocks - 6 at 0.15	1.30	1.30
Mustering:		
6 mobs at 2 hours	12.00	12.00
Droving:		
6 mobs at 1½ hours	9.00	3.00
6 mobs at ½ hour		
Dagging and Drenching:		
6 mobs at 5 hours	30.00	30.00
Returning to paddocks		
6 mobs at 1 hour	6.00	1.30
6 mobs at 0.15		
Travelling time return		
6 at 0.15	1.30	1.30
Time saved		10.30
	60.00 hours	60.00 hours

The time saved through using extra yards will vary according to several factors. The main factors are the type of sheep to be driven (e.g. ewes and lambs or dry sheep), and the number of clearing paddocks through which the mob must travel, or alternatively the detours which must be taken to avoid other sheep. The value of the time saved will depend upon the time of the year, and upon the operation itself.

One man day saved in six days, on a one man farm as given in the example, is likely to be of considerable benefit just prior to shearing. Where the husbandry operation is time consuming, or where a large mob of sheep are mustered, droving time may constitute less than one-sixth of the total operational time. However this may be the difference between finishing an operation in one day, and leaving it unfinished to complete the following day.

Although comparatively new technology has enabled men and materials to be transported quickly around most farms, it has only been possible to speed up the mustering and travelling of sheep by methods such as those discussed earlier, (i.e., the use of Perendales, and farm access races). Hence time may be saved at peak labour periods by decentralising husbandry operations through the use of additional sheep yards.

5.3.5 Grouping Ewes for Lambing

5.3.5.1 Discussion

Before lambing, ewes are frequently sorted into groups classified by the stage of pregnancy. This is done by using ram harnesses at tupping or by sorting pregnant ewes into various groups on the basis of udder development shortly before lambing.

The ram harness method of marking ewes consists of fitting harnesses containing coloured marking crayons to all rams mated with the ewes. [11] All ewes mated thus are marked with a crayon of a particular colour.

The udder method involves classifying each ewe according to the condition of its udder. Usually the udder is felt for firmness and size which indicate the proximity of lambing. However allowance is usually made for the variable characteristics for each ewe- age, body condition, and udder heat and colour. A certain amount of intuition on the part of the farmer is also required.

The reasons for grouping ewes in this manner are to enable pregnant ewes to be fed according to their pregnancy requirements, and to allow shepherds to intensively shepherd only the ewes lambing at lambing time.

5.3.5.2 Farm Survey Data

Ram Harness

The use of the ram harness was studied on two farms, Farm 20 and Farm 40. Both farms were carrying a similar number of ewes but differed in other respects.

TABLE 5.10 SUMMARY OF FARM PHYSICAL FEATURES ON FARMS USING RAM HARNESS

	Farm No. 20	Farm No. 40
Effective Acreage	1454	530
Topography	Steep	Flat to Rolling
Sheep Wintered 1966-Romney	1500	1490
Permanent Labour Units	1.5	1
Sheep Policy	Breeding	Fat Lamb

11. Readers unfamiliar with the harness marking technique are referred to: Ch'ang, T.S., "The Use of Harness and Crayon on Rams to Mark Ewes during the Tupping Season", Sheepfarming Annual, Massey University, 1960, pp. 211 - 216.

Farmer 20, farming on steep hill country, used the harness technique to enable him to shepherd intensively, group by group, at lambing time (see Section 5.4.3). The harness technique enabled him to sort the ewes accurately into lambing groups.

Farmer 40 managed a fat lamb farm which experienced feed shortages during winter and dry periods during summer. The harness technique enabled him to sort out the late lambing ewes and to sell them. This lessened the wintering problem and the problem of fattening late lambs in a dry summer.

Farmer 20 changed the crayon marking colour according to the proportion of the flock marked. In this system, rams were fitted with harnesses at the beginning of tupping and the colours were changed when sufficient ewes were marked. The proportion marked was judged by counting the number of ewes marked with the particular colour, out of a paddock sample of about 80 - 100 ewes.

TABLE 5.11 HARNESS METHOD - FARMER 20

Harness on - Start of Tupping	
First crayon colour	- 500 ewes marked
Second crayon colour	- 400 ewes marked
Third crayon colour	- 500 ewes marked
Remainder	100
Total ewes	1500

Farmer 40 fitted harnesses on the rams after 21 days. The

majority of ewes were mated by this stage, and consequently were not marked. Ewes that were not mated could not be detected and by Farmer 40's estimate amounted to 1 to 2 per cent of the ewes put to the ram.

TABLE 5.12 HARNESS METHOD - FARMER 40

Harness on - 22nd day

Mating Period	Harness	Ewes Marked
1 - 21 days	-	-
22- 28 days	First colour	95
29- 45 days	Second colour	204

Udder Method

The practice of two farmers was studied, although many instances of the technique were encountered.

Farmer 17, managing 1890 ewes with one permanent labour unit mustered all ewes 10 days prior to the start of lambing. He then divided the flock into three lambing groups, according to the size and heat of each udder. The accuracy was 70 - 80 per cent.

Farmer 2, managing 2600 ewes with one permanent labour unit and a youth, also mustered ewes 10 days prior to lambing and divided the ewes into three lambing groups according to the firmness and size of the udder. The operation took 3 - 5 days and the accuracy of the method was also 70 - 80 per cent.

5.3.5.3 Evaluation

The ram harness can be effectively used to group ewes either into lambing time periods, or into groups of lambing ewes. That is,

lambing ewes may be grouped by the particular time period during which they will lamb, or according to the number of ewes required in each lambing mob.

It is possible to mark ewes accurately. Late lambing ewes which are marked may be sold.

There are some disadvantages associated with the harness technique. Unless fully understood and used correctly there are a number of technical problems which can occur - the ram harnesses may fall off, crayons may wear out and the colours on ewes may become difficult to distinguish.

Constant supervision is required at tupping time to check on the various technical aspects, and catching rams on hill country to change crayons may be difficult. The ewes that do not mate are not marked. Wool may have crayon marks at the time of sale.

To be successful, the ram harness method must satisfy two requirements; first it must be used with a definite objective, and secondly, the marking technique must be accurate. If it is not accurate then it has no advantage over the udder method of grouping pregnant ewes.

However used correctly, the harness technique will enable farmers to feed ewes in various stages of pregnancy according to their respective requirements. Equally importantly, it is a useful technique in organising lambing so as to reduce the shepherding distance travelled, making better use of the available labour.

The udder method is successful only when ewes are in late stages of pregnancy when it is possible to distinguish between ewes, on the basis of udder development. The technique has the advantage that it can be used without preparation, as is the case with the harness

technique, and it is a simple technique.

The disadvantages of the technique are that it is not as accurate as the harness technique; it can not be successfully used to separate dry ewes from pregnant ewes in early and middle stages of pregnancy. Also considerable work is involved in individual handling of ewes.

5.3.6 Second Shearing

5.3.6.1 Discussion

The practice of shearing ewes more than once every year became widespread amongst North Island sheep farmers between 1950 and 1960. By the 1959/1960 season a survey of 200 North Island sheep farms conducted by the New Zealand Meat and Wool Boards' Economic Service indicated that a majority of farmers (except in the Gisborne district) were shearing ewes more than once a year. 12/

The usual second shearing practice is to shear the ewe flock (excluding two tooth ewes) at six month intervals, in October or November (main ewe shearing) and again in April or May. A variation is shearing three times in a two year period, at eight month intervals. Two tooth ewes are commonly shorn in March or April, regardless of whether the older ewes are second shorn, and often independently of when the older ewes are shorn.

The reasons for second shearing two tooth and older ewes are different. Two tooth ewes are second shorn to avoid a 14 month or 15 month fleece that would result from shearing as hoggets in September, and again at main ewe shearing in the following year. Farmers claim that second shorn two tooth ewes are more thrifty and are easier to

12. Tebb, C.P., "Multiple Shearing. 1 Field Practice", Proceedings of the Ruakura Farmers' Conference Week, 1961, p.53, Table 4. (A classification of fleece wool sold at auction in the North Island during the 1965-66 season is given in Table 2.8).

manage. Second shearing is also claimed to raise two tooth fertility. This has been substantiated by experimental results.

Inkster showed that in the Waikato district, shearing two tooth Romney ewes just before mating, improved their fertility at first service and probably reduced the number of dry ewes.[13] Subsequently Wodzicka - Tomaszewska and Dobbie confirmed that two tooth lambing percentages could be increased by pre-tupping shearing, but this increase was only likely with "medium sized" two tooth ewes (95lb-110lb), and with sufficient suitable feed available.[14]

Older ewes are second shorn for less specific reasons. The benefits are likely to contribute to general ease of management. Tebb put forward the view that:

> "To date, northern farmers seem quite satisfied that the accruing increased shearing wages are more than offset by improved wool condition, by reduced sheep losses, by shepherding and labour economics, by better lambings, and improved sheep thrift." [15]

5.3.6.2 Farm Survey Data

Second shearing was studied on two farms. These farms were different in a number of aspects. However both farmers said second shearing enabled them to manage their ewe flocks during the winter and spring periods with less labour than would otherwise be required.

Farmer 1 said second shearing was one of the main husbandry techniques contributing to a management system which enabled him to

13. McClure, T.J., "Improving the Fertility of Two-Tooth Romney Ewes", Proceedings of the Ruakura Farmers Conference Week, 1960, p.30.
14. Wodzicka - Tomaszewksa, Manika, and Dobbie, J., "The Effect of Size, Nutrition and Pre-tupping Shearing on Two-tooth Fertility", Proceedings of the Ruakura Farmers' Conference Week, 1967, pp,7-18.
15. Tebb, C.P., op.cit., p.56.

manage without employing permanent labour. In this management system, second shearing had two functions. First it enabled the ewes to forage more effectively on the steep slopes. Secondly, because the ewes were more thrifty, it was possible to maintain them in lean, fit condition before and during lambing, without sustaining losses higher than the usual 3 to 5 per cent.

TABLE 5.13 COMPARISON OF FARM PHYSICAL FEATURES ON TWO FARMS CONDUCTING SECOND SHEARING

	Farm No. 1	Farm No. 28
Effective Acreage	2500	900
Topography	Steep	Flat to Rolling
Sheep Wintered 1966	6980	4100
Ewes - Romney	3000	4000
Permanent Labour Units	1	3
Sheep Policy	Breeding and Store Lambs	Fat Lambs

A flock of 2100 mixed age wethers was run on 600 acres of steep fern country at the back of Farm 1. This flock was maintained by retaining all wether lambs on the farm. It was used as a development tool, and stocking rates reached 5 to 6 wethers per acre during the year. The wethers were shepherded at 3 to 4 week intervals. Second shearing was considered by the farmer to be the main factor in enabling the flock to be grazed with very little shepherding.

Farmer 28 was a fat lamb farmer. He purchased cast for age ewes from other farmers who considered the ewes to be too old for retaining in their own flocks. These ewes were second shorn in April.

By second shearing Farmer 28 said it was possible to shepherd only once or twice weekly. Previously he had found that the full wool old ewes required daily shepherding from May until shearing in December.

Although both Farmer 1 and Farmer 28 considered second shearing was a profitable practice, neither farmer had budgetted its profitability. Farmer 1 estimated that ewe and wether losses were 1 per cent to 3 per cent lower due to second shearing. Farmer 28 thought that the ewes grew extra wool due to second shearing (provided the feed was available) and that this wool paid for the cost of shearing.

5.3.6.3 Evaluation

Second shearing is likely to save shepherding labour, but this alone may not make it a profitable husbandry technique. Farmers must consider several other factors as well. These are concerned with the management system followed, the comparative gross revenue from second shear and long wools, and the possible changes in ewe losses, ewe lambing percentages and ewe wool production as a result of second shearing.

The type of management system followed is the most important farm management consideration. It is likely to determine how profitably extra shepherding labour can be employed as an alternative to second shearing . The cost of second shearing is important, at contract shearing rates the usual cost is 25 cents per sheep. If shearers and shed hands can be employed on a casual basis the cost may be reduced to 15 cents per sheep.

Other farm management considerations include the risk of sheep losses at second shearing due to inclement weather, and possible changes required in pasture management in order to provide newly shorn

ewes with adequate feed. The management advantages of rapid drying of second shear wool at main shearing in October and November should also be assessed.

The gross revenue from an average quality Romney ewe fleece of 46/50's quality number [16] as a single fleece, or its equivalent as two second shear fleeces will depend mainly upon three factors. The factors are the relative prices received, the relative amount of skirting required, and the effect of the management system on long and second shear wools.

The price of the long crossbred wool (Wool Commission Type 114) [17] has sold at an average price of 2.2c per lb (range 0.65c-8.0c; clean basis) higher than the corresponding second shear fleece wool (Wool Commission Type E.695) [18] at individual wool auctions, over the period 1952-65 [19]. (However earlier trade during this period may not have been prepared to handle second shear wool and this may have depressed prices initially). There has also been a high positive correlation (0.976) between the weekly average price of wool type 114 with the weekly average price of wool type E695.

The relative amounts of skirting required for the two wool types is likely to vary with the management system. Usually however, there is likely to be a greater amount of skirting with main fleece wool. The management system and the type of country that the sheep are

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16. Wool "Count" is defined in the Glossary.
17. Wool Commission Wool Type 114 is defined in the Glossary.
18. Wool Commission Wool Type E695 is defined in the Glossary.
19. Candler, Wilfred, "Fluctuations in the Price of New Zealand Wools 1952-65", New Zealand Wool Board - Wool Commission Wool Marketing Study Group, Submission Paper No. 1, May 1966, p.5, Table 1.

grazed on is likely to effect the amount of cotted or wet wool, as well as seed and dirt that is present in the wool. On less developed country long wools may be correspondingly dirtier and contain more cots and seed. Hence any price difference in favour of long wool compared with second shear may be cancelled out by the less attractive appearance of the long wool.

A direct contribution to the profitability of second shearing will occur with higher production per ewe. The largest increases will come from lower ewe losses and higher lambing percentages. While wool production per ewe may increase this is not certain, particularly at average to high stocking levels, when feed shortages may occur.

The most important single aspects for North Island sheep farmers are likely to be:

(i) the amount of shepherding saved,

(ii) the cost of second shearing, and

(iii) the change in ewe losses and lambing percentage.

An evaluation of second shearing may be made with respect to a one man, 1500 ewe, moderate hill country farm. 20/

(i) Shepherding saved.

The shepherding requirements for second shorn ewes are greatly reduced. From the farm survey information the time spent shepherding during the winter and spring months may be reduced by two-thirds. For a one man farm wintering 1500 ewes and travelling by motor-bike the time saved may be over 30 man hours. With a slower form

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20. See Appendix C for a description of this hypothetical farm.

of transport such as a wheel tractor or horse travelling at half the average motor bike speed, the time saved would exceed 60 man hours.

TABLE 5.14 COMPARATIVE SHEPHERDING TIME - LONG WOOLLED AND SECOND SHORN EWES

Month	Long Wool	Second Shear
May	3 x per week = 12 hours	1 x per week = 4 hours
June	3 x per week = 12 hours	1 x per week = 4 hours
July	4 x per week = 16 hours	2 x per week = 8 hours
August (half month)	5 x per week = 10 hours	3 x per week = 6 hours
October	3 x per week = 12 hours	2 x per week = 8 hours
Time Saved	-------	32 hours
	62 hours	62 hours

One round takes 1 hour by motor bike.
Half August and all September omitted because of lambing shepherding.
Extra shepherding of long woolled sheep not sufficient to reduce ewe losses to the level of the second shorn sheep which require less shepherding.

(ii) Cost of second shearing

Usually hill country farmers with medium sized ewe flocks (1500-2000 ewes) have to rely on contract shearing. The cost of contract shearing is usually about $25 per hundred sheep (25c per sheep). Second shearing carried out from February to April can omit the need for tupping crutching (3c per ewe). Also any daggy or stained wool can be sorted out during second shearing. The pre-lamb crutching need not be as expensive since the short wool does not require as much of the belly wool to be taken off and "flanking" may be saved. The nett cost of second shearing is thus likely to be 20c per ewe.

Added Costs per Ewe		Costs Saved per Ewe	
Second Shearing	25c	Autumn crtg eliminated	3c
		Pre lamb crtg reduced by	2c
		Net added cost per ewe	20c
	25c		25c

(iii) Change in ewe losses and lambing percentage.

Although shepherding time may be decreased because of second shearing, ewe losses also may be decreased. This situation is not unusual, but can be expected on many North Island hill country farms. The reason is that on most classes of hill country the shepherding time involved, alternative demands on farm labour, and the accessability of some grazing areas results in the situation where intensive shepherding does not mean complete coverage of the ewe flock. Some ewes are not seen on each shepherding round. They may be grazing in undeveloped areas such as gullies and swamps.

In these areas, long woolled ewes are more likely to become caught in blackberry and bogged in swamps. They are also more likely to become cast. Thus even with more intensive shepherding, losses amongst long woolled ewes may be higher than amongst second shorn ewes. Lambing percentages may be markedly increased in two-tooth ewes.

Partial Budgets

Two partial budgets are presented below which calculate the break even points for second shearing two tooth and mixed age Romney ewes. The two classes of ewes are grouped separately to enable a more useful calculation. The reason for this is that two tooth ewes and older ewes

in general have different responses to second shearing.

Two tooth ewes show increases in lambing percentages, while in older ewes second shearing, the main advantage is usually in a reduced death rate. Further this is likely to become important under management systems of high stocking rates and/or less intensive shepherding.

The budgetting assumes that the mixed age ewes,and lambs saved in the two tooth and mixed age ewe flocks are kept and sold in the late summer.

The mixed age ewes which would be saved during the winter could be sold as in-lamb ewes prior to lambing. The mixed age ewes saved at lambing time would have been in too low condition for slaughter and would have low market value at that time of year with young lambs at foot. Hence the budgets are made more realistic by valuing the extra ewes and lambs at normal selling times of the year, rather than at the time when the stock were saved.

The figure for shepherding time saved in each partial budget was derived from Table 5.14. The two tooth flock and the mixed age flock were respectively allocated the same proportion of the total time saved (32 hours) as the respective proportions each flock constituted of the total hypothetical flock (1500 ewes).

The costs incurred through carrying the ewes saved and the extra lambs to normal sale times are included in the budgets. Husbandry labour has been allocated at 6 minutes per sheep [21], and $1.00 per hour. Veterinary, crutching and shearing are charged at 35 cents per sheep. Reduced transport costs are based on an average speed of 10 miles per hour and 10 cents per mile for farm motor bike (See Appendix C).

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21. "Six minutes per Sheep" was estimated by the author.

TABLE 5.15 BREAK EVEN PARTIAL BUDGET - SECOND SHEARING TWO TOOTH EWES

Marginal Costs		Marginal Revenue	
Ewes - Net added shearing and crutching costs 450 at 20c	90.00	Extra Lambs	
		18 lambs at $4.00	72.00
		36 lbs wool at 25c	9.00
Costs of Extra Lambs		Reduced Costs	
Husbandry labour 18 lambs at 6 minutes (and $1.00 per hour)	1.80	Labour 9.6 hours at $1.00	9.60
		Transport 96 miles at 10c	9.60
Vet., shearing, crtg. 18 at 35c	6.30		
Net cash surplus	2.10		
	$100.20		$100.20

Assumptions - No change in gross wool revenue as a result of second shearing.
No change in ewe mortality rate.
Ewes shorn in October and March.

TABLE 5.16 BREAK EVEN PARTIAL BUDGET - SECOND SHEARING-MIXED AGE EWES

Marginal Costs		Marginal Revenue	
Ewes - Net added shearing and crutching costs 1050 at 20c	210.00	Ewes Saved	
		20 at $4.00	80.00
		160 lbs wool at 25c	40.00
Costs of Ewes Saved		Extra Lambs	
Husbandry labour 20 ewes at 6 minutes (and $1.00 per hour)	2.00	15 at $4.00	60.00
		30 lbs wool at 25 c	7.50
Vet., crutching, Shearing Costs. 20 ewes at 35c	7.00	Reduced Costs	
		Labour 22.4 hours at $1.00	22.40
Costs of Extra Lambs		Transport 224 miles at 10c	22.40
Husbandry labour 15 lambs at 6 minutes (and $1.00 per hour)	1.50		
Vet., Crutching, Shearing Costs. 15 at 35c	5.25		
Net cash surplus	6.55		
	$232.30		$232.30

Assumptions - Ewes shorn October and April.
No change in lambing percentages.
Ewes saved raise 75% lambs.
No change in gross wool revenue as a result of second shearing.
Pre lamb crutching costs imputed to all ewes second shorn.

Summary

Second shearing appears an ideal husbandry technique for saving labour, and in addition it is likely that the cost of shearing will be met by the decrease in ewe losses, the increased lambing percentage, and the amount of shepherding time saved.

In the examples of break even budgetting above an increase of 4 per cent in the two-tooth lambing or a 2 per cent decrease in mixed age ewe deaths is likely to offset the cost of second shearing.

The technique seems especially suited to semi-developed hill country areas where access is difficult during winter and spring months and where there are natural hazards including blackberry and bogs. Under these conditions second shearing will often result in a lower death rate.

On more developed and easier contoured country savings in ewe losses may not be as great but there can still be considerable reductions in shepherding time needed. Ewes become cast less frequently and tend to lamb with less trouble. They also move more freely and are easier to muster and drove.

5.3.7 Farm Tracking.

5.3.7.1 Discussion

Farm tracks are an important aspect of hill country sheep farming in the North Island. They are constructed and used extensively for several purposes, all of which are associated with access and mobility for labour, vehicles and stock.

Important features concerning track planning and construction have been discussed by Bowler.[22/]

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22. Bowler, D.G., "Points in Planning and Construction of Bulldozed Tracks on Hill Country", Sheepfarming Annual, Massey University, 1951, pp. 57-68.

5.3.7.2 Farm Survey Data

All sheep farms in the farm survey had tracking in less accessible hill country. In each case the tracks had been bulldozed and could be used by vehicles, although in some cases this was restricted to four wheel drive vehicles and tractors.

The tracks were used for transporting farm materials such as fencing materials and operational equipment, as well as farm labour and stock. The sit ing of farm tracks was considered important by many farmers, particularly in relation to stock movements. In hill country where there are "natural" stock routes, tracks sited so that they transversed" natural" routes for stock were likely to be of little aid in mustering and droving.

The cost of farm tracking varied, depending mainly upon the type of country. In steep hill country where not only more tracking was required for farm access, but also because the steeper hill slopes involved more work per mile the cost ranged from $100 to $500 per mile.

In many steep hill country areas, culverts are required in traversing streams and hill seepages.

In moderate hill country tracking was required in many hilly areas, although the cost of tracking was frequently lower, ranging from $50 to $250 per mile. In flat and rolling country, little tracking was usually necessary.

5.3.7.3 Evaluation

Farm tracks are a complementary farm input with farm transport and the present farm labour. The additional access and mobility achieved may allow substitution of tracks and vehicles for additional permanent labour.

On steep and moderate hill country farm tracks are likely to become the second priority for the available finance for development (after stock). Stock can frequently be grazed with little access, but management and development are likely to be limited by the available access. On both flat and rolling country fast and efficient stock supervision is aided by tracking.

5.3.8 Farm Transport

5.3.8.1 Discussion

Most North Island sheep farms have some mechanical means of transport. In the early 1950s the main vehicles used were four wheel drive vehicles, farm trucks, and wheel tractors. During the 1960's the choice of the mode of transport expanded considerably and now includes adapted two wheel drive vehicles, three wheel farm "gnats" and farm motor bikes.

This range has given farmers considerable scope in choosing the type of vehicle most suited to individual requirements. As well as the differences in versatility between types of farm vehicles there are also considerable differences in the respective purchasing and running costs.

5.3.8.2 Farm Survey Data

The author noted the use of five types of farm transport:

(i) Four wheel drive vehicles.

(ii) Two wheel drive vehicles.

(iii) Wheel tractors.

(iv) Three wheel vehicles.

(v) Farm motor bikes.

The usefulness of each type in farm transport was studied according to four criteria, effective mobility, job versatility, individual operating characteristics, and purchase price and operating costs. The mobility of each type refers to the farm conditions under which each vehicle may be used., while job versatility refers to the number of farm jobs that can be accomplished as a transport vehicle. Operating characteristics refer to distinct features of operation as well as to the conditions that the operator works under.

Some basic features of each type of vehicle are given below.

TABLE 5.17 BASIC FEATURES OF TYPES OF TRANSPORT

Vehicle Type	Weight - Tons	Carrying Capacity - persons	Purchase Price - $ a/
Four Wheel Drive	1.0	5 - 6	3057
Two Wheel Drive	0.7	5 - 6	2065
Wheel Tractor	0.75	1	1792
Three Wheel Vehicle	0.2	2	700
Farm Motor bike	0.05	1	495

a/ Retail price at 30 November 1968.

Effective Mobility

The four wheel drive vehicles are mobile even over moderate hill country in dry conditions. However in wet conditions they are usually restricted to easier slopes and flat and rolling country. Travelling speeds range from 5 m.p.h. to 35 m.p.h.

Two wheel drive vehicles may be driven over most hill country during dry conditions with the aid of farm tracks. In wet or

steep areas this type of transport has limited mobility. Travelling speeds range from 5 m.p.h to 40 m.p.h.

Wheel tractors may not be as versatile as four wheel drive vehicles under dry conditions, but are likely to be equal or superior under wet conditions. Travelling speeds range from 2 m.p.h. to 20 m.p.h.

The three wheel vehicle can be driven under dry and wet conditions and on a wide range of slopes. The range of operating speeds is 2 m.p.h. to 20 m.p.h.

Farm motor bikes may be ridden over a wide range of hill slopes, and under some wet conditions. Because of their low weight they may be "walked" by the operator down steep slopes or under wet conditions. The range of speeds is 2 m.p.h to 45 m.p.h.

Job Versatility

Both two and four wheel drive vehicles can be used for transporting a range of farm materials as well as farm labour and sheep.

A wheel tractor with a trailer has similar versatility.

The three wheeled vehicle is limited to carrying two people and a small amount of gear. However when equipped with a trailer it can transport small amounts of farm materials. Farm motor bikes can transport one man and a small amount of gear.

Operating Characteristics

The two and four wheel drive vehicles have good operating characteristics. Both are equipped with weatherproof cabs which seat 2 to 3 people, and may be driven with relatively little engine noise. Being sprung vehicles, riding conditions are also comfortable. A characteristic of four wheel drive vehicles is that when operated under wetter conditions, farm track surfaces are likely to deteriorate rapidly.

Wheel tractors may be equipped with weatherproof cabs but the operating conditions are not as comfortable as the two and four wheel drive vehicles. The design of the seat and operating controls reflects the primary role of tractors as agricultural machinery rather than as transport vehicles. In addition wheel tractors are unsprung and have considerable engine noise.

The three wheel vehicle also has relatively uncomfortable operating conditions. The operator and passenger seats are exposed to the weather and the vehicle is unsprung. It is also noisy.

Farm motor bikes are not a comfortable mode of transport under some conditions. Their main disadvantage is the exposed operating position, and also the operator's seat which, in common with the wheel tractor, has no back rest. An important feature of motor bikes is that unless dogs can be trained to ride on a small platform behind the operator, they are likely to tire quickly attempting to keep pace alongside. The alternative, travelling at slower speeds, foregoes one of the main attributes of farm motor bikes.

5.3.8.3 Evaluation

There was considerable variation between the different types of transport according to all criteria. In general, the more costly vehicles were more versatile with respect to the number of farm jobs that could be undertaken and also offered more comfortable conditions for the operator.

The individual vehicles have a similar ranking with regard to their effective mobilities, the more costly four wheeled vehicles being faster, and, with the aid of tracks, able to cover a farm more quickly.

An exception to this is the farm motor bike, which is likely to be much faster than any other form of transport. A comparison of the time travelling by six methods is shown in Table 5.18.

TABLE 5.18 COMPARISON OF TIME TAKEN TRAVELLING BY SIX DIFFERENT METHODS

Method	Three Miles		Detours		Time at Gates Minutes	Total Time Minutes
	Av. Speed m.p.h.	Time Minutes	Distance Miles	Time Minutes		
Walking	2.5	72	-	-	-	72.0
Four Wheel Drive Vehicle	10.0	18	0.75	3	7.5	28.5
Two wheel Drive Vehicle	10.0	18	1.0	4	7.5	29.5
Wheel Tractor	6.0	30	0.75	3	7.5	40.5
Three Wheel Vehicle	6.0	30	0.5	2	7.5	39.5
Motor Bike	15.0	12	0.5	2	5.0	19.0

Assumptions: Data based on hypothetical 500 acre, 1 man farm (see Appendix C). Basic distance to travel around the farm is 3 miles. By vehicle there are 10 gates to go through. Stops as for shepherding not included.

In addition there is likely to be considerable variation in the annual costs of each type of transport. The use of a transport vehicle can be expected to allow more productive and timely shepherding thus increasing stock productivity. Farm transport may also reduce labour travelling times substantially.

However an evaluation of the profitability of vehicle use

on this basis may be difficult because of the estimation required. An alternative method, comparing farms of transport on a "break even" basis is given below. The additional ewes that would have to be carried to offset the annual costs of each vehicle are given in Table 5.19.

TABLE 5.19 ADDITIONAL EWES REQUIRED TO BREAK EVEN ON VEHICLE COSTS [a] - $

Vehicle Type	Present value of 3 years' Costs Vehicle [b]	Tracking	Total	Present Value of 3 Years' Ewe Gross Margins	Number of Ewes Required	Initial Capital Requirement [c]
Four Wheel Drive	2586	267	2853	10.34	276	4713
Two Wheel Drive	1967	267	2234	10.34	216	3361
Wheel Tractor	1657	267	1924	10.34	186	2908
Three Wheel	954	134	1088	10.34	105	1330
Motor Bike	389	134	523	10.34	51	801

a/ See Appendix C for details of costing.
b/ Vehicle costs include depreciation, interest, repairs and operating costs.
c/ Capital required for vehicle purchase, and required number of ewes at $6.

The total capital requirements for each type of vehicle are given in the last column of Table 5.19. The differences in annual costs, the capital requirements, and the number of additional ewes required should force individual farmers to consider the exact farm jobs that can be accomplished most efficiently with extra transport. Where labour mobility is the main consideration a motor bike will be the fastest form of transport, and a motor bike or second hand wheel tractor and trailer

are likely to be the most economic.

5.4 Saving Labour during Farm Operations

5.4.1 Introduction

In the two previous sections of this chapter (sections 5.2 and 5.3), discussion was concerned with techniques that enabled quicker assembly of sheep, men and materials at centres of farm operations. In this section it is assumed that the sheep, men and materials are assembled at the appropriate facility, and the question now is how quickly the farm operation can be accomplished.

Five farm operations are included in this section. They are concerned with lowering labour requirements at lambing, by controlling ewe nutrition prior to mating and lambing and also by concentrating the groups of lambing ewes on small areas of land, alternative dagging techniques, a method of minimising labour requirements for footrotting, and alternative docking techniques.

5.4.2 Controlled Ewe Nutrition

5.4.2.1 Discussion

The level of feeding of ewes from weaning in one year to lambing in the next year is likely to have a considerable effect on the amount of labour required at lambing. This is due to the size of the lambs at birth.

The size of a lamb at birth varies according to whether it is a single or twin lamb and also according to the level of feeding of the ewe, particularly in the 4 to 6 weeks prior to parturition.

Research work by Wallace and Coop has shown that the percentage of barren ewes in a flock decreases rapidly as ewe live weight at mating increases. 23/ However barrenness decreases at a slow rate from 90 lb live weight upwards.24/ Most ewes are thus likely to lamb if they have a mating live weight of 90 lbs or above.

The percentage of twin lambs born has been shown to increase in a direct way with the mating live weight of the ewe. Coop suggested that:

> "As the live weight of the ewe increases twinning rate increases at a consistent rate of about 6% per 10 lb. liveweight. This means that for every 100 ewes lambing, 6 extra lambs will be born for each 10 lb. increase". 25/

In the period from tupping to lambing, the level of nutrition of the ewe has a direct effect on the birth weight and mortality rate of the lamb. An experiment with Romney ewes showed that the average birthweight of lambs born to ewes on three different nutritional levels did not vary greatly.

"Effect of Level of Feeding of Ewes before Lambing on Birth weight of Lambs" 26/

Level of feeding	High lb	Medium lb	Low lb
Average birthweight of singles	10.3	10.2	9.6
Average birthweight of twins	8.8	8.4	7.3

However amongst single lambs

> "it was found that the death rate at birth and during the first week was only 3.3 per cent for lambs of about average size weighing 9 to 11lb, but over 30 per cent for the heaviest lambs weighing 13 lb or more and for the lightest weighing 7 lb or less." 27/

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23. Wallace, L.R., "Nutrition of Grazing Sheep", Proceedings of the Ruakura Farmers' Conference Week, 1960, pp. 13-26; Coop, I.E., "Liveweight, Flushing and Fertility", Sheepfarming Annual, Massey University, 1964, pp. 122-132.
24. Coop, I.E., op.cit., p.123.
25. Coop, I.E., op.cit., p.122.
26. Wallace, L.R., op.cit., p.17.
27. Ibid., p.18.

Amongst twin lambs the death rate

> "at birth and during the first week was only 7.3 per cent for those weighing more than 7 lb, but 28 per cent among those weighing 7 lb or less." 28/

However, Cockrem 29/ considered that there was insufficient information available for the inclusion of body weight in selection plans for sheep except for the culling of obviously poorly grown animals. He considered, that Coop's conclusion that the increase in fertility with age resulting from live weight increases, did not appear to be validated.

The basic effect of the nutritional level of the pregnant ewe differs according to the number of lambs. In any flock, single lambs can give rise to dystocia, while ewes bearing twin lambs are more susceptible to pregnancy toxaemia, and twin lambs of low birthweight may require much shepherding time.

5.4.2.2 Farm Survey Data

The method of managing ewes to minimise shepherding labour at lambing was studied on four farms. In each case the author studied the nutritional approach within a farming system; information on ewe liveweight during pregnancy, and the number and percentages of single and twin lambs born and lost was not available.

None of the four farms were cited by Extension Officers as having a nutritional approach to labour saving at lambing. Rather the author studied three of the methods during a survey of farms with low permanent labour inputs for the number of ewes handled. These farms are described in Chapter 6. On the other, Farm 17, control of ewe nutrition

28. Ibid., p.18.
29. Cockrem F.R., "The Analysis and Interpretation of Data on the Body Weight of the Two Tooth Ewe", Proceedings of the New Zealand Society of Animal Production, 25, 1965, pp. 164-183.

was studied as a labour saving technique.

The reason for studying the four farms, was because in each case the permanent farm labour was handling a large number of ewes at lambing with low to average losses and average to high lambing percentages compared with their respective districts. Each of the four farms had flocks made up of mixed age ewes.

TABLE 5.20 SUMMARY OF FARM PHYSICAL FEATURES ON LOW SHEPHERDING PER EWE FARMS

	Farm No. 1	Farm No. 11	Farm No. 15	Farm No. 17
Effective Acreage	2500	1100	1120	520
Topography	Steep	Rolling	Flat to Rolling	Rolling to Moderate
Sheep Wintered 1966	6980	6120	8190	1980
Ewes-Romney	3000	4500	6200	1890
- Romney x Border Leicester	-	1500	-	-
- Perendale	-	-	400	-
Permanent Labour Units	1	1	2	1
Sheep Policy	Breeding	Fat Lamb	Breeding	Breeding
Sheep Ewe Equivalents/ acre	2.4	5.6	6.8	4.0
Lambing Percentage 1966	80	101	95	105
Ewe Losses 1966 (per cent)	5	3	2	3

In each case the nutritional approach was part of a

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management system based on high stocking compared to usual district levels, and high numbers of ewes per permanent labour unit. Although each of the farmers were aware of the increased lambing percentages that were possible by flushing ewes and farming heavier ewes, none were attempting to achieve high lambing percentages by these methods.

The grazing systems varied. Farmers 1, 11 and 17 mob stocked ewes after weaning while Farmer 15 set stocked, but at a higher stocking rate than before weaning.

Only one farmer (17) attempted to flush ewes prior to mating. During mating, Farmers 1 and 17 drafted off thin ewes for better feeding. After mating,all the farmers restricted ewe intake.

During the winter, Farmers 1, 11 and 17 drafted off low condition ewes and gave them special grazing. Farmer 17 drafted 3 or 4 times so that he had one third of the flock as a "low condition" group. These ewes were given the best grass available from about 4-6 weeks prior to lambing. The remainder were grazed on pasture on a "day-on", "day - off" system and supplemented with lucerne hay.

Farmers 1 and 11 drafted off thin ewes 1 to 2 times during the winter and had a low condition group containing 5 to 10 per cent of the ewe flock. These were given better grazing. Farmer 15 did not draft off any ewes during the winter period. Instead he kept an extremely close check on ewe condition and paddock feed supplies, and frequently evened up the paddock stocking rate with the available feed. In this way all ewes had a similar body condition.

Before the start of lambing all the farmers sorted the ewes according to the stage of pregnancy. One of the main reasons for this was to enable ewes in various stages of pregnancy to be fed according to

their individual requirements.

Farmers 1 and 11 drafted out the dry and late lambing ewes, while Farmer 17 drafted the ewes into three lambing groups. Farmer 15 drafted out the late lambing and dry ewes. Following this all farmers set stocked the earlier lambing ewes. Farmers 1 and 17 mobbed stocked the late and dry ewes.

5.4.2.3 Evaluation

Although the levels of ewe nutrition throughout the year were part of management systems that enabled high stocking rates and large numbers of ewes per permanent labour unit, and hence meant that flushing ewes prior to mating was restricted, the four farmers were particularly careful with the level of feeding of ewes prior to lambing.

The reason was to reduce lambing trouble and consequently shepherding time to a level that could be managed by the permanent labour force on each farm. From experimental work (see Section 5.4.2.1) carried out this approach appears to be well founded.

Restricted flushing of the ewes prior to mating was not a deliberate management policy, but resulted from the high stocking rates used in each case. The result, which is supported by experimental evidence, was to reduce the ovulation rate of the ewes being mated, and consequently the incidence of multiple conceptions and births.

Under a system of restricted feeding prior to lambing, the birth weight of single and twin lambs is reduced. This restricted feeding has a proportionately greater effect on the mortality rate of twin lambs through low birth weight, than it does on single lambs.

Hence whether by design or accident the management systems combining restricted flushing at mating, with restricted feeding of

ewes prior to lambing, may cause a lower percentage of twin births but lower absolute mortality rates amongst twin lambs, and much less shepherding assistance being required for ewes bearing single lambs.

5.4.3 Concentrated Lambing Technique

5.4.3.1 Discussion

In a number of hill country areas in the North Island difficult shepherding and ewe and lamb losses at lambing are largely caused by the topography. Many of the farms in these areas have some flat land, although it may only be a small percentage of the effective acreage.

Where it is possible to organise lambing so that a substantial part of the ewe flock may be lambed on a flat, easily managed area, then substantial reductions in shepherding time and travel and sheep losses may be expected.

5.4.3.2 Farm Survey Data

The author studied two examples of concentrated lambing. In each case the entire ewe flock was lambed on a small flat area of the farm. Farmer 20 originated the concentrated lambing technique, which his neighbour, Farmer 43 adopted. The technique of Farmer 20 is described below.

Formerly shepherding at lambing time took 4 to 5 hours by horse totravel once around the ewes at lambing time. The lambing percentage varied between 80 per cent and 85 per cent, and the farmer considered the ewe flock fertility was average but that a considerable

number of lambs were being lost due to the terrain. 30/

TABLE 5.21 PHYSICAL STATISTICS OF FARM 20

Effective Acreage	1100
Topography	Steep
Sheep Wintered 1966	4700
Ewes - Romney	1200
Romney x Border Leicester	300
Permanent Labour Units	1.5
Sheep Policy	Breeding
Lambing Percentage	
Before Technique - Pre 1966	80 - 85%
Using Technique - 1966	94%

The concentrated lambing technique consisted of using the ram harness technique at tupping, and then lambing the groups of ewes consecutively on the same flat area. The ram harness technique used is described in section 5.3.5.2. It consisted of marking all ewes. Teaser rams were joined with the ewes 4 to 6 weeks prior to the start of tupping to bring all ewes into season.

Considerable effort was involved in supervising tupping. The two-tooth ewes were vaccinated for malignant oedaema, pulpy kidney and black leg in the autumn and mated separately. Following mating all

30. Most lambs lost appeared to be falling into "under runners" - holes created by underground erosion.

Fig. 5.1. Concentrated Lambing Area on Farm 20.

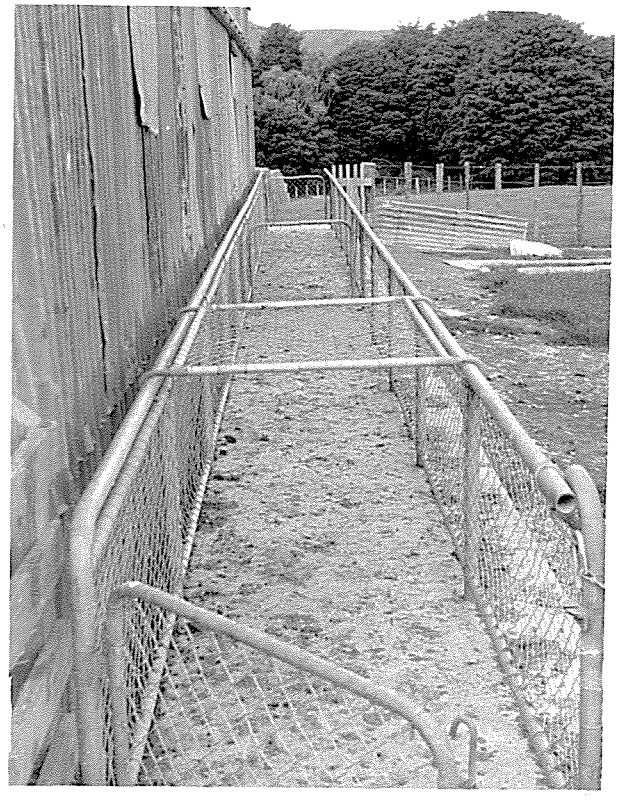

Fig. 5.2. End View of Dagging Race on Farm 49.

ewes were grazed together.

About 10 to 14 days before the start of lambing, the ewes were mustered and drafted by tupping colours into four lambing groups. They were then grazed separately. At the start of lambing the first group was moved into the flat area of 25 acres which was divided into 8 paddocks. As lambing proceeded the ewes without lambs were shepherded through the series of paddocks, leaving the ewes with lambs behind. Ewes with 2 to 3 day old lambs were shepherded out through side gates back onto the hills. As the next group of ewes started lambing they were brought into the first two to three paddocks of the flat area.

Using this technique lambing shepherding took one hour per round of lambing ewes, and four rounds per day were usually carried out. Farmer 20 said that every ewe in the flat area was seen twice each day. The farmer claimed that the technique of intensive lambing at shepherding was largely responsible for an increase of 10per cent in the lambing percentage.

5.4.3.3 Evaluation

This lambing system is an intensive version of the technique of lambing ewes by groups. It differs in that a small area is used and ewes and older lambs are moved back into grazing paddocks. To be operated successfully the technique requires a well managed tupping operation, so that ewes are grouped into mobs of suitable sizes for lambing in the small shepherding area.

The lambing facilities required are a fenced, drained, and sheltered area. There must be provision for shepherding groups of ewes into thearea, and for shepherding ewes and lambs back onto the hills. The

technique requires high shepherding ability, so that ewes and lambs can be handled successfully under the high stocking conditions.

Partial Budget

The break even partial budget in Table 5.22 computes the number of extra lambs that have to be saved to break even on the net extra costs associated with the use of the concentrated lambing technique. Extra capital is required to improve lambing facilities. Additional "equipment", ram harnesses and vasectomised rams, is also necessary.

Extra labour is required at tupping, but in this calculation none is saved at lambing. Instead, 4 one-hour lambing "beats" have been substituted for the 1 four hour lambing "beat carried out previously on the hills. (An alternative would have been to maintain the previous level of losses and the previous lambing percentage, and markedly reduce lambing labour using the concentrated lambing technique. The amount of time saved by this approach is shown in Table 5.23).

The transport costs included are motor-bike costs at 10 cents per mile. This rate is based on the costs listed in Appendix C. The budgetting assumes that the lambs saved are kept and sold after weaning, which is carried out in December. This makes the budget more realistic since during lambing, when they were saved, the extra lambs would have a very low market value. Costs incurred in keeping the lambs until sale after weaning have been included in the budget.

TABLE 5.22 BREAK EVEN PARTIAL BUDGET - CONCENTRATED LAMBING TECHNIQUE.

Hypothetical Farm - See Appendix C.

Capital Requirements:

16 ram harnesses	48.00
Vasectomy - 8 rams	10.70
Fencing	200.00
8 extra gates and metal in gateways	200.00
Drainage	100.00
	558.70

Marginal Costs		Marginal Revenue	
Interest on capital at 6%	33.00	Extra Lambs	
Depreciation		42 at $4.00	168.00
Vasectomy 50% C.V.	5.35	84 lbs wool at 25c	21.00
Drainage 10% C.V.	10.00		
Ram Harness 20% C.V.	9.60		
Repairs and Maintenance		Reduced Costs	
Fencing	10.00	Lambing Transport	
Gates and Gateways	20.00	2 miles per day at 10c per mile	8.40
Net Extra Tupping, Maintenance Labour			
Tupping 28 hours at $1.00	28.00		
Maintenance 12 hours at $1.00	12.00		
Net Extra Tupping Transport			
50 miles at 10c	5.00		
Tupping Crayon			
48 crayons (3 colours)	40.80		
Costs of Extra Lambs			
Husbandry Labour 42 lambs at 10 minutes (and $1.00 per hour)	7.00		
42 lambs at 35c, Vet., Crutching, Shearing Costs	14.70		
Cash Surplus	1.95		
	$197.40		$197.40

The budget shows a break even point with an extra 2.8 per cent lambs saved at lambing time.

There are several management disadvantages of the technique. Considerable labour and skill is involved in getting ewes accurately marked at tupping, the weather conditions may make high stocking rates at lambing difficult, and may cause pugging. Also the risk of infection to lambing ewes at high stocking rates is likely to be greater.

The main features of the technique are that it alters the pattern of labour requirements, and it becomes possible to achieve a big reduction in the labour shepherding time at lambing. This is shown in Table 5.23.

TABLE 5.23 TIME SAVED USING CONCENTRATED LAMBING TECHNIQUE (Man Hours)

Hypothetical Farm - See Appendix C.

Part of Operation	Lambing Ewes Spread over Farm	Concentrated Lambing Technique
Repairs and Maintenance		
Lambing Area	-	8
Vasectomised Rams	-	4
Tractor	4	4
Tupping		
Shepherding	8	16
Fitting Harnesses	-	4
Changing Crayon	-	8
Drafting into Mobs	-	8
Lambing		
Mustering for lambing	8	16
One round per day at lambing	168	42
TIME SAVED		78
	188 Man Hours	188 Man Hours

Assumptions - Lambing takes place over 6 weeks (42 days). No change in stock losses or lambing percentage.

The effect of saving labour at lambing is to either enable more intensive shepherding and consequently lower ewe and lamb mortalities, or to enable a greater number of ewes per man to be handled while maintaining the previous standards of sheep husbandry.

5.4.4 Dagging

5.4.4.1 Discussion

Dagging consists of removing the dags and stained wool from sheep. It is carried out several times a year.

Traditionally the operation has been carried out using the shearing plant and facilities. This method has certain management inflexibilities. First sheep must be brought to the wool shed for dagging, and secondly dagging cannot be done while shearing is in progress. Also because the flow of sheep through the shed and the actual dagging is done in the same way as shearing, a considerable proportion of dagging time is spent moving sheep into the shed, and dragging them individually onto the shearing board.

Two alternative methods of dagging are evaluated in this section; pen dagging and race dagging. The pen method is already widely used throughout the North Island, but the race method is a comparatively recent innovation. Both methods incorporate the use of portable dagging plants (electric, petrol, and also run by the tractor power-take-off). With a portable power source it is possible to situate the yards and pen or race wherever they are required.

5.4.4.2 Farm Survey Data

Pen Method

The methods used on two farms, Farm 25 and Farm 45, were studied during the survey. Farm 25 consisted of 1300 effective acres.

The farmer and two married shepherds provided almost all of the permanent labour. The number of sheep wintered in 1966 was 6470, consisting of 4300 mixed age Romney ewes, 2000 hoggets, and 170 rams and killers. Second shearing was practised on the farm; two tooths were second shorn in March, and mixed age ewes in April or May.

Dagging was carried out in three yards on the farm, using a portable dagging plant. This consisted of a petrol motor mounted on a steel pole which was driven into the ground in the middle of the dagging pen. Dagging was carried out before main ewe shearing, by the permanent labour force, using the portable plant and the three sets of yards.

About 15 ewes were put into the dagging pen, the dirty ewes were dagged, and then the pen of ewes was released. In this way one man could dag a mob of 600 to 1000 moderately daggy ewes in 8 hours. No clean wool was cut off, and the dags were discarded.

On Farm 45 pen dagging was carried out in covered yards adjoining the wool shed, with an electric dagging plant that moved along on a rail suspended above the dagging pen. The pen was 14 feet long by 7 feet wide and 15 ewes was a suitable number to handle at one time. Ewes were caught while standing around the perimeter of the pen, and dagged in the central area of the pen. All dags were discarded.

Race Method

The race method is a specialised method of pen dagging. Sheep are driven into the race, and are then dagged individually from behind, starting with the last sheep into the race. Dagging races on Farm 17 and Farm 49 were inspected during the survey.

The dagging race on Farm 17 was not specially constructed,

but was part of the main sheepyards layout. The farmer had constructed an overhead rail to carry the portable dagging plant along side the race. The race held 50 ewes and lambs at one time. Using this dagging method, Farmer 17 said that he was able to dag 400 to 500 sheep in 4 to 5 hours without extra labour.

The dagging race on Farm 49 had been constructed at a cost of $220. for materials. The farmer had copied the design from a description of a dagging race in a farming magazine 31/. He and a shepherd spend two 8 hour days laying the concrete and placing the welded pipe rails in position. Farmer 49 estimated that one man could dag approximately three times as many ewes in the dagging race compared with the same time interval using the board method.

5.4.4.3 Evaluation.

The advantages of both the pen and race methods of dagging compared with the board method, are mainly concerned with the decreased amount of handling of sheep that is possible. Because both the pen and the race can be sited anywhere on a farm, with power supplied by a portable plant, sheep mustering and droving time can be markedly reduced.

Sheep handling in the dagging operation can also be reduced, since only sheep requiring dagging need be handled. The operational movements for each method of dagging are shown in Fig. 5.3. Other sheep in the race or pen need not be handled. The race method is likely, under many dagging conditions, to involve the least physical effort on the part of the operator, since with many sheep it is possible to dag sheep while they are standing. The pen method requires that all sheep to be dagged must be handled into the usual board dagging position, but

31. Anon., "2 Men Dag 1200 Sheep in a Day, But Don't Catch One", The New Zealand Farmer, 87, 11, August 11 1966, pp.11-13.

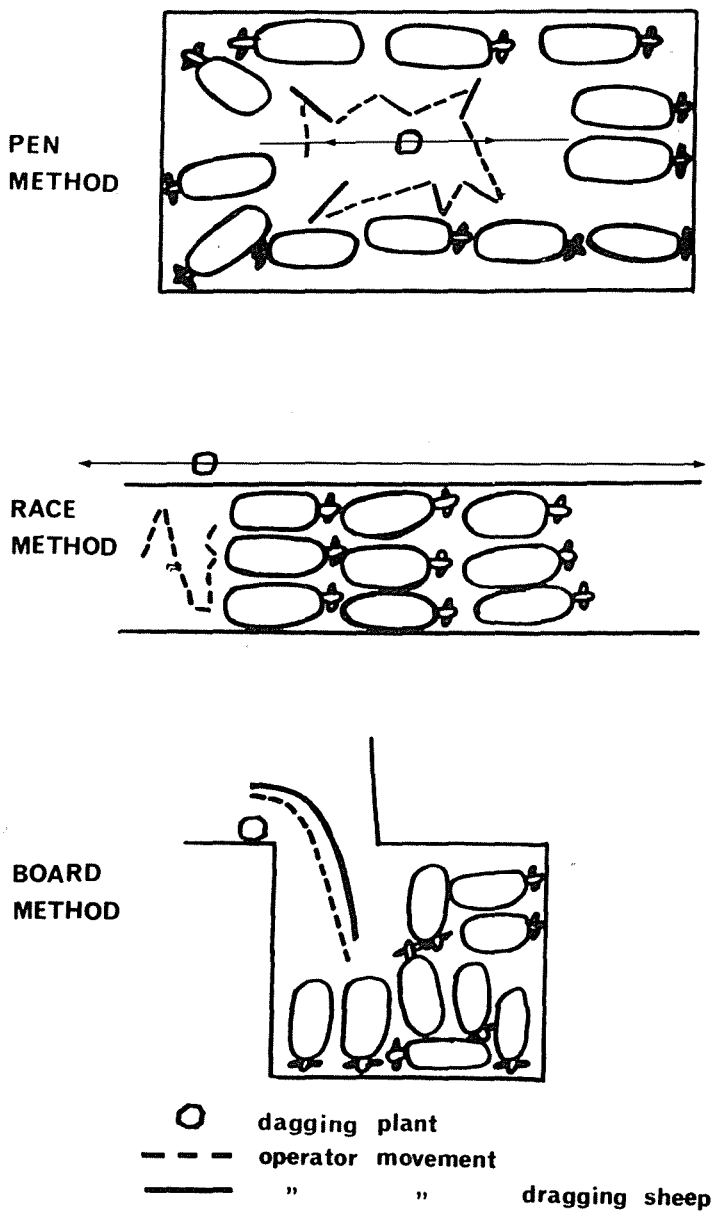

Fig. 5.3 Diagrammatic Representation of the Operational Movements Involved in Three Dagging Methods.

because of the location of the dagging plant within the pen, little dragging of sheep into a suitable position is necessary. Thus both the pen and race methods require less physical effort than the board method for most types of dagging operations.

The operating conditions of both pen and race methods are not likely to be as good as the board method. Whereas with the board method the operator is working under the same conditions as for shearing, with adequate lighting, adequate working area, freedom from draughts, and shelves to put extra equipment on, the working conditions of the pen and race methods are likely to be comparatively arduous.

With the pen method the operator frequently has to work under bad lighting due to shading by the sheep, and because of the numerous different dagging positions adopted within the pen. The operator is likely to be frequently bumped by sheep moving around the perimeter of the pen. The operator must also hold the dagging hand piece during dagging because it cannot be put down in the pen of sheep.

The race method has better working conditions than the pen method. By driving the sheep into a long narrow race pen the sheep can be held in position for dagging by standing at the rear of the race. Unlike the pen method, in the race each sheep is released from the race after it has had the required dagging. Hence the operator is not subjected to bumping by sheep milling around, as movement is restricted, and after dagging they are released from the race.

However each race full of sheep (particularly ewes) must be dagged in one operation. The reason for this is that if left, the sheep become less tightly packed in the race, and some may even turn and face the other direction. Thus the positioning of sheep in the race ready for

dagging is changed, and individual sheep may have to be dragged into a suitable dagging position. This negates one of the main advantages of this method.

TABLE 5.24 COMPARISON OF TIME TAKEN FOR EACH OF THREE DAGGING METHODS[a]/

	Method		
	Pen	Race	Board
Pen Capacity - Ewes	15	40	10
Time - Per Ewe (seconds)	30	25	45
- Total Time Refilling Pen (Minutes)	33	25	25
- Total (Man Hours)	4 hours 43 min.	3 hours 53 min.	6 hours 40 min.
Cost of Extra Equipment	$40 - $70	$50 - $250	-

Assumptions - One man dagging 500 mixed age Romney ewes prior to main shearing in November. All ewes were previously second shorn in May. Every ewe requiring some dagging.

a. Figures used are estimates made by the author based on data collected during the farm survey.

5.4.5 Footrot Control

5.4.5.1 Discussion

Footrot is an infectious organism present in all North Island sheep farming areas. It has been defined as:

> "a contagious disease of the sheep's foot characterised by separation of a large portion of the hoof from the soft tissues due to a spreading infection immediately beneath the horn and caused primarily by Fusiformus nodosus". 32/

32. Beveridge, W.I.B., (1941), Bull, Coun. Sci. industr. Res. Aust., No. 140.

Footrot is different from "foot scald", which is infection between the two digits, although the infecting organisms and the predisposing conditions may be similar.

The incidence of footrot varies, with slow infection under hot dry conditions and rapid infection under warm humid conditions. The incidence may also vary with stocking rates, the length of pasture and ground moisture. However even under ideal conditions, footrot organisms are not likely to survive without a host (the sheep's foot) for longer than 14 days. Under adverse conditions the length of survival may be only 1 to 2 days.[33]

Footrot affects sheep farm production in several ways. It is one major cause of sheep lameness and lowered flock mobility, and as a consequence lower wool and lamb production. More shepherding may be required, and extra work may be created through treating flystrike that occurs as a side effect of footrot.

Most sheep farmers pay some attention to footrot in their flocks, but treatments vary. There are three main methods of treatment:

(i) Clipping and treating all ewes' feet once a year.

(ii) Clipping and treating the feet of lame ewes, and putting the rest of the flock through a footrot bath.

(iii) Clipping and treating lame ewes, or culling them; and not treating the rest of the flock.

Some farmers leave the whole flock untreated. Eradication of footrot is rarely attempted on North Island sheep farms. Although claims have been made that footrot can be eradicated from flocks [34],

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33. Burnett, R.E., "Footrot in Sheep can be Eradicated", New Zealand Journal of Agriculture, 113, 4, p.22.

34. Burnett, R.E., op.cit., and Miller, J.A.,"Foot Rot Scheme Successfully Operated", New Zealand Journal of Agriculture, 100, 4, April 1960, pp. 322 - 324.

few North Island Farmers have attempted eradication programmes. No studies have been made of the profitability of footrot eradication schemes.

However current North Island practice in treating rather than eradicating suggests that the extra labour required for eradication may be more profitably employed in other farm operations. Thus this section on footrot is concerned with time saving methods of controlling the disease.

5.4.5.2 Farm Survey Data

One method of footrot control was studied during the survey and is described below. One other approach to the problem footrot was also noted. This is discussed briefly.

The method studied was on Farm 10 which had previously been in a footrot eradication scheme. 35/ Although the scheme had contributed to a decrease in the incidence of footrot in the area (from 50 per cent to 5 per cent), eradication had not been achieved. The farm consisted of 880 effective acres of moderately podzolised rolling gumland clay (550 acres) and mainly clay country (330 acres). The permanent labour force was 1.5 units, and the number of sheep wintered in 1966 was 4287 (3200 ewes).

Although the incidence of footrot on the farm had previously been high, with up to 50 per cent of the ewe flock requiring treatment, the incidence at the time of the farm survey was 5 to 10 per cent. The farmer considered that the lowered incidence was due to several factors: the eradication scheme, higher stocking rates and shorter pasture lengths,

35. Briscoe Moore, A., and Ensor, C.R., "Purua Foot Rot Scheme" New Zealand Journal of Agriculture, 100, 3, March, 1960, pp. 245 - 249.

and increased farm drainage.

The control method for footrot used at the time of the farm survey did not attempt to treat all sheep as did the eradication scheme, but the farmer considered that at the present stage of farm development the footrot incidence could be kept at a low level using this method.

The method used was to draft off the lame ewes at weaning time in January. The lame ewes, which comprised about 5 per cent of the flock were individually inspected in a footrot cradle and their feet inspected and pared. The remainder of the ewe flock were driven through a footrot bath containing a 5 to 10 per cent formalin solution.

The labour used for treating the flock, consisted of the farmer and a youth. The operation was completed over a period of one week. However the farmer estimated that the time spent solely on the footrot operation was approximately 40 man hours.

The approach to footrot on Farm 2 was to pare the feet of all ewes (excluding two-tooths) after weaning in December. Two or three men pared the feet of 2400 ewes on the shearing board. All the ewes were put through a foot bath containing formalin. The operation took 7 to 10 days and was carried out annually.

5.4.5.3 Evaluation

Under most North Island sheep farming conditions some incidence of footrot is present in flocks. With the prevailing conditions of rainfall of over 40 inches per annum in the principal sheep farming areas (see Fig. 2.1) and lower permanent labour input per ewe, the eradication of footrot is likely to be a difficult and costly objective to attain. Treatment of seriously affected ewes seems profitable, but the profitability of treating the complete ewe flock annually

seems questionable.

The method of control used on Farm 10 had two main advantages:

(i) By handling only lame ewes and putting the remainder of the flock through a foot bath, it ensures a maximum return from lame sheep, while containing the disease in the whole flock.

(ii) In contrast to the method of complete treatment of the whole flock used on Farm 2, the control method, requiring fewer man hours, makes labour available for other farm operations over the busy summer and autumn period.

Several management techniques should be used in conjunction with the control method; treatment of all rams feet, control of spring and summer pasture growth, higher stocking rates and increased farm drainage.

A comparison of the time taken for the control method as used on Farm 10, and the complete treatment method as used on Farm 2 is given in Table 5.25.

TABLE 5.25 COMPARISON OF OPERATIONAL TIME [a]

Complete and Control Methods of Footrot Treatment on Hypothetical Sheep Farm (Appendix C).

Part of Operation	Time - Hours and Minutes	
	Control Method	Complete Treatment Method
Mustering	3.00	3.00
Droving	1.00	1.00
Drafting off 10% lame ewes	3.00	-
Penning ewes	0.15	2.30
Foot paring at 5 minutes per ewe	12.30	75.00
Drafting off 10% lame ewe	-	3.00
Foot bath - Remainder of flock	1.00	1.00
Returning remainder to paddock	0.30	0.30
Re-examination of 10% lame ewes	0.30	0.30
Treatment and foot bath	2.00	2.00
Returning to main paddock	0.30	0.30
Time Saved (man hours)	64.45	-
	89.00	89.00

a. Figures used are estimates made by the author based on data collected during the farm survey.

5.4.6 Docking

5.4.6.1 Discussion

Docking is carried out every year, 2 to 4 weeks after the beginning of lambing. It consists of tailing and ear marking all

lambs, and castrating male lambs. Vaccinations for pulpy kidney and scabby mouth are also often given.

The operation is sometimes carried out in additional yards, but more often in temporary yards constructed specially for the purpose. There are two main reasons for using temporary or additional yards; first, ewes and young lambs are difficult to muster and drove long distances to permanent yards, and secondly, permanent yards increase the risk of infection.

Two or three people are generally required at docking to erect yards, muster ewes and lambs, and carry out docking. The number of lambs docked per day may vary between 200 and 500, depending upon several factors, the most important being the time taken for mustering, the size of the mob, and whether more than one mob can be docked without shifting the docking yards and equipment to a new site.

5.4.6.2 Farm Survey Data

There was little variation in the basic docking method described to the author during the farm survey. In addition many farmers showed personal preferences which were not based on temporal considerations. Because of this, and because of the many variations possible on the basic docking technique, it was difficult to compare any complete docking operations. However particular aspects of individual operations did lend themselves to comparisons.

Docking Yards

There was considerable time saved either by having portable yards, or by having part of the docking yards permanently in position. The only yard erection ~~was~~ required was for setting up several hurdles, or netting or scrim "wings" to guide to ewes and lambs into

the docking yards. The time saved in erection was likely to range from 15 minutes to 1 hour, for 2 men erecting yards to hold 400 ewes and lambs. Several farmers regarded scrim as easier to handle and quicker to erect than wire netting.

On Farm 5, which consisted of 4500 effective acres of steep hill country, permanent docking facilities were constructed from wire netting and iron standards. These facilities were sited at the junctions of farm tracks throughout the farm. The type of facility is illustrated in Fig. 5.4. Throughout the year sheep became accustomed to grazing around and walking through the yards which were open at both ends.

At docking time the necessary gates and docking hurdles were added to complete the docking yards. The farmer claimed that ewes and lambs were relatively easily driven into the yards since they were sited on farm tracks, and because the ewes had become accustomed to the netting. The advantages of this type of yards were the small expenditure required, the ease of yarding ewes and lambs, and the time saved in erection of complete yards and transporting around the farm at docking time.

On Farm 45, a portable docking pen had been built. This is shown in Fig. 5.5. The pen was mounted on two wheels and was towed in the same way as a trailer. Ewes and lambs could be brought into the pen from either end, and ewes could be drafted out through any of the four side gates. Docking could be carried out from either side.

The pen had adjustable "legs" in each corner, so that the pen could be lowered to the desirable operating height. The operator stood outside the pen, while one or two people filled the pen with ewes and lambs, drafted off the ewes, and put the lambs individually into the multiple docking cradle.

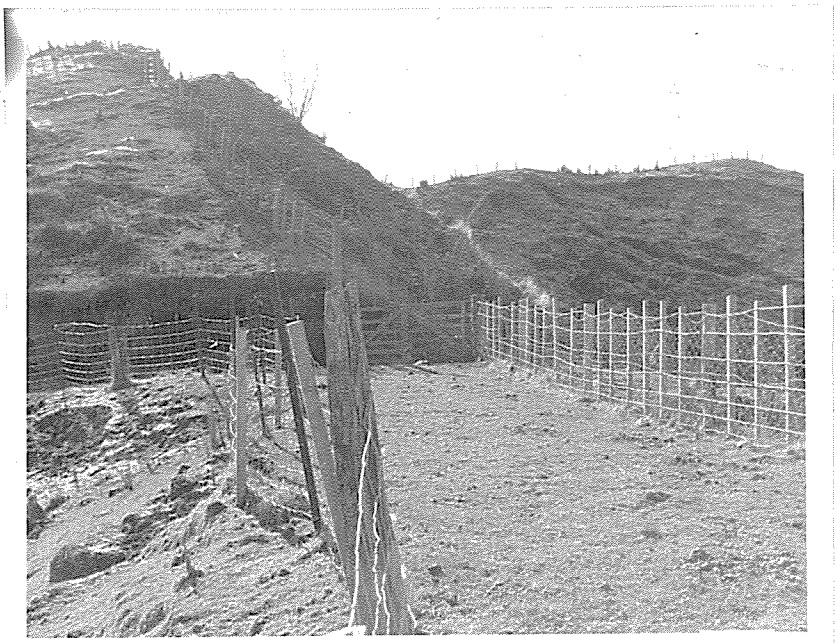

Fig. 5.4. Permanent Docking Fence on Farm 5.

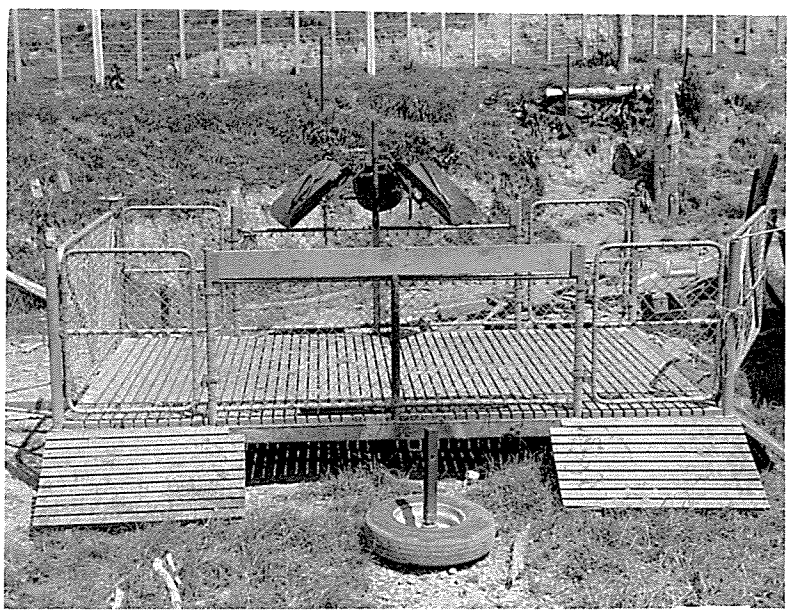

Fig. 5.5. Portable Docking Pen on Farm 45.

While in transit the pen served as a trailer and it was used to carry all docking gear. The farmer said that 3 people could set up the pen and scrim wings in 10 to 15 minutes. The docking pen was built at a cost of $700.

Docking Cradle

With two men docking lambs, one holding and the other performing the various tasks, a method of reducing the waiting time of the operator is to have a lamb held and ready in a docking cradle. This allows the lamb catcher some latitude in catching lambs. In effect the cradle serves as another man.

Docking Techniques

Castration of male lambs was claimed by two survey farmers to be done most efficiently if first in the docking technique. The reason was that the shock from ear marking, tailing or injections causes contraction of the testical muscles making castration difficult.

The particular tailing technique may be using a knife, rubber rings, or a searing iron. Where the searing iron is used, a gas heated iron saves considerable time as compared with preparing and maintaining the fire for a fire heated iron.

5.4.6.3 Evaluation

Docking is one of the more repetitive farm operations that is performed by farm labour. Although there are numerous variations possible on the basic docking method, these are determined by a number of factors as well as the time taken. In addition there is likely to be a high return for the time spent arranging additional labour for docking.

However even with additional labour, docking time can be saved through the use of permanent or portable docking yards, and a docking cradle.

5.5 Chapter Summary

In this chapter, labour saving techniques were discussed and evaluated under three main headings: management, mobility, and saving labour during farm operations.

The chapter was primarily concerned with movements from C to OA (Fig.4.1). However the labour saved with some techniques, such as the use of Perendales (as a complete flock) and second shearing Romney ewes, indicated the possibility of moving to a higher production function such as OB (Fig. 4.1).

Mobility was an important way of saving labour. Hence on many North Island sheep farms, simply recognising that mobility was important, and becoming more "vehicle conscious" (i.e. using the existing farm vehicle more often, and taking advantage of suitable topography by maintaining mobility in these areas), allowed movement from C to OA (Fig.4.1).

However, single labour saving techniques in most cases can only alleviate one or two "labour peaks" during the year. A labour saving management approach is required in order to plan and co-ordinate labour utilisation. Further, labour saving techniques and labour utilisation must be considered in the context of a management system. This is the subject of Chapter 6.

CHAPTER 6

FARMS WITH HIGH NUMBERS OF BREEDING EWES PER PERMANENT LABOUR UNIT

This chapter describes the resources and management of sixteen farms with high numbers of ewes per permanent labour unit, studied by the author during the course of the survey (see Section 3.5.1). These farms are described as having high average labour productivity. This is defined in terms of numbers of breeding ewes per permanent labour unit. Labour saving techniques used are discussed in the context of the farm physical descriptions and the husbandry practices on these farms.

The first section describes the physical features of the sixteen farms and the second section describes the management systems. Section three reviews the characteristics of the farms contributing to the high labour productivity achieved on each farm. Section four contains a case farm description of five high labour productivity farms, and a marginal analysis of the profitability of employing an additional permanent labour unit on each farm.

6.1 Physical Description

6.1.1 Location

The location of the sixteen farms can be seen in Fig. 3.1. This shows that all the main North Island sheep farming regions are represented, with the exception of the East Coast.

6.1.2 Sheep Policy

The management policy and some of the main climatic and topographic features of the sixteen farms are summarised in Table 6.1.

Four of the farms had a policy directed exclusively towards wool and fat lamb production. These farms bought ewes and mated them with fat lamb sires to produce fat lambs.

Eleven farms had a basic breeding policy although nine of these fattened wether lambs when the season was favourable. One farm, with two blocks of land, had a breeding policy on one, and a fat lamb policy on the other.

6.1.3 Physical Features of the Farms

The sixteen farms differed in many important physical attributes. The effective, or grazeable area ranged from 440 to 4,800 acres, and the topography ranged from flat to very steep hill country. With four exceptions (Farms 1, 4, 5 and 11), most of the land within each farm consisted of rolling to moderate hill country.

Moderate tracking was required to facilitate access and management on these farms. Farms 1, 4 and 5 [1] consisted mainly of steep hill country, and relied heavily on tracks for access around the farm for stock handling and other farm operations. Farm 11, on the other hand, consisted of rolling country which was negotiable throughout much of the year by car - with the help of some tracking.

None of the sixteen farms were in what might be called 'drought areas', although Farms 3 and 8 did experience a lack of summer rainfall which had a significant influence on the type of management practised.

At the time of the survey all farms were increasing stock numbers, although in only five cases did the farmer appear to have a definite objective, (see Table 6.6). The farm development necessary

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1. See Fig. 6.1.

for stock increases consisted in most cases of topdressing and oversowing.

6.1.4 Farm Labour

On each farm the farmer acted as a manager as well as contributing to the permanent labour force - on eleven farms farmers acted as owner-operators, and did not employ permanent labour. Hence only five farmers employed permanent labour.

Almost all farmers however used casual and contract labour, but farms 8 and 15 only employed contract labour, and Farm 11 only employed casual labour. Thus although the number of ewes per permanent labour unit was relatively high, all farms did in fact employ other labour when necessary (see Table 6.2).

Family labour was "employed" as casual labour for various operations on all of the owner-operator farms, but apart from Farm 10, this was no so on farms with more than one permanent labour unit.

6.1.5 Facilities and Equipment

The author considered the facilities on the sixteen farms were normal for farms of their respective sizes and that there was little evidence of intended substitution of capital for labour. Nearly every farmer considered additional yards and improved farm access, over and above that already present on their farms, were essential in maintaining and increasing ewes per man, and Farms 1, 6, 12 and 13 intended constructing additional yards. Facilities and equipment are tabulated in Table 6.3.

Access Around the Farms

Natural farm access in most instances was supplemented by farm tracks and, in many cases by the use of public roads. Generally farmers appeared to have adequate access for their individual management

systems, although in three instances (Farms 1, 4 and 5 [2]) it was evident that management had been significantly modified because of limited access.

Subdivision

There was considerable variation in the number and average size of grazing paddocks, as shown in Table 6.3. Much of this variation could be explained by the stage of farms' development. Farmers did not seem to have any optimum number of paddocks in mind, but some farmers said that a certain minimum number of paddocks (about 15) was necessary for effective farm management. Farm 15 had 31 holding paddocks but most of these were partitions of the farm race.

Woolsheds, Sheep Yards

Apart from Farm 1 which made complete use of a neighbouring woolshed, farms were self sufficient with regard to crutching and shearing. Sheep yards and sheep numbers were in usual proportions on the survey farms, but, as indicated earlier, some farmers intended building additional sheep yards. Farm 5, consisting of steep hill country had fifteen partly constructed docking yards consisting of wire netting, posts and iron standards, to which the necessary gates were added at docking time.

Transport Equipment

A variety of farm transport was used as indicated in Table 6.3. All but four of the farms had wheel tractors, but only Farm 5 owned a crawler tractor [3], and only two of the fifteen wheel tractors

2. These three farmers were all on steep hill country and with relatively poor access were all carrying Romney "easy-care" sheep (through necessity). They were relying on natural selection and in increasing stock numbers to give them lighter and fitter sheep.
3. Farmer 5 had half shares in a bulldozer and driver.

were used for cultivation. The remainder were used as "farm hacks", for carting materials and for miscellaneous jobs such as weed spraying, topping rushes and hay making.

Operational Equipment

In addition to the usual plant in woolsheds, farmers had dagging plants which were portable, drenching races and sheep dips. However there was a marked tendency for shower dips in preference to other kinds. Nine farms used shower dips, four used spray dip and two used plunge dips. 4/

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4. The other, Farmer 16, used both a spray and a plunge dip.

TABLE 6.1 LOCATION AND PHYSICAL DESCRIPTION OF SIXTEEN HIGH EWES/MAN FARMS

Farm No.	Farming Region	Sheep Policy	Farm Area (Acres) Total	Farm Area (Acres) Effective	Topography [a]	Rainfall Per Annum (Inches)	Rainfall Distribution
1	Rangitikei	Breeding	2760	2500	Steep	40-60	Well spread
2	Rangitikei	Breeding	1165	1000	Moderate	40-60	Well spread
3	Hawkes Bay	Breeding and Fat Lamb	870	770	Flat to Steep	40-60	Dry Summer
4	Rangitikei	Breeding	1788	930	Steep	40-60	Well spread
5	Rangitikei	Breeding	5588	4800	Steep	40-60	Well spread
6	Rangitikei	Breeding	837	800	Rolling to Moderate	40-60	Well spread
7	Waikato	Fat Lamb	490	440	Rolling to Moderate	40-60	Well spread
8	Wairarapa	Breeding	2868	2850	Flat to Moderate	30-40	Dry Summer
9	Central Auckland	Fat Lamb	691	680	Rolling to Moderate	40-60	Dry Summer
10	Northland	Breeding	991	880	Rolling to Moderate	60-100	Well Spread
11	South Auck.	Fat Lamb	1130	1100	Rolling	40-60	Well Spread
12	Rangitikei	Breeding	1500	1200	Rolling to Moderate	40-60	Well spread
13	Raglan-King Country	Breeding	1100	700	Rolling to Steep	60-100	Well spread
14	Rangitikei	Fat Lamb	577	550	Moderate to Steep	40-60	Well spread
15	Hawkes Bay	Breeding	1150	1120	Flat to Rolling	40-60	Well spread
16	Rotorua-Taupo-Matamata	Breeding	1550	1500	Rolling to Moderate	40-60	Dry Summer

a. The four designations for Topography are defined in the Glossary.

TABLE 6.2 FARM LABOUR

Farm No.	Permanent - Number		Type of Extra Labour	Ewes/Permanent L.U.
	Farmer	Staff		
1	1	-	CS. & CT.	3000
2	1	-	CS. & CT.	2650
3	1	-	CS. & CT.	2300
4	0.5*	-	CS. & CT.	2000
5	1	2	CS. & CT.	2633
6	1	-	CS. & CT.	2100
7	1	-	CS. & CT.	3000
8	2*	2	CT.	2030
9	1	-	CS. & CT.	2100
10	1	0.5	CS. & CT.	2000
11	1	-	CS.	6000
12	1	-	CS. & CT.	3350
13	1	-	CS. & CT.	2200
14	1	-	CS. & CT.	2200
15	2*	1	CT.	2200
16	1	2	CS. & CT.	2160

CS. - Casual labour, including family labour.
CT. - Contract labour, not including contract services.

* Farms 4, 8 and 15 managed as partnerships; Farm 4 managed on a part-time basis.

TABLE 6.3. FARM FACILITIES AND TRANSPORT EQUIPMENT

Farm No.	Effective Acreage	Total Sheep [a]	No. of Woolsheds	No. of Sheepyards	Additional Access [b]	No. of Paddocks Grazing	No. of Paddocks Holding [c]	Transport Equipment
1	2500	6890	-	2	Tracks	16	3	Landrover
2	1000	4271	1	1	Tracks, public road	18	10	Wheel tractor, horse
3	770	2356	1	2	Tracks, public road	24	4	Landrover, Wheel Tractor
4	930	3700	1	1	Tracks	7	3	Wheel Tractor, horse
5	4800	12,900	2	5	Tracks, public road	40	10	Landrover, wheel tractor motor bike, horse
6	800	2960	1	2	Tracks, farm race	20	8	Wheel tractor
7	440	3060	1	1	Tracks, public road	30	3	Wheel Tractor
8	2850	10,552	2	3	Tracks, public road	101	8	Landrover (2), motor bik horse.
9	680	2552	1	2	Tracks, public road	27	3	Wheel tractor
10	880	4287	1	2	Tracks, public road	35	5	Landrover, wheel tractor horse
11	1100	6120	1	1	Tracks	54	6	Wheel tractor
12	1200	4170	1	2	Tracks	18	2	Four wheel drive truck
13	700	2995	1	1	Tracks, public roads	20	2	Wheel tractor, motor bik horse
14	550	2240	1	1	Tracks, public road	10	2	Truck, 3 Wheel vehicle
15	1120	8190	1	5	Tracks, race, public road	65	31	Wheel tractor (2), motor bike (2), truck, 3 wheel vehicle.
16	1500	6800	1	2	Tracks, public road	55	6	Landrover, wheel tractor

a. At 30 June 1966.
b. Access in addition to 'normal paddock access'.
c. Paddocks constructed and used primarily to assist sheep handling.

TABLE 6.4. STOCK WINTERED AT 30 JUNE, 1966

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Sheep																
(1.0) Ewes	3000	2650	2300	2000	8500	2100	3000	8121	2100	3200	6000	3350	2200	2200	6600	6500
(0.6) E.Hts	1000	1300	-	1400	3000	800	-	2171	200	800	-	750	750	-	1500	-
(0.6) W.Hts	800	200	-	-	1000	-	-	20	200	190	-	-	-	-	20	-
(0.6) Wthrs	2100	35	-	100	-	-	-	50	-	34	-	-	-	-	-	150
(1.0) Rams	80	86	56	200	400	60	60	190	50	63	120	70	45	40	70	150
Total Sheep	6980	4271	2356	3700	12900	2960	3060	10552	2550	4287	6120	4170	2995	2240	8190	6800
Cattle																
(5) Cows)		233	124	-	300	86	-	250	72	145	36	-	120	-	-	-
) 267																
(4) Heifers)		49	-	-	100	45	-	40	15	-	64	-	26	-	-	-
(3) Yrlgs)		110	-	-	-	55	-	157	-	176	-	-	43	-	-	500
) 285																
(3.5) Steers)		14	-	100	200	-	-	110	-	74	354	-	-	30	70	-
(5) Bulls	5	6	2	-	8	3	-	38	2	3	-	-	4	-	-	-
Total Cattle	557	412	126	100	608	189	-	595	89	398	454	-	193	30	70	500
Ewe Equivalents *																
Sheep	6020	3657	2356	3100	11300	2640	3060	9656	2390	3877	6120	3870	2725	2240	7597	6725
Cattle	2131	1750	630	350	2640	790	-	2456	430	1527	1675	-	853	105	245	1500
Total	8151	5407	2986	3450	13940	3430	3060	12112	2820	5404	7795	3870	3578	2345	7842	8225
EE's/Acre	2.9	5.4	3.9	3.7	2.9	4.3	6.9	4.2	4.1	5.5	7.0	3.2	5.1	4.3	7.0	5.5
EE's/Man	8151	1750	2986	3450	4646	3430	3060	3037	2820	3602	7795	3870	3578	2345	2614	2741
Ewes/Man	3000	2650	2300	2000	2633	2100	3000	2030	2100	2000	6000	3350	2200	2200	2200	2160

* The ewe equivalents for each class of stock appear in the left hand column.

6.1.6 Stock Wintered

The number of stock wintered on each farm is given in Table 6.4. Although most farms wintered cattle there was considerable variation in the proportion of sheep to cattle. Farms 1 and 2 had relatively low ratios of sheep to cattle but this was evidently not the result of substitution of cattle for labour. Farm 1 was in a stage of development where adequate cattle were considered necessary and Farm 2 had reasonable cattle numbers but probably less than maximum sheep numbers because the farmer did not like "seeing stock hungry".

6.2 Management of the Farms

6.2.1 The Farmers

The farmers did not have many attributes in common. They had a wide range of ages and education, as shown in Table 6.5.

TABLE 6.5. FARMER AGE AND EDUCATIONAL LEVEL

Age Distribution:

Age Group	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	Over 50	Tota
Number of Farmers	5	2	2	3	3	1	16

Educational Level:

Qualification	Primary School	Secondary School 2-3yrs.	U.E.	H.S.C.	Other	
Number of Farmers	2	9	3	1	1*	16

* Massey Sheep Diploma.

Almost every farmer however, had an optimistic and confident attitude. Although often uncertain about the future, the farmers felt that many new situations could be turned to their own advantage.

6.2.2 Management

All farmers expressed farm goals or objectives in terms of stock numbers to be carried, but only five farmers could indicate a definite target figure to be aimed at several years ahead. None of the farmers specifically stated his objectives in terms of farm profit or return on investment.

The degree of planning varied. The author did not see any examples of detailed long term planning, and even yearly planning was not always detailed. In most cases farmers seemed to be advancing in "yearly steps", as shown in Table 6.6, using the previous year as a "benchmark". Because of this the author gained the impression that many farmers felt that with income and expenditure in similar proportions to the previous year they could "feel their way" 5/ quite well enough without detailed planning and control.6/

Seven farmers prepared formal yearly budgets, usually in association with their accountants or lending institutions. Four other farmers prepared rough budgets which served as guide lines for the year's operations "in their heads". In planning day-to-day operations, stock work had priority on all farms.

6.2.3 Husbandry Practices

By and large the sixteen farms used husbandry practices which were characteristic of their districts and topographies. The author

5. This was well illustrated by Farmer 5. With the fall in wool prices in the 1966-67 season, he said it would be necessary to draw up a budget in order to cut farm expenditure by $16,000!

6. Discounting the usefulness of detailed financial control may be due to: confidence in experience and instinct, lack of confidence in using formalised management, and pessimism as to the usefulness of detailed financial planning and control with uncertain and fluctuating market prices.

TABLE 6.6 FARMERS' FINANCIAL PLANNING AND FARM OBJECTIVES

Farm No.	Financial Planning			Farm Objective	
	Mental Budget	Rough Budget.	Formal Budget	Yearly	Future Goal
1			X		X
2	X			X	
3			X	X	
4			X		X
5	X			X	
6		X		X	
7			X		X
8		X		X	
9		X		X	
10	X			X	
11		X		X	
12			X		X
13			X		X
14	X			X	
15			X	X	
16	X			X	
Total: 16	5	4	7	11	5

considered that any differences between the sixteen farmers and their respective district practices, was a question of degree. That is, the sixteen farmers differed fromtheir respective district practices in the amount of emphasis, the quality and the time spent on farm operations.

6.2.3.1 Tupping

The sixteen farmers varied on all aspects of tupping management. Most farmers thought it was not very important to flush ewes. The degree of flushing varied mainly with available yearly autumn feed rather than definite attempts to get the ewes into "good" condition. Farmers 2, 3, 6 and 7 considered flushing was important, while Farmers 11 and 16 thought it was good practice but made no special effort to flush ewes, apart from normal seasonal grazing. All farmers with mixed age flocks mated two-tooth ewes separately. The total percentage of rams used during mating varied from 1.5 per cent to 4 per cent, with many farmers replacing and adding the remaining rams as tupping progressed. Understandably farmers using lower ram percentages were more concerned with individual ram performances. Farmer 2 used one ram per 100 ewes for ten days and then replaced the ram and worked on a ten day rotation for a total of 2 per cent rams. In this way he said the rams did not get over-fatigued. Farmer 9 used 1 per cent rams for the first fortnight and then added the other 1 per cent to prevent fighting and injury to rams. Only two farmers (3 and 4) put all rams out at the start of tupping.

No particular grazing system was followed during tupping. Rotational grazing, set stocking, and combination systems of grazing were used.

6.2.3.2 Wintering

During late autumn and early winter many of the farmers allowed their ewes to lose condition. For many farmers this occurred in the course of pasture management and designed to "get pastures into order" for good winter and early spring growth; but two farmers (2 and 9) actively pursued a lowered nutritional level for the ewes. No farmers increased ewe nutrition after tupping.

All farmers attempted to keep ewes on an even plane of nutritional over the winter, and from this stage onwards five farmers initiated supplementary feeding. Farmers 2 and 6 fed choumollier [7], and Farmers 7 and 14 fed out hay, and Farmer 16 fed swedes. Five farmers drafted out ewes in low condition and the frequency of drafting varied from once during the winter period, to once every three weeks during this period.

The percentage of ewes drafted out was 2 to 10 per cent with most farmers drafting off about 5 per cent. Other farmers (13 and 15) achieved the same objective by making adjustments to the stocking rates in individual paddocks during set stocking. Two fat lamb farmers (3 and 14) had the opportunity to draft off ewes in low condition when drafting dry ewes in late winter.

Towards lambing time thirteen farmers [8] drafted the ewe flock into lambing groups. Most farmers drafted ewes according to their udder development. In each case a mob of the earlier lambing ewes was drafted out but the balance were either drafted into a mob of ewes due to lamb during the middle of lambing and a mob of ewes due to lamb towards the end of lambing, or left as one mob and redrafted later. The author felt that farmers' drafting methods were varied mainly according to the available feed and the ability to control ewe nutrition. Thus on Farm 15 the high stocking rate management system meant there was sufficient feed to allow the ewes to meet seasonal nutritional requirements but without "putting on condition". Ewes could be drafted up after lambing.

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7. Both farmers have since ceased cropping.

8. The other three were Farmers 4, 5 and 15. Farmers 4 and 5 left their ewes largely unshepherded from tupping to weaning whilst Farmer 15 shepherded intensively during lambing and drafted out "late"and "dry" ewes about three weeks after lambing had begun.

Fig. 6.1. Typical Topography on Farm 1.

Fig. 6.2. Typical Topography on Farm 11.

That is, the grazing system was sufficiently restrictive, and lambing shepherding sufficiently intensive, that ewes in various stages of pregnancy could be successfully run together, and hence late ewes could be drafted off after most lambing had finished.

6.2.3.3 Lambing

The lambing period is considered to be the main "labour peak" by most North Island sheep farmers, but it was managed without much difficulty by the sixteen survey farmers. The author considered that although these farmers varied in their individual lambing practices, they all used techniques which are commonly practised throughout the North Island.

They differed, however, from usual practice in the emphasis they placed on various aspects of lambing. Understandably most were reluctant to mother up many orphan lambs with ewes that had lost lambs, preferring instead to attempt to avoid such situations and/or ignore them. It was significant in this respect that only three farmers (2, 6 and 16) attempted to raise the level of nutrition for ewes immediately prior to and during lambing. 9/ The other farmers relied on the increased seasonal pasture growth and the conditioning of ewes to a relatively even nutritional plane. To achieve this set stocking during lambing was most commonly practised and few farmers (2, 3 and 9) attempted "shedding out" unlambed ewes on a large scale.

Most farmers shepherded lambing ewes twice a day, but farmers 10 and 11 shepherded once a day, Farmer 5 seldom (once a week) and Farmers 1 and 4 not at all. In each case the farm topography was considered by each farmer to preclude profitable shepherding at lambing. 10/

9. Interpretation of nutritional studies during pregnancy, principally by Wallace at Ruakura, has resulted in extension advice recommending a rising plane of nutrition for ewes during late pregnancy.

10. See section 6.1.3.

Two farmers, Farmers 7 and 16 spent all day shepherding, managing up to three rounds.

The means of transport varied but eight farmers used a horse, though frequently with some vehicle. In no case was a motor bike used alone. Where a vehicle could travel, most farmers had the attitude that it was better to collect the ewes and lambs that required special attention rather than travel back to inspect them later.

6.2.3.4 Post Lambing Management

Following lambing, set stocking was the normal practice. Docking operations varied. Most farmers used temporary yards, but one docked all his lambs using a corner of a paddock and his dogs to keep the sheep together. No preference was shown for any particular docking method or materials.

While some farmers drenched lambs at some stage prior to weaning, most drenched their lambs first at weaning which itself was frequently combined with ewe crutching, shearing or some other operation.

Shearing practices varied but all farmers shore the ewe flock in the November-January period. Most farmers second shore [11] two tooth ewes, but only Farmers 1, 10 and 11 second shore all ewes. One farmer (10) was second shearing hoggets in May in order to get better hogget growth under wet winter and spring conditions.

Culling ewes took place in late summer and was based on several criteria - dry ewes, teeth condition, age, body condition and constitution were given as the main culling criteria. [12]

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11. "Second shearing" is defined in the Glossary.

12. Farmer 5 said the visible presence of footrot was the main criterion for culling in his flock.

TABLE 6.7. SHEEP BREEDS, STOCKING RATE, LAMBING PERCENTAGE AND WOOL PRODUCTION

Farm No.	Effective Area - Acres	Wool Production - Lbs	Wool Per Acre - lbs	Sheep E.E's Per Acre	Lambing Percentage 1966	Sheep Breed	
						Ewes	Rams
1	2500	58,096	23	2.4	80	R	R
2	1000	50,033	50	3.7	105	R X B.L	R
3	770	32,533	42	4.0	96	R	R & S
4	930	19,000	21	3.3	85	R	R
5	4800	113,800	24	2.4	85	R	R
6	800	31,821	40	3.3	95	R	R
7	440	25,900	59	7.0	101	R	S
8	2850	110,922	39	3.4	105	R & R X BL	R & R X BI
9	680	22,218	33	3.5	110	R	S
10	880	41,528	47	4.4	93	R	R & S
11	1100	55,650	51	5.6	101	R & R X RL	S
12	1200	30,960	26	3.2	97	R & P	R & P
13	700	27,800	40	3.9	94	R	R
14	550	23,500	43	4.1	103	R & P	S
15	1120	83,950	75	6.8	95	R & P	R & S
16	1500	62,000	41	5.1	97	R,P & BL	R & D.D

R. = Romney; P. = Perendale; R. X BL. = Romney X Border Leicester; S = Southdown; D.D. = Dorset Down.

Few farmers attached much importance to footrot. Although footrot was evident on all farms, only Farmers 2 and 9 had comprehensive footrotting programmes. In each case almost all ewes' feet were individually inspected, pared and treated. The practices of other farmers could be described as "minimal control". This consisted of treating or culling the lame sheep and running the remainder through a footrot bath, or ignoring them. This procedure was performed once a year.

6.2.3.5 Pasture Management

Most of the sixteen farmers maintained effective grazing control. With the high stocking and fertiliser rates pasture growth was considerable, particularly in good seasons. Thus, to get pastures into good order for winter and early spring growth, use of ewe flocks after tupping for "clearing-up" grazing was frequently practised. Pasture improvement was usually carried out by oversowing.

TABLE 6.8 FARM FERTILISER USAGE - 1965 - 66

Farm No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Application Time																
Spring			X			X		X	X	X					X	X
Autumn	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Tons	250	110	65	165	400	105	74	306	83	150	280	90	100	75	230	259
Cwt per effective acre	2.0	2.2	1.5	3.5	1.5	2.6	3.0	2.1	2.4	3.0	5.0	1.5	2.9	2.6	4.0	3.5
Aerial straight Super.	X	X		X	X	X		X			X		X			X
Straight Super			X				X									
DDT Super												X			X	
Potassic Super										X						
Molybdic Super									x					X	X	
Lime (Tone)			63							300						

6.2.4 Use of Labour

While having a relatively low permanent labour force, all sixteen farmers made extensive use of other sources of labour. The author considered additional labour requirements were satisfied in three ways:

(i) substituting capital for labour,

(ii) substituting casual and contract labour and contract services for permanent labour, and

(iii) through efficient farm organisations.

Large capital/labour substitution was not evident on any farms; most farms had what could be considered as usual per man inventories of equipment. Substitution of casual and contract labour was evident particularly on Farms 1 and 11. It should be noted, however, that "peak labour" periods usually require outside help, even on "normal" sheep farms.

Organisation played a large part in satisfying labour requirements. Although difficult to quantify, the author formed the opinion that the sixteen farmers showed unusual resourcefulness in finding and arranging for assistance to meet "labour peaks". In doing this many appeared to have decided that they could get jobs done while avoiding the fixed costs associated with extra permanent labour.

The author concluded that amongst these farmers there was a distinct tendency for the permanent labour force to confine itself to management, stock work, and miscellaneous farm maintenance, and to employ extra labour to assist in, or completely carry out, large farm operations.

TABLE 6.9 LABOUR USE FOR MAIN JOBS ON 16 SURVEY FARMS

Farm No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mustering	P+CS	P	P	P+CS	P	P	P	P	P	P	P	P	P	P	P	P
Dagging	CT	P	CS	CS	CS*	P	CT	CT	P	P+CS	CS	CS	P+CS	--	P	--
Shearing	CT	CT	CT	CS	CT	CT	CT	CT	CT	CT	CS	CT	CS	CS	CT	CT
Weaning	P	P	P	P	P	P	P	P	P+CS	P	P+CS	P	P	P	P	P
Drenching	P	P	P	P	P	P	P	P	P	P	P+CS	P	P	P	P	P
Autumn Crtg.	CT	--	P	CS	P	CT	--	CT	P	--	--	CS	CS	P+CS	--	--
Second Shrg.	CT	CT	CT	--	CT	CT	CT	CT	--	CT	CS	--	CS	CS	--	--
Lambing	--	P	P	--	P	P	P+CS	P	P+CS	P	P	P	P	P	P	P
Docking	P+CS	P+CS	P+CS	P+CS	P+CS	P+CS	P+CS	P+CS	P+CS	P+CS	P+CS	P+CS	P+CS	P+CS	P	P+CS
Culling	P	P	P	P	P	P	P	P	P	P	P+CS	P	P	P	P	P
Footrotting	--	P	P	--	--	P	--	P	P	P	--	--	P	--	P	--
Dipping	P+CS	P	CT	P+CS	P	CT	CT	P	P	P	P+CS	P+CS	P+CS	P+CS	P	P+CS
Fencing	CT	CS	CT	CT	CS*	CT	CT	CT	P	CT	CT	CT	CT	CT	CT	P+CS
Fence Repairs	CT	CS	CS	CS	P	P	P	CS	P	P	CS	P	P	-	CT	P
Topdressing	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT
Cultivation	--	CT	CT	--	CS*	CT	--	P	--	--	--	--	--	--	--	P
Regrassing	-	P	CT	CT	CS*	CT	--	P	--	--	--	--	--	--	--	P
Scrubcutting	CS	P	--	CS	CS	CS	--	--	--	--	--	--	--	--	--	CT
Bulldozing	CT	--	CT	--	CS*	CT	CT	P	--	CT	--	CT	--	CT	--	CT
Maintenance	P	P	P	--	P	P	P	P	P	P	P+CS	P+CS	P	P	P	P
Drainage	--	--	--	--	--	--	--	--	--	CT	CT	--	--	--	CT	--

P = Permanent Labour
CS = Casual Labour
CT = Contract Labour
-- = Not a main job on this farm, or not done
* = Permanent Labour - but employed specifically for these jobs.

6.3 A Review of the Sixteen Farms

The sixteen high average labour productivity farms showed considerable diversity in their respective physical features, types of management, and husbandry practices. Locations of farms covered most regions of the North Island, and farm size and topography showed great variation.

There was a wide range of ages amongst the sixteen farmers. Educational levels ranged from less than six years' formal education, to a University Diploma. The sheep policies followed included breeding and fat lamb policies and a combination of both policies. Three breeds of ewes were handled; Romney, Perendale and Romney x Border Leicester.

The types of facilities and equipment on the sixteen farms included a variety of woolsheds, sheep yards and variations of the amount of farm subdivision. Some of the farmers had planned, or were using farm races. Transport vehicles included both motor bikes and four wheel drive vehicles.

The husbandry practices on the sixteen farms varied and the approaches to most husbandry practices covered the range of approaches found in North Island sheep farming. Tupping management and wintering of the ewe flock included a variety of approaches. However the approach to one aspect of lambing management was similar on most of the sixteen farms. There was little emphasis on raising the nutritional levels of ewes immediately prior to lambing.

After lambing, set stocking of ewes and lambs was practised by all of the sixteen farmers. However, this is usual North Island sheep farming practice. The ways in which stock operations were carried out after lambing also varied on the sixteen farms.

The reasons for above average labour productivity on the sixteen farms were difficult to determine. The farm characteristics and practices covered the usual range found on North Island sheep farms. Apart from high numbers of ewes per permanent labour unit, the sixteen farms did not seem to differ significantly from most North Island sheep farms. Thus initially the author found difficulty in describing any factors as being the main contributing factors to high labour productivity on the sixteen farms. For as Warren noted:

> "one of the most firmly established traits of human nature is to notice striking exceptions and to make rules from them. The normal, or usual thing is too common to be noticed." 13/

The author concluded that the main contributing factors in achieving high average labour productivity on the sixteen farms were: attitude of the farmer, mobility of the farm labour, and the simplicity of the management systems.

6.3.1 Attitude

The attitudes of the survey farmers were notable in several respects:

(i) The relative optimism and the positive approach to farming, problem solving, and to the future shown by most of the sixteen farmers.

(ii) The presence of goals for all farmers. Although only five farmers had goals more than one year ahead, every farmer had a stock wintering figure for the next year.

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13. Warren, G.F., "Agricultural Surveys", Cornell Agricultural Experiment Station, Bulletin 344, April 1914, p.421.

(iii) The relatively lesser value placed on traditional "farm standards" such as lambing percentages, stock losses and fleece weights. Thus the management policy of Farmer 10 was not "to farm for the highest possible lambing percentage, or absolute maximum production, but rather for good production that can be profitably managed".

(iv) The tendency to view the farm "as a whole". The author felt most survey farmers were more flexible in their approach to problem solving than most sheep farmers. As an example Farm 1 carried stock of only average quality, had a usual hill country pasture composition, and had average quality farm tracks and fences; this farm was unusual because of the low running costs and low labour costs for a farm of its size.

In summary, the author considered the survey farmers had, as a group, a more optimistic, positive confident and venturesome attitude that would a random group of farmers, and that this was the major factor influencing high labour productivity.

6.3.2 Farm Mobility

The mobility of the labour force appeared as an important factor influencing labour productivity. On some farms this was obvious; on Farm 1, which consisted of 2500 acres of steep hill country, a land-rover and 7.5 miles of main farm track helped one man to manage almost 7,000 sheep.

On other farms it was not so obvious. Thus Farm 15, although easily traversed on foot, was in fact managed (by a labour force of three) with the aid of extensive farm races and a comprehensive range of farm transport equipment (see Table 6.3). Again, Farm 11, which consisted of 1100 effective acres with relatively easy access was managed by one man who travelled over the farm by tractor.

The author concluded that mobility was an important factor in productivity since all survey farmers, regardless of topography, relied on farm vehicles and the necessary farm tracking to enable quick and easy access to all parts of their farms.

6.3.3 Simplicity

Most of the high labour productivity farms had simple management systems. An important aspect of this simplicity was a notable reduction in the number of jobs to be done. The decrease in the total number of jobs to be done was achieved in three ways:

(i) Number of enterprises. All sixteen high labour productivity farms were primarily concerned with managing ewes (with or without replacement sheep). Hence sheep were the main enterprise on every survey farm. (Breeding and store cattle were a secondary enterprise on twelve farms.) No farm had any other enterprise.

(ii) Management systems. The management systems on all survey farms were designed to manage ewes. Consequently survey farmers tended to specialise in the sheep enterprise even though wool and lamb prices could be

unfavourable relative to beef or cash crop prices. In most cases the management systems were characterised by all-grass farming, the use of contractors for large operations, and frequently some reduction in the husbandry operations carried out.

(iii) Reliability. By restricting the scope of the management system to one that was simple, an important element of reliability was introduced. In addition, the high labour productivity farms were characterised by reliable transport and sheep proof fences where required.

The author considered that the high labour productivity demonstrated that North Island sheep farming could be an uncomplicated system of farming, and that this was shown in the number of ewes handled per permanent labour unit.

6.4 Case Farm Studies

This section discusses the physical and financial implications of the management systems of five of the sixteen farms described in this chapter. They are Farms 1, 6, 10, 11 and 13. These farms were selected mainly because of their differing geographical location, and in the case of Farms 1 and 11, for extraordinarily high numbers of ewes per man. To aid the reader, a table of basic physical statistics is given for each case farm at the beginning of each case farm study.

The management and profitability of each farm is discussed and compared with an alternative situation involving a more usual situation

of one extra permanent labour unit on each farm. [14] The two situations compared are:

Situation A - the actual situation

Situation B - a hypothetical situation involving one extra labour unit.

The technical possibility of high labour productivity would be of some interest without a financial analysis. But the real interest is in the relative profitability of high and low labour productivity since labour productivity should not be increased to the point where it adversely affects profit. The author decided to compare each actual farm situation with a hypothetical (synthesised) situation of each farm in essentially the present state of development, but with one more permanent labour unit. It was assumed that capital was found for a house without reducing other kinds of investment.[15]

No attempt was made to trace back on a period of years, since this would have involved far too many assumptions. Thus the comparison offered is the best available comparison.

6.4.1 Relative Profitability

6.4.1.1 Basis of Comparison

The comparison of the profit from each situation is computed on a cash basis. No attempt has been made to include changes

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14. Obviously Farm 11, for one, is still far from usual. However, the author considered that with the management systems used, two extra labour units would be even less profitable than one extra labour unit.

15. This assumption biases the comparison in favour of more labour on many farms since the extra capital would not have been available.

in capital liabilities and assets and non-economic goals of farmers in this analysis. The analysis assumes that no change in farm policy would accompany the addition of an extra labour unit, unless the farmer indicated that this would occur. For example, Farmer 1, with a Romney flock would not consider changing to Perendales, with or without extra labour (though the author believes this policy would be more profitable.)

Situation A is based on the actual physical and financial data obtained during the farm survey. In each case the details of farm income, farm expenditure and stock numbers are factual.[16] Taxation minimising procedures have necessitated the recalculation of tax by the author. In most cases however, actual taxation closely approximates the figure calculated by the author.[17]

Situation B is an estimate of the comparable cash position with an additional labour unit. It is based on the changes in income and costs that would be likely to result. The estimates used in this analysis have been made by the author in consultation with each farmer, and with regard to particular implications of this policy on each of the six farms. Comparative farm working expenditures, farm taxation and farm cash surpluses can be seen in Tables 6.10, 6.11 and 6.12.

The exact assumptions underlying the partial budgetting for each farm, as well as the details of the wage and associated labour costs for each farm, are given in Appendix D.

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16. Stock reconciliations were computed by the author using available stock statistics.

17. Not so for Farms 10 and 11. In the actual situation, Farm 10 paid more tax. Because of tax minimising Farm 11 actually paid less tax.

6.4.1.2 Accuracy of Comparison

Being a marginal analysis, the changes in productivity and costs are required to be accurate if the analysis is to be useful. Hence, although accuracy in an absolute sense is desirable, accuracy in a relative sense is essential. Ironically, although the accuracy of absolute levels (Situation A) is guaranteed, by using actual farm data, accuracy in the latter sense must be based on estimation.

Although this accuracy is difficult to ascertain, the likely changes in costs and productivity, from the addition of an extra man (Situation B) were discussed in detail with the farmer, and the author is confident that such estimates are representative and further, that where any deviation is present, it understates the relative profitability of Situation A.

TABLE 6.10 FARM WORKING EXPENDITURE UNDER TWO LABOUR POLICIES

FARM NO.	1		6		10		11		13	
Situation -	A	B	A	B	A	B	A	B	A	B
		$		$		$		$		$
Wages -										
Permanent	-	2000	850	2000	1000	2000	-	2000	866	2000
Fencing	1072	1072	738	369	-	-	-	-	-	-
Scrubcutting	1164	1164	350	350	-	-	-	-	614	614
Shepherding	600	-	-	-	-	-	-	-	-	-
Wife	-	-	208	208	-	-	-	-	208	208
General	68	-	66	-	284	284	2074	1037	106	-
Contract -										
Bulldozing	1996	1996	-	-	2192	2192	-	-	118	118
Cultivation	-	-	688	688	-	-	-	-	-	-
Haybaling	-	-	-	-	540	540	1178	1178	-	-
General	-	-	38	38	-	-	648	648	324	324
Shearing -										
Wages	3342	3364	-	-	-	-	-	-	966	971
Shed Expenses	386	386	256	256	160	160	282	282	240	240
Crutching	-	-	124	-	100	-	392	392	-	-
Main	-	-	926	954	1030	1043	1870	1881	-	-
2nd Shear	-	-	106	106	838	838	-	-	-	-
Animal Health	528	537	556	567	388	396	924	935	332	334
Electricity	28	108	66	146	162	242	106	186	96	176
Farm Stores	-	100	482	582	300	400	-	100	1146	1246
Feed	22	22	120	120	400	400	-	-	340	340
Fertiliser	4362	4362	3640	3640	6808	6808	6466	6466	3074	3074
Freight	394	394	274	274	906	906	2132	2132	506	506
Grazing	-	-	270	270	-	-	-	-	-	-
Seeds	1006	1006	540	540	180	180	-	-	66	66
Weed and Pest	-	-	40	40	148	148	220	220	-	-
General	22	22	156	156	58	58	-	-	276	276
Repairs and Maint.	834	834	732	732	1466	1466	2418	2418	692	692
Vehicle	856	1092	578	636	1722	1894	906	906	584	634
Administration	304	304	408	408	222	222	656	656	200	200
Standing Charges -										
Insurance	6	54	212	260	102	150	374	422	74	122
Rates	496	496	392	392	398	398	684	684	390	390
Interest	2484	2904	1532	1952	1510	1930	3510	3930	1518	1938
Rent	-	-	188	188	-	-	1758	1758	-	-
Other [a]	5488	5488	-	-	-	-	4000	4000	-	-
TOTAL FARM WORKING EXPENDITURE	$25458	$27705	$14536	$15872	$20914	$22655	$30598	$32260	$12736	$14469

a. Farm 1 expenditure of $5488 is development expenditure written off in 1965/66.

Farm 11 expenditure of $4000 is the salary paid to the farmer by his farming company.

TABLE 6.11

CALCULATION OF FARM TAXATION

FARM NO.	1		6		10		11*		13	
	A	B	A	B	A	B	A	B	A	B
	$		$		$		$		$	
INCOME - Book	2848	2848	1400	1400	3174	3174	1622	1622	3162	3163
Cash	27740	28794	18666	19195	20422	21105	43774	44444	15328	15603
Total	30588	31642	20066	20595	23596	24279	45396	46066	18490	18765
EXPENDITURE										
Farm Working	25458	27705	14536	15872	20914	22655	30598	32260	12736	14469
DEPRECIATION	690	1110	1368	1788	2212	2632	1432	1852	1332	1752
EXEMPTIONS	1830	1830	1850	1850	2216	2216	-	-	1946	1946
INCOME TAX										
Taxable Income	2610	997	2312	1085	-	-	13366	11954	2476	598
Tax	494	135	414	148	-	-	4601	4001	457	80
SOCIAL SECURITY TAX										
Taxable Income	4232	2619	3954	2727	262	-	13366	11954	4214	2336
Tax	316	196	296	204	20	-	1002	897	316	175
TOTAL TAX	810	331	710	352	20	-	5603	4898	849	255

* Farm 11 paid company tax. All other farm taxation was computed on an individual basis

TABLE 6.12

CALCULATION OF FARM CASH SURPLUS

FARM NO.	1		6		10		11		13	
Situation	A	B	A	B	A	B	A	B	A	B
	$		$		$		$		$	
Income	27740	28794	18666	19195	10422	21105	43774	44444	15328	15603
Sale of Plant	-	-	200	200	850	850	4128	4128	1098	1098
TOTAL CASH INCOME	27740	28794	18866	19395	21272	21955	47902	48572	16426	16701
Farm Working Expenses	25458	27705	14536	15872	20914	22655	30598	32260	12736	14469
Capital Transactions:										
- Mortgage Rep.	98	448	676	1026	-	350	-	350	976	1326
- Plant Purchase	-	-	810	810	5860	5860	6122	6122	2156	2156
Taxation	810	331	710	352	20	-	5603	4898	849	255
TOTAL CASH EXPENDITURE	26366	28484	16732	18060	26794	28865	42323	43630	16717	18206
CASH SURPLUS [a]	1374	310	2134	1335	-5522	-6910	5579	4942	-291	-1505
CASH DIFFERENCE (A-B)	+$1064		+$ 799		+$1388		+$637		+$1214	

a. Cash Surplus is Total Cash Income less Total Cash Expenditure.

6.4.2 Case Farm 1

TABLE 6.13 BASIC STATISTICS OF FARM 1 1965 - 66

Farm Location	Rangitikei Region
Sheep Policy	Breeding
Farm Area - Total	2760 acres
Effective	2500 acres
Topography	Steep
Farmer Age	30
Permanent Labour Force	1 Man
Stock Wintered 1966 - Ewes	3000
Total Sheep	6980
Sheep E.E.'s per effective acre	2.4
Total Stock " " "	2.9
Fertiliser application " (Cwt)	2.0
Wool Production " " (Lbs)	23
Lambing percentage 1966	80
Ewes per permanent man	3000

6.4.2.1 Farm.

The farm was located 36 miles north of Wanganui and consisted of 2,760 acres of steep hill country. The predominant soil type was a Taihape silt loam (114a) [18] which had a good phosphate response and on which slips healed fairly readily. Rainfall varied between 45 inches

18. For the soil descriptions and the soil classification numbers given for each case farm in Section 6.4, readers are referred to: Department of Scientific and Industrial Research, "General Survey of the Soils of New Zealand", Soil Bureau Bulletin No. 5, R.E. Owen, Government Printer, Wellington, 1954.

and 55 inches, with no marked dry season.

6.4.2.2 Farmer

The farmer was aged 30, and had had four years secondary schooling. He started farming in 1957 in partnership with his father. At the time of the survey he had sole ownership.

6.4.2.3 Labour

No permanent labour was employed but extra labour was engaged when necessary. Casual and contract labour made up most of this additional labour, but assistance was also given by relations and neighbours on a reciprocal basis.

6.4.2.4 Stock

The Romney flock increased from 5,860 to 6,980 sheep wintered from 30 June 1965 to 30 June 1966; the increased stock mainly consisted of hoggets (400) and wethers (500). The flock was characterised by a high number of sheep dead or missing (906),[19] a small number sold (199 ewes), and a low lambing percentage (80%), which however was average for the class of country. Cattle numbers remained relatively static in 1965-66 (an increase of 17, from 540 to 557).

6.4.2.5 Management

The farmer was responsible for co-ordination and supervision on this farm

Co-ordination - Planning was directed towards a goal of 10,000 sheep (including 5,000 ewes) and 700 to 800 cattle. Consequently yearly stock increases were expected. A supporting development programme comprised

19. The farmer believed that 300 to 400 sheep had been stolen.

scrubcutting, oversowing, topdressing, and fencing.

Financial planning and control was achieved with budgets. Each year was budgetted for, and a monthly cash flow budget constructed. The year ahead was tentatively budgetted.

Organisation consisted mainly of arranging contractors and extra labour to meet the farm labour requirements.

Supervision - Management involved considerable supervision, mainly concerning stock. This was concerned with watching pasture and stock condition and shifting stock when required. Other work was concerned with checking on scrubcutting and fencing progress and being "on hand" for topdressing operations from the farm airstrip.

Management Aids

(i) Advisory Services - This farmer received much advice from his accountant and worked closely with him in drawing up budgets. The farmer was not a member of a farm improvement club or discussion group. A farm advisory officer had inspected the farm once during 1964.

(ii) Organising - A telephone and a notebook were the main aids.

(iii) Supervision - A landrover played an indispensable role in supervision. With farm tracks cut through the farm practically all travelling was done in this vehicle.

6.4.2.6 Management System

Farmer's Role: - Being the only labour unit on the farm, as well as the manager, the farmer was probably the key factor in the

management system. He usually worked five or six days a week on the farm, but often farm working days were taken off for business or social engagements. Daily working hours on the farm varied, but were usually from 7.30 a.m. to 6.00 p.m.

Most of this time was taken up by supervisory tasks such as general shepherding and supervising employed labour, but the farmer contributed a full labour unit during some farm operations (see Table 6.9) and was engaged in mustering for other operations (main and second shearing) which were done by contractors. Seasonally slack periods were occupied by farm maintenance work.

Grazing System - The grazing system incorporated stock as four groups; ewes, hoggets, wethers, and cattle.

(i) The ewe flock was set stocked from lambing to weaning, but rotationally grazed for the rest of the year.

Particular attention was paid to maintaining the ewes in lean, fit condition prior to lambing.

(ii) The ewe and wether hoggets were run together but in two mobs, average to heavy, and light condition. The hoggets were set stocked throughout most of the year.

(iii) A large mixed age wether flock was run on the less developed areas of the farm. They served two purposes, first as a source of revenue (from wool) with a low labour input, and secondly as a means of developing rough bracken country into pasture. Grazing included both mob stocking and set stocking - both at relatively high rates (2.9 total E.E's per acre) for the class of country.

(iv) Cattle were run on most of the ewe and hogget country, and some steers were run with the wether flock. Grazing management was designed to control reversion in pastures as well as seasonal pasture growth itself.

Meeting Labour Requirements

Since the permanent labour force was so small and occupied largely with management jobs, extra labour was required when any large operation, or any operation dependent on time, had to be carried out.

Hence "labour peaks" occurred for almost every farm operation, and extra labour was hired at these times (Table 6.9). Some farm operations which usually cause peak labour demands, under normal North Island conditions, were absent: lambing involved no shepherding, but percentages similar to neighbouring farms with 1,000 ewes per shepherd were obtained; footrotting was almost ignored apart from rams' feet and paring 30 to 40 ewes each year.

6.4.2.7 Main Contributing Factors

Several factors stood out as being responsible for the success of this high ewes per man management system. The most important factor in the system was the farmer. This was shown in several ways:

(i) The farmer had a goal to strive for.

(ii) The farmer had recognised his role as a manager, so that his manual efforts however great, were recognised as not being very important relative to his managerial role.

(iii) The ability of the farmer to carry the responsibility involved in a rapidly increasing enterprise.

(iv) The attitude and confidence of the farmer in his own ability to manage the farm.

The management system on this farm was characterised by two factors.

(i) Simplicity - Through a lower than usual standard of husbandry, and only doing farm jobs that are necessary, high ewes per man could be carried.

(ii) Organisation - Although not detailed the organisation of the management system was important. The farmer had a clearly defined role involving management and some manual work. Extra labour was organised to meet all extra requirements.

6.4.2.8 Financial Summary

This farm was in the midst of a rapid development programme, with heavy expenditure on fertiliser ($4,362), seeds ($1,006) and bulldozing ($1,996) with additional development expenditure ($5,820) carried forward to be offset against future income. Apart from shearing costs ($3,342), the labour expenses for the year were relatively small ($2,904) (Table 6.10).

Farm revenue was derived almost entirely from wool ($18,326) and cattle ($9,232). 20/

6.4.2.9 Alternative Labour Policy

An additional permanent man would probably decrease stock losses. The lambing percentage would be similar since shepherding at lambing was not considered by the farmer to be economic. The reasons for this were that the country was too steep and difficult to shepherd,

20. Sheep and cattle farm revenue on each case farm is net of purchases.

and because ewe losses (3 to 4 per cent) and lamb losses (5 to 10 per cent) under this system were still low enough not to warrant making an attempt to decrease losses. Extra labour would reduce casual labour costs, but not substantially, since most operations required several men and many were done on a reciprocal basis.

Hence during the 1965-66 year the alternative labour policy would have been substantially less profitable. There are two main reasons for this.

(i) Because of the farm topography and the management system used, extra labour would help decrease stock losses only slightly (between 1 and 2 per cent) and contribute negligible amounts to the lambing percentage. Thus aggregate stock productivity would not be affected greatly. The lambing percentage and death losses on this farm are already clost to the district average of between 80 and 90 per cent

(ii) Substitution of permanent for casual wage costs would be limited because of the size of the farm and the magnitude of farm operations. Many of the jobs for which casual labour is hired, are best carried out by several workers. For this reason one permanent employee could not easily be substituted for the several casual employees who are hired intermittently.

TABLE 6.14 PARTIAL BUDGET FOR EXTRA PERMANENT LABOUR ON CASE FARM 1 [21]

Extra Revenue	$	Extra Costs	$
Wool	169	Permanent Wages	2,000
Sheep	502	Associated Costs [a]	998
Cattle	383	Variable Costs [b]	267
Reduced Costs			
Casual Wages	668		
Reduced Taxation	479		
Extra Income	$2,201	Reduced Income	$3,265

Net change in Income - $1,064

a. Associated costs consist of the following items: electricity, farm stores, employee and house insurance, and interest charges and principle repayment on employee housing.

b. Variable costs consist of the following items: animal health, freight, shearing, and vehicle expenses.

21. The underlying assumptions, and the details of the partial budgetting for each case farm are given in Appendix D.

6.4.3 Case Farm 6

TABLE 6.15 BASIC STATISTICS OF FARM 6 1965-66

Farm Location	Rangitikei
Sheep Policy	Breeding
Farm Area (Acres) - Total	830
Effective	300
Topography	Rolling to Moderate
Farmer Age	28
Permanent Labour Force	1 Man
Stock Wintered 1966 - Ewes	2100
Total Sheep	2960
Sheep - E.E.'s per effective acre	3.3
Total Stock " " "	4.3
Fertiliser Application " (Cwt)	2.6
Wool Production " " (Lbs)	40
Lambing Percentage 1966	95
Ewes per permanent man	2100

6.4.3.1 Farm

The farm was situated 23 miles north of Palmerston North and comprised 837 acres of rolling to moderately steep hill country. Rainfall, although heavier in the winter and spring months, was still well distributed throughout the year. The predominate soil type was a

Matamau heavy silt loam (77bH) of medium fertility which responded well to phosphate.

6.4.3.2 Farmer

This farmer was 28 years old, a Massey sheep diplomate and married. He had farmed on his own account since 1962.

6.4.3.3 Labour

In the 1965-66 year a general hand was employed from June 1965 to December 1965. During this period all fencing was done by the permanent labour force. Since then fencing, crutching, cultivation and cropping, dipping, and shearing operations were performed by contractors. The farmer did all stock work and dagging by himself, and obtained casual labour to assist with docking.

6.4.3.4 Stock

The number of ewes wintered increased from 1,900 to 2,100 Romneys during the 1965-66 season.[22] The number of beef cows increased from 105 to 120. Internal farm access was limiting stock increases to some extent, and this probably influenced the farmer's decision to increase cattle numbers proportionately more. The reasons for this change given by the farmer were: first, "cows require less labour" and secondly "a personal preference for cattle".

6.4.3.5 Management

The farmer was responsible for management.

Co-ordination and Supervision - Planning was done on a yearly basis, with no definite future goal in mind. A limited development programme

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22. The stock wintered in 1964 and 1967 were: 1,700 and 2,400 mixed age Romney ewes; and 82 and 160 mixed age beef cows respectively. Replacement stock were carried in both cases.

accompanied stock increases. This consisted of cultivation, regrassing and fencing.

Financial planning was done by a yearly budget, but the author gained the impression that this was not adhered to very rigidly, and that many mental amendments were made.

No supervisory role was clear, it seemed to be part of the farmer's general farming activities - stock work and manual work.

Management Aids

(i) Advisory Services - This farmer was visited once or twice yearly by Farm Advisory Officers, but did not seem to rely to any extent on their advice. Since the 1965 - 66 year he has participated in a Department of Agriculture discussion group formed in his district. He received no detailed financial advice or on planning yearly operations.

(ii) General - The farmer used his telephone and farm records to aid in managing. However the author formed the opinion that the records were not used to any great extent. A wheel tractor was used for most farm travel.

6.4.3.6 Management System

Farmer's Role - Although a general hand had been employed for six months during 1965-66, the farmer was the only permanent labour unit at the time of the survey visits. In contrast to Farmers 1 and 11 in particular, the role of Farmer 6 seemed to be similar to most North Island sheep farmers. That is, he not only managed, but he provided much of the labour for farm operations as well.

Farmer 6 probably worked longer hours and harder than many other North Island sheep farmers. He worked from 7.30 - 8.00 a.m. until 6.00 p.m., or later, on most days of the week. Frequently he worked seven days a week.

Much of this time was taken up with stock work (moving stock, drenching, dagging and sorting sheep) and the standard of animal husbandry was correspondingly higher than that on Farm 1.

Grazing System - The grazing system followed was typical North Island practice; ewes, ewe hoggets and rams were wintered, along with beef cows and "dry" cattle. However the author thought the farm was understocked. At the time of the farm visit in late autumn, Yorkshire Fog was a prominent pasture species, and pastures generally showed some rank growth and uneven grazing.

Meeting Labour Requirements

The farmer said the greatest need for additional labour occurred during lambing. Labour was also required for some other stock operations, notably crutching and shearing. All development work required extra labour.

As shown in Table 6.9, many of the main jobs were performed by contract labour and contractors. However, the farmer performed most of the stock operations, as well as doing farm repairs and maintenance.

6.4.3.7 Main Contributing Factors

The author thought two factors in particular were responsible for the high ewes per man handled on this farm. They were: economic necessity, and hard work.

(i) Economic necessity was an important motivating factor in increasing stock numbers. Because of the particular

stage of development of Farmer 6, additional permanent labour as well was not financially possible.

(ii) Any inefficiencies with respect to permanent labour utilisation were outweighed by the physical and mental effort made by the farmer, making it possible to manage above average ewe numbers with an average North Island management system.

6.4.3.8 Financial Summary

Farm development was fairly conventional on this farm. Development expenditure was contained in farm working expenditure in wage, contracting, farm stores, fertiliser, and repairs and maintenance items.

Wool was the most important source of farm income, providing $9,932 of the $18,866 total. Sheep and cattle sales provided $4,678 and $4,028 respectively.

6.4.3.9 Alternative Labour Policy

An alternative policy of employing extra labour would have had some benefits. Lambing percentage may have risen by five per cent and ewe losses may have been reduced. Also fencing labour costs may have been halved. General labour costs could have been omitted.

An extra man would probably have been less profitable. The main reasons for this were:

(i) The limited scope for increasing stock productivity - apart from lambing percentage, other ways such as reducing stock losses were restricted, because losses

were already low.

(ii) Farmer 6 had a substantial labour bill, which could have been reduced, however permanent labour would not have been used for scrubcutting. Fencing labour costs would have only been halved.

TABLE 6.16 PARTIAL BUDGET FOR EXTRA PERMANENT LABOUR ON CASE FARM 6

Extra Revenue	$	Extra Costs	$
Wool	118	Permanent Wages	2,000
Sheep	411	Associated Costs	998
Reduced Costs		Variable Costs	97
Perm. Wages (20 wks)	850		
Fencing	369		
General	66		
Crutching	124		
Reduced Taxation	358		
Extra Income	$2,296		$3,095

Net Change in Income - $799

6.4.4 Case Farm 10

TABLE 6.17 BASIC STATISTICS OF FARM 10 1965 - 66

Farm Location	Northland
Sheep Policy	Breeding
Farm Area (acres) - Total	991
Effective	880
Topography -	Rolling to Moderate.
Farmer Age	Over 50
Permanent Labour Force	1 Man and a Youth.
Stock Wintered 1966 - Ewes	3200
Total Sheep	4287
Sheep - E.E.'s per Effective Acre	4.4
Total Stock " " " "	5.5
Fertiliser Application " " (Cwt)	3.0
Wool Production " " " (Lbs)	47
Lambing percentage 1966	93
Ewes per permanent man	2133

6.4.4.1 Farm

This farm consisted of 880 effective acres of rolling to moderate hill country situated 20 miles east of Whangarei. The farm was made up of two blocks, 330 acres in the homestead block which served as a fattening area, and 550 acres 4 miles away which was used as a breeding farm. The 550 acre block was rolling gumland clay country and consisted

mainly of a moderately podzolised yellow brown earth known as Waikare clay and silt loam.

The homestead consisted of steeper but reasonably fertile clay country as well as 190 acres of free draining volcanic soil. Rainfall ranged between 45 inches and 60 inches per annum, with heavier precipitation from June to mid-August making the podzolised soils too wet for mature cattle.

6.4.4.2 Farmer

Farmer 10 was over 50 years of age, married and had occupied this farm since 1946.

6.4.4.3 Labour

During the year 1965-66 a youth was permanently employed. In addition casual labour was employed mainly for docking, dagging and haymaking. Contractors were engaged for shearing, crutching and bulldozing.

6.4.4.4 Stock

From 1959 to 1963 inclusively, both sheep and cattle numbers wintered remained fairly constant at 2,000 ewes and 90 beef cows, with replacement stock in both instances. In 1964 the sheep wintered increased substantially to include 2,350 ewes and this increased to 2,640 mixed age ewes and 148 beef cows were wintered in 1965. 23/ Ewe numbers increased further to 3,200 in 1966 while total cattle numbers rose from 475 in 1965, to 540 in 1966. During 1965-66 both sheep and cattle losses were relatively low, while the lambing percentage was good, and the calving percentage high compared

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23. These totals are taken at the 31st March but approximated the actual numbers wintered at 30 June.

with district stock performances.

6.4.4.5 Management

Farm 10 was classified as a 1.5 man unit. This gave over 2,000 ewes per man. This was calculated on the basis that the farmer was no longer physically fit, and that the youth was too inexperienced at 17 years of age to contribute a full labour unit. The farmer was responsible for management.

Farmer 10 had management duties consisting largely of supervision. Co-ordination was a small part of management, only mental budgetting was practised, and future farm goals seemed indefinite.

Supervision however, was fairly intensive. Using a landrover the farmer was able to drive over most of the farm watching stock condition, the state of pastures and the progress of work being done.

Management Aids.

(i) Advisory Services - Farm advisory officers visited this farm once or twice a year. From the survey interview however the author concluded that the farmer did not seem to be influenced to any great extent by extension advice. The farmer did not follow any intensive farm management advice.

In financial matters the farmer relied on the services of his accountant. The author however, considered that the accountant's role did not include management advice.

(ii) General - A telephone and a landrover were the main

management aids. No comprehensive farm records were kept. While some planning was necessary, for example, "labour takes some planning, but is not too difficult to manage", this planning seemed to be conducted mentally.

6.4.4.6 Management System

Farmer's Role - The role of Farmer 10 was mainly a supervisory one. Because little formal management was carried out, and because the farmer was physically unfit for heavy manual work, he was mainly concerned with general shepherding tasks. These consisted of sorting sheep and cattle, and grazing management. Light manual work such as farm maintenance and drenching was also undertaken.

Grazing System - The basis of the grazing system was a high stocking rate. Because of this, and accompanying fertiliser rates, the farmer said a longer pasture growing season and earlier spring growth had resulted. Both sheep and cattle grazed for per acre and per man production. Per animal production was less important.

Meeting Labour Requirements

Peak demands for labour occurred from lambing until main shearing. However, in contrast to other case farms most stock operations during this time were carried out by the permanent labour force.

Several farm operations were carried out by contract labour and services and casual labour was employed to help with docking and dagging.

6.4.4.7 Main Contributing Factors

The author concluded that this farmer was basically

no different from many other North Island sheep farmers. He was moderately conservative, did not have a formal method of management, and had much the same philosophy as other farmers. He was however, handling more ewes per man.

The farmer said that the main factor involved in increasing ewes per man was simply "carrying more sheep". The management system had not changed from the time when there was a more usual number of ewes per man. The attitude of the farmer was important to the management system, though, since he did not farm for the highest possible lambing percentage, or absolute maximum production but rather for good production that can be profitably managed.

6.4.4.8 Financial Summary

The farm made a loss during 1965-66. The cash deficit of $5,522 was primarily due to a cattle account trading loss of $1,564, and high farm working expenditure of $20,914 and plant purchase of $5,860. Recalculation of taxation was necessary because of the original accounting procedures used, and the cash loss differs from the actual farm situation. However the cash loss figure derived serves as a benchmark for the alternative labour policy.

6.4.4.9 Alternative Labour Policy

The addition of a permanently employed man instead of a youth would have possibly enabled more productive shepherding and stock work. This may have increased the lambing percentage by 2 per cent, lowered ewe losses by 1 per cent, and increased calving percentage by 3 per cent. A permanent man would have been unlikely to have had much effect on the losses incurred in other classes of stock, because of the

type of grazing system.

Apart from substitution for the wages of the youth, and for crutching, no other substitution seemed likely. This was because general wage costs represented "peak labour", i.e. more than two workers were required, and hence it seemed unlikely that contract labour and services would be replaced.

Thus only limited permanent labour substitution for casual and contract labour was possible, and stock productivity could only have been increased to a limited extent. Also fixed labour costs would have been incurred. In these circumstances permanent labour would not have been profitable.

TABLE 6.18 PARTIAL BUDGET FOR EXTRA PERMANENT LABOUR ON CASE FARM 10

Extra Revenue	$	Extra Costs	$
Wool	67	Permanent Wages	2,000
Sheep	432	Associated Costs	998
Cattle	184	Variable Costs	193
Reduced Costs			
Youth	1,000		
Crutching	100		
Reduced Taxation	20		
Extra Income	$1,803		$3,191

Net Change in Income - $1,388

6.4.5 Case Farm 11

TABLE 6.19 BASIC STATISTICS OF FARM 11 1965 - 66

Farm Location	South Auckland
Sheep Policy	Fat Lamb
Farm Area (Acres) Total	1130
Effective	1100
Topography	Rolling
Farmer Age	38
Permanent Labour Force	1 Man
Stock Wintered 1966 - Ewes	6000
Total Sheep	6120
Sheep E.E.'s per effective acre	5.6
Total Stock " " "	7.0
Fertiliser application "(Cwt)	5.0
Wool Production "(Lbs)	51
Lambing percentage 1966	101
Ewes per permanent man	6000

6.4.5.1 Farm

The farm was situated 45 miles north west of Hamilton and comprised 1,100 effective acres of rolling hill country. The main soil types were Opuatia clay and silt loam (83c), and Wairama clay loam (26H). Both of these soils were of medium fertility and showed a good response to phosphate. The Wairama clay loam had poor draining characteristics in some low lying areas.

Rainfall averaged 50 inches to 60 inches per annum on this farm. Precipitation was heavier in winter but was fairly well distributed throughout the year.

6.4.5.2 Farmer

The farmer was aged 38 years, married and had four children aged 3 to 9 years. The farmer assumed ownership of the property ten years in 1955. He had Higher School Certificate.

6.4.5.3 Labour

Although the farm was adequately subdivided, and situated on easily managed country, it was still surprising that it was managed by one permanent labour unit. From 1962 to 1966 inclusively, when between 4,400 and 6,000 ewes were wintered by one man, general labour costs [24] ranged between $1,062 and $3,180 per annum. In 1965-66 contract labour was engaged for fencing, drainage and some bulldozing, while casual labour was employed to assist with nearly every stock operation.

6.4.5.4 Stock

The sheep carried on this farm consisted mainly of mixed age ewes. Under the present fat lamb policy two tooth ewes were purchased in the late summer. These ewes were bought mainly on a price basis and appeared to the author to be average quality. Approximately 25 per cent of the ewes were Romney-Border Leicester cross and the rest were Romneys.

The numbers of ewes wintered in 1965, 1966 and 1967 were 5,650, 6,000, and 7,000 respectively. Cattle were run on the farm and sold as fat stock.

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24. Excluding contracting (General and Hay baling) and Shearing costs.

6.4.5.5 Management

Responsibility for management lay solely with the farmer.

Co-ordination - The farmer planned on a yearly basis and calculated his financial position by budgetting. "Development" accompanying stock increases consisted only of increases in fertiliser applications and some drainage. Farmer 11 did not feel a comprehensive development programme was justified, since at the high stocking rate and high number of ewes per man it had become difficult to calculate changes in farm requirements with further ewe increases.

Organisation was obviously an important aspect of management on this farm, particularly where labour requirements were concerned. But throughout the author's three visits to the farm, the farmer was never "short of time". The availability of labour and the flexibility of the farm programme probably avoided most "labour problems".

Supervision did not seem to be a large part of management, and mainly consisted of checking stock and pasture condition. Most farm operations involved stock work and the farmer was usually present. He often worked as well as supervising.

Management Aids

(i) Advisory Services - The farmer was a member of a Farm Improvement Club. However the author could not ascertain the extent to which the farmer relied on this service.

(ii) General - A telephone was perhaps the main aid to management. It was used to arrange extra labour, contractors, and stock sales and purchases.

On the farm a large wheel tractor provided fast transport all over the farm.

6.4.5.6 Management System

Farmer's Role - Farmer 11 spent most of his on-farm time co-ordinating and directing farm operations. When contributing his own labour he did not appear to attempt to do jobs any better than employed labour, but completed them within the required time.

He spent considerable time off the farm, especially during the autumn purchasing ewe replacements. For most of the year a 4 to 5 day week was worked on the farm. However, during some farm operations (lambing, shearing, and dipping) Farmer 11 sometimes worked longer hours (7.30 a.m. - 9 p.m.) than his usual 8 to 10 hours per day.

Grazing System. The grazing system on this farm was simple. Apart from mating two tooth and mixed ewes separately, all ages of ewes were grazed as one flock. This flock was split into three mobs for ease of management. The ewes were grazed on a rotation-set stocking combination system until after lambing, when they were set stocked. After weaning the ewes were mob and set stocked prior to tupping.

The noteworthy feature of the grazing system was the attention paid to the condition of ewes prior to lambing. An effort was made to have them in lean condition.

Meeting Labour Requirements

Additional labour was required for almost every farm operation. This was provided by casual and contract labour (see Table 6.9)

The most remarkable feature concerning the labour input for stock operations was that the farmer shepherded the ewe flock at lambing without assistance. The lambing percentage usually ranged between 100 per cent and 105 per cent and ewe losses usually ranged between 2 per cent and 4 per cent.

6.4.5.7 Main Contributing Factors

The low permanent labour input of this management system was due to four main factors:

(i) The attitude of the farmer, who was not concerned that the number of ewes per man on his farm were abnormally high. He was interested in "seeing how far I can go before the system breaks down".

(ii) The simplicity of objectives and the farming system. The farming objective was to produce fat lambs for profit, although substantial revenue was obtained from wool. Farmer 12 was attempting to achieve higher ewe fecundity and intimated that in the long term he was more concerned with fat lamb rather than wool production.

(iii) The organising ability of the farmer. Labour was employed for all farm operations when required. With no permanent labour employed, wages were paid only for specific tasks. Also the quality of achievement of individual tasks was frequently compromised in order to keep the complete management system operating.

(iv) The topography of the farm and the mobility of labour. With the rolling mature of the farm and the use of a wheel tractor and motor-car, stock management on the farm was relatively easy. Because of this, and high stocking rates, individual ewes may have received almost as much individual shepherding surveillance as 1,500 ewes per man farms in moderate to steep hill country.

6.4.5.8 Financial Summary

Although he had recently increased the stock numbers the farmer was in a sound financial position. Facilities appeared adequate for the management system [25], "development expenditure" consisted of fertiliser, stock purchases, and drainage. Each of these could show an almost immediate financial return on investment.

Thus all farm expenditure was classified as working expenditure. Biggest items for 1965-66 were fertiliser, salary [26], interest, and shearing expenses. Cash income was provided mainly by sheep ($21,044) and wool ($15,684). Fat lamb sales were worth $28,363 but replacement ewe purchases reduced net sheep revenue by $10,257. Cattle contributed $6,646.

6.4.5.9 Alternative Labour Policy

The employment of a permanent labour unit would have given limited benefits. These would probably have included a small increase in lambing percentage, a decrease in ewe losses, and replacement of approximately half the general casual labour costs. The author considered that the marginal revenue from this policy would have been unlikely to cover the marginal costs.

The reasons for this were:

(i) Increases in stock productivity would necessarily have been small, because lambing percentage and losses were already better than average and Farmer 12 did not consider extra labour warranted at lambing, even on a casual basis.

(ii) Permanent labour would have replaced casual labour costs only to a certain degree because of the scale of many

25. Except for the woolshed with nightspace for 400 ewes which may not be considered adequate on a farm wintering 7,000 ewes.
26. The salary was paid to the farmer by his "farming company".

of the farm operations. Frequently more than two extra labour units were required to complete the operation within the allowable time limits.

(iii) Farm 11 would incur the fixed costs associated with a salary and housing one permanent man.

TABLE 6.20 PARTIAL BUDGET FOR EXTRA PERMANENT LABOUR ON CASE FARM 11

Extra Revenue	$	Extra Costs	$
Wool	157	Permanent Wages	2,000
Sheep	513	Associated Costs	998
Reduced Costs		Variable Costs	51
Casual Wages	1,037		
Lower Taxation	705		
Extra Income	$2,412	Reduced Income	$3,049

Net Change in Income - $637

6.4.6 Case Farm 13

TABLE 6.21 BASIC STATISTICS OF FARM 13 1965 - 66

Farm Location	Raglan - King Country.
Sheep Policy	Breeding
Farm Area (acres) total	1100
effective	700
Topography	Rolling to Steep
Farmer Age	41
Permanent Labour Force	1 Man
Stock Wintered 1966 - Ewes	2200
Total Sheep	2995
Sheep E.E.'s per effective acre	3.9
Total Stock " " "	5.1
Fertiliser Application " (Cwt)	2.9
Wool Production " (Lbs)	40
Lambing percentage 1966	94
Ewes per permanent man	2200

6.4.6.1 Farm

This 700 acre farm was situated 32 miles north west of Taumarunui. The main soil types were Maehoenui silt loam and Mokau sandy loam. The topography ranged from rolling to steep. Rainfall was well distributed seasonally and averaged 65 inches per annum.

6.4.6.2 Farmer

The farmer was aged 41 years, and married. He had four children aged between 3 and 10 years. The farmer bought this farm in May, 1962.

6.4.6.3 Labour

A youth was employed for the first half of the 1965-66 season, and casual labour was employed throughout the whole season. Contract labour was employed for bulldozing and general clearing work.

6.4.6.4 Stock

This farm experienced a rapid increase in sheep wintered, while cattle numbers had remained relatively constant. In 1962, 1730 sheep (including 1,300 mixed age Romney ewes) were wintered. In 1965, 2,285 sheep (including 1,600 mixed age Romney ewes) were wintered, and this increased to 2,995 sheep (2,200 ewes) wintered in 1966.[27]

6.4.6.5 Management

The farmer was responsible for management.

Co-ordination - Apart from a general plan to carry 5,000 ewes and replacements, and 200 to 300 beef cattle within five years, formal co-ordination was almost non-existent.

Although the farmer had previously been under budgetry control by the State Advances Corporation until July 1964, at the time of survey no detailed financial control or management was evident.

Supervision - Management on this farm consisted mainly of supervision. Because of the type of grazing system and the rapid

27. And 3,970 sheep wintered in 1967 (3,000 mixed age Romney ewes).

stock increases most supervision was concerned with checking stock and pasture condition.

Management Aids

(i) Advisory Services - This farmer had visits from the local farm advisory officer and was advised by him on some technical problems. No comprehensive financial advice was received from any source. Since occupying this farm the only advice which the farmer said had been of real benefit arose as a result of visits to Te Awa Experiment Station, and to a progressive Hawkes Bay farmer.

(ii) General - A telephone and a motor-bike were the only real aids. Records were poor, and little use appeared to be made of them.

6.4.6.6 Management System

Farmer's Role - This farmer was a true "owner-operator", in the North Island sense. Most of his time was spent in husbandry operations and manual work; little was spent in management.

The length of working weeks varied, but averaged six 9-hour days a week from lambing to after main shearing, and four 8-hour days a week during the remainder of the year.

Some farm operations such as lambing and shearing involved longer hours, but wet weather sometimes precluded any work.

Grazing System - The grazing system was based on set stocking the ewe flock from tupping to weaning (December) and using the "shuffling technique" to equate stock numbers and paddock feed levels.

After weaning the lambs the ewes were rotationally grazed around the farm after the lambs. This enabled control of pastures while allowing lambs to be grazed lightly and moved frequently. The grazing system for hoggets and cattle was a combination of set stocking and rotational grazing.

Meeting Labour Requirements

Frequent additional labour demands occurred during the year, but most of these were met by casual labour, often supplied by the farmer's wife and sometimes by his children. Some jobs were done by contract labour. As for Farmers 1 and 11, labour requirements at lambing time were considerably reduced by the grazing system prior to lambing. The farmer thought that this was the main reason for little sleepy sickness or bearing trouble and for not being able to "make wages" at lambing time.

6.4.6.7 Main Contributing Factors

Four factors were mainly responsible for the high number of ewes per man managed on this farm. They were:

(i) The attitude of the farmer. The farmer was enthusiastic about increasing stock numbers. He had a definite goal, and was not concerned that the number of ewes per man was higher than on surrounding farms.

(ii) The set stocking grazing system for the ewe flock.

(iii) Use of extra labour when required.

(iv) Maintaining a mobile system of supervision - by using a motor-bike and horse when necessary.

6.4.6.8 Financial Summary

With rapid stock increases occurring cash expenditure exceeded total cash income (including $5,720 of new finance). The heaviest expenditure was on a new woolshed ($7,066), but fertiliser ($3,074) and wages and contract charges ($2,236), were also important.

Wool was the most important source of income ($8,340), but sheep and cattle sales added $2,796 and $3,448 respectively.

6.4.6.9 Alternative Labour Policy

Because of the farmer's shepherding ability and his success in getting additional casual labour when required, the benefits of an extra permanent labour unit would probably have been low. The lambing percentage may have been raised by up to 3 per cent. Losses may have been decreased by 1 per cent.

As for previous case farms an additional permanent labour unit would have probably been less profitable because the fixed costs incurred in such a policy would probably not be offset by sufficient permanent labour substitution for casual labour and increased revenue from higher stock productivity.

TABLE 6.22 PARTIAL BUDGET FOR EXTRA PERMANENT LABOUR ON CASE FARM 13

Extra Revenue	$	Extra Costs	$
Wool	35	Permanent Wages	2,000
Sheep	108	Associated Costs	998
Cattle	132	Variable Costs	57
Reduced Costs			
Wages	866		
General Wages	106		
Lower Taxation	594		
Extra Income	$1,841	Reduced Income	$3,055

Net Change in Income - $1,214.

6.4.7 Case Farm Summary

In each case farm study, the farmer was the most important factor involved in managing higher ewe numbers per permanent labour unit. Although all the farmers (including Farmer 17) were managing higher than average ewe numbers there were no common methods.

Farmer 1 achieved high ewes per man through good financial management and supervision. He also was less concerned with animal production. Farmer 6 handled high numbers of ewes mainly through hard work. Supervision and lower per animal production were important to Farmer 10. Farmer 11 had assumed a largely managerial role. Farmer 13 was enthusiastic and worked hard physically, and was a good stock man.

However, all the farmers had decided it was possible to manage higher than usual numbers of ewes per man, and all the farmers had increased ewe numbers. It was estimated that the post tax cash return from the individual management systems was $637 to $1,388 greater than it would have been with an extra permanent man.

CHAPTER 7

HIGHER NUMBERS OF EWES PER PERMANENT LABOUR UNIT ON NORTH ISLAND SHEEP FARMS

In this chapter the farm survey results are discussed. Ten questions are asked as a guide in determining the likelihood of high numbers of ewes per permanent labour unit on any North Island sheep farm. A summary of the survey results and the author's conclusions form the last part of the chapter.

7.1 Discussion of the Survey Results

The survey showed that there are at least 16 North Island sheep farmers handling 2000 or more ewes per permanent man; and that these farmers span all types of sheep policies, and are ranged over all the principal sheep farming districts of the North Island (other than the East Coast). That is, regardless of the sheep policy, and regardless of the geographical location in the North Island (with the exception of the East Coast) the author is confident that there are examples of other farmers in substantially similar situations who are handling at least 2000 ewes per permanent man.

There is no doubt about the technical feasibility of handling 2000 ewes per permanent man; and examples can be found of farmers handling up to 7000 ewes per permanent man. Further, given reasonable assumptions about the effect of additional permanent labour, none of the high labour productivity farms would have been more profitable with additional labour.

Exactly because of the diversity of situations in which farmers were handling high numbers of ewes per man, it was not possible

to spell out any one recipe for high permanent labour productivity. As illustrated in Tables 6.1 to 6.9 there were many differences between farms. There were farmers who used Perendales, and farmers who used Romneys; there were farmers who used a motor bike and farmers who used a wheel tractor; there were farmers who had internal races, and farmers with no races and minimum subdivision; some farmers double shore mixed age ewes, others did not. No one husbandry practice seemed essential for high permanent labour productivity.

However there were some common features of the high productivity farms, perhaps most notably, attitude. None of the farmers expressed the opinion that his permanent labour force was fully extended handling the present number of ewes per permanent man. Most of the farmers intended carrying more ewes the following year. With high numbers of ewes per man almost all farmers had done something about the conventional lambing labour peak; this ranged from low shepherding time, with natural selection for easy care Romneys, to the use of Perendales, to the farm vehicles for mobility, to the technique of endeavouring to maintain in-lamb ewes in lean, fit condition for lambing.

Most of the high labour productivity farmers had adopted methods to reduce travelling time around their farms. These methods included the use of additional yards, farm races,farm motor bikes and the combining of husbandry operations. Most farmers had a conscious management policy which differed, of course, to some degree from standard district practice. All of the high labour productivity farmers employed casual and contract labour and for a variety of farm operations. These operations ranged from mustering to lambing to farm maintenance.

7.2 Ten Questions on High Permanent Labour Productivity.

A number of labour saving techniques were located and evaluated during the farm survey. No new techniques were discovered in the sense that they were not already described in farming magazines and also known to most sheep farmers. Although the survey method was considerably restricted by lack of available data, it was possible to show that substantial time savings could be achieved by labour saving techniques.

The study highlighted a number of farm features and techniques which were likely to have a major influence on the number of ewes handled per permanent man on a North Island sheep farm. Given any information about the management of a sheep farm, but not the number of ewes wintered or the number of permanent labour units, it is possible, by a number of questions, to determine the likelihood of that farm handling high numbers of ewes per permanent man. Ten of the most important questions are discussed below. Most of these questions are of course, related to one another, and together help to constructa picture of the farm and the management system.

Question 1: What type of farmer is he? (If he has a progressive attitude towards farming, and if he places less emphasis on traditional farming standards, such as lambing percentage and fleece weight per ewe than on farm profitability, then it is possible that his farm is above average in terms of ewes per permanent man).

Question 2: How has the management system been adapted to the farm topography? (For example, if the topography is steep and few adjustments such as: running Perendale ewes, or second shearing Romney Ewes; using good dogs or employing musterers when necessary; and using farm tracking and farm vehicles where possible; have been made, then there

is little chance of carrying high numbers of ewes per permanent man).

Question 3: What breed of sheep is run on the farm? (If Perendale ewes are run, less attention is required for each ewe, and there is a greater chance of handling higher numbers of ewes per permanent man).

Question 4: What sheep policy is followed? (If a fat lamb policy is followed and no replacement stock are carried, then there is a greater possibility of handling greater numbers of ewes per permanent man).

Question 5: What steps has the farmer taken to reduce travelling time? (Steps which would tend towards high permanent labour productivity would include any, or all, of the following: additional sets of yards, an internal farm race, and a farm motor bike or some other type of vehicle).

Question 6: Is second shearing carried out? (If Romney ewes are run, and second shearing is not carried out, then the extra shepherding and husbandry required may operate against higher labour productivity).

Question 7: How is lambing managed? (There are several ways of increasing labour productivity at lambing. These include grouping ewes by using ram harnesses, or by sorting ewes on udders, keeping ewes in lean fit condition prior to lambing, and by lambing all ewes in groups on a small area).

Question 8: What are the stocking rates and the production figures? (Low stocking rates for the topography could mean over-fat ewes, cast ewes, bearing trouble and increased footrot incidence. High wool production per ewe, and a high lambing percentage could indicate understocking. Understocking is likely to result in greater husbandry requirements per ewe, and greater travelling time per ewe by both men and sheep. Permanent labour productivity is not likely to be high

Question 9: Which farm operations are carried out solely by permanent labour? (Where permanent labour carries out only shepherding and shifting of stock, stock operations such as drenching and dagging and routine farm maintenance; then permanent labour productivity is likely to be high).

Question 10: Does the farmer utilise casual and contract labour to reduce the work load on the permanent labour force. (If no, then the chances of high numbers of ewes per permanent man are low).

7.3 Summary and Conclusions

The study showed that at least sixteen North Island sheep farmers are handling 2000 or more ewes per man. That is, they demonstrated that high numbers of ewes per permanent man is technically feasible. The basic farming methods within each management system were no different from usual North Island sheep farming practices. This meant that these farmers were using technology and farming techniques that were known and used by many other farmers. Further, the study indicated that on many farms, management systems with higher permanent labour productivity are likely to be more profitable.

Labour saving techniques were evaluated under three headings; management, mobility, and saving labour during farm operations. Each technique enabled time to be saved during peak seasonal farm operations. The author considered the management approach was the most important "technique". This forced labour utilisation problems to be considered as part of an overall management problem.

As a result of this study the author believes that substantial increases in the number of ewes per permanent man are possible under

present farming conditions. Further, this may be achieved fairly simply. Complete changes in technology or in the system of farming need not be necessary. Modifications to existing systems may be all that is required.

On many farms substantial increases in permanent labour productivity may be achieved through changes in the farmer's attitude and improved management. The extent to which increases in permanent labour productivity are achieved will depend upon the effect of farmers who have the objectives, ability and resourcefulness consistent with profitable sheep farming.

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GLOSSARY

BLACKLEG — Micro-organisms which cause blood poisoning in sheep. The organisms enter the blood stream through any break in the skin, through injuries which can occur at lambing, docking, crutching, and shearing.

EFFECTIVE ACREAGE — Grazeable area of the farm.

EWE EQUIVALENT — The equivalent of the nutritional requirements of one ewe.

FLEECE WOOL

- Early Shorn Fleece - Wool of 3½ inches - 4 inches and over in length, which holds together slightly as a fleece. Usually about 8 months' growth.
- Main Fleece - One year's wool growth.
- Second Shear - For 46/50 wool and coarser, it is wool of 2 - 4 inches to 3 - 5 inches in length. Usually about 4 - 7 months' growth.
- Wool Commission Type 114 - A 46/50's B grade, crossbred, good topmaking, fair to good colour, skirted, and may contain the odd cott and/or very slight seed.
- Wool Commission Type E695 - 46/50's average second shear firsts, fair to good colour, fair length, may be slightly skirted and contains slight seed. Length 2 - 4 inches - to 3 - 5 inches.

MALIGNANT OEDEMA — Blood poisoning.

PULPY KIDNEY — Disease causing death, usually in good-conditioned lambs from 3 weeks to 4 months of age and caused

by a toxin secreted in the small intestine by bacteria known as Clostridium welchii Type D.

SCABBY MOUTH — A disease which is caused by a virus infection of the skin which is most common in lambs of 3 - 6 months of age, and which results in blisters developing on the lips, which later become hard brown scabs, preventing lambs from grazing or suckling freely.

SECOND SHEARING — Shearing sheep more than once a year.

TOPOGRAPHICAL CLASSIFICATIONS - Flat - Land which can be traversed by all farm vehicles.

Rolling - Land comprised of easy hills, almost all of which can be traversed by farm vehicles without farm tracking.

Moderate - Land negotiable by farm vehicles with reasonable farm tracking.

Steep - Land negotiable by farm vehicles only with extensive farm tracking.

TUPPING — Mating.

WOOL COUNT — Refers to the number of hanks from one lb. of wool yarn. On sheep farms "count" is measured by the number of crimps per inch of wool fibre.

APPENDIX A

CONSTITUENT COUNTIES OF PRINCIPAL SHEEP FARMING REGIONS.

Region	Constituent Counties
Northland:	Mangonui Whangaroa Hokianga Bay of Islands Whangarei Hobson Otematea
Raglan - King Country:	Raglan Otoroganga Waitomo Taumarunui
Rotorua-Taupo-Matamata:	Rotorua Taupo Matamata
East Coast:	Waiapu Waikoku Cook
Hawkes Bay:	Wairoa Hawkes Bay Waipawa Waipukurau Patangata Dannevirke Woodville
Wairarapa:	Pahiatua Akitio Eketahuna Masterton Wairarapa South Featherston
Rangitikei:	Waimarino Waitotara Wanganui Rangitikei Kiwitea Pohangina Oroua

APPENDIX B

This appendix records some of the vital statistics connected with the conduct of the farm labour survey.

TABLE 1 SUMMARY OF TIME AND ACTIVITIES INVOLVED IN SURVEY

Survey Summary

Time interval - March 1966 to July 1967

Phase One - Exploratory

March/April - 8 letters to Palmerston North Organisations

6 farm visits

Phase Two - Revised Farm Survey

April/July - 101 letters to Extension Personnel

27 farm visits

November - Article published in the N.Z. Farmer, November 24, 1966.

December 1966/February 1967 - 19 farm visits.

Phase Three - Revisiting Farms and Collection of Financial Data

February 1967/July 1967 - 10 farms revisited once

3 farms revisited twice

Financial data collected from 4 accountants and 2 farmers

TABLE 2 RESPONSE TO MAIL REQUESTS FOR INFORMATION

Letter to:	Number of Letters	Number of Replies*	Response %
Department of Agriculture Farm Advisory Officers	35	23	66
Farm Improvement Club Advisors	29	20	69
Veterinarians	28	3	11
Valuation Department Valuers	6	4	66
N.Z. Meat & Wool Board's Economic Service Officers	3	2	66
	101	52	51

* Replies on behalf of two or more people have been credited where this was stated on the reply.

TABLE 3 ANALYSIS OF REPLIES GIVING ACTUAL EWES PER MAN ON FARMS IN RESPONSE TO REQUESTS FOR INFORMATION ABOUT FARMS CARRYING 2000 OR MORE EWES PER PERMANENT MAN.

Ewes per Man	Number of Farms
1000 - 1499	7
1500 - 1999	10
2000 - 2499	19
2500 - 2999	2
3000 and above	5
	43

TABLE 4 EWE EQUIVALENTS PER MAN CITED IN RESPONSE TO REQUEST FOR INFORMATION ABOUT FARMS CARRYING 2000 OR MORE EWES PER PERMANENT MAN

Ewe Equivalents per Man	Number of Farms
Under 2000	2
2000 - 2999	14
3000 - 3999	12
4000 - 4999	3
5000 - 5999	1
6000 - 6999	-
7000 and above	2
	34
Ewe equivalents not given	9
	43

TABLE 5 LABOUR SAVING TECHNIQUES REPORTED AND INVESTIGATED.

	Device or Technique	Frequency
(i)	Transport, Access and Mobility	
	Transport - Tractor	1
	3-Wheel vehicle	1
	Motor bike	4
	*Construction of tracks for motor bike	1
	Farm race	1
	Gate system	1
(ii)	Facilities and Equipment	
	'Good' sheep yards	1
	Extra sheep yards	1
	Type of fencing	1
	Docking equipment and method	2
	Crutching pen and portable plant	2
	Crutching race and portable plant	1
(iii)	Management and Husbandry Techniques	
	Perendale sheep to reduce labour	7
	Border Leicester sheep to reduce labour	2
	*Substituting hoggets for ewes	1
	Spray dipping	1
	Shower dipping	1
	Footrotting methods	2
	*Sawdust pad for cattle feeding	1

Device or Technique		Frequency
*Silage for cattle feeding		1
Drafting into lambing mobs		1
Use of ram harness		3
Feeding ewes hay after tupping.		1
Controlled lambing		1
Concentrated lambing area		1
Selection of Romney ewes for ease of lambing		1
Employing casual labour for lambing		2
Efficient shedding system at lambing		1
Docking technique		2
Grazing systems -	Rotational	1
	Intensive Rotational	1
	Set stocking	1
Second shearing -	Ewes	1
	Lambs	1
(iv) Miscellaneous		
Use of contractors		1
Chemical ploughing		2
Buying old ewes		1
'Good' farmers		12
		67

Total = 67 instances of 38 labour saving techniques.

* Farm not visited.

** Note: Several farms used more than one labour saving technique so that the sixty-seven individual cases of labour saving techniques on use on farms occurred on a total of 52 farms.

APPENDIX C

DESCRIPTION OF A HYPOTHETICAL SHEEP FARM

For the purposes of evaluating several labour saving techniques the statistics of a hypothetical sheep farm have been used in the analysis. The reason for the use of such a farm was that in most instances insufficient reliable data was available during the farm survey for a detailed analysis to be carried out.

The author constructed the hypothetical situation described below as one which would be useful in illustrating the possible time saved on a type of farm where the "labour problem" is likely to be important. The farm is a one-man, 500 acre unit.

The hypothetical farm attempts to simulate the situation of a one-man farm with 1500 ewes per permanent labour unit. The number of ewes is considered to be all that one permanent labour unit can handle. However the stocking potential is considerably above the present stocking rate.

Farm Area - 500 effective acres of rolling to moderate hill country.

Climate and Rainfall - Moderate winters but with frosts, good spring growth, and declining pasture growth in late summer. Rainfall heavier during the late winter months, and lowest precipitation in late summer.

Farm Management - Management by the farmer - in his capacity as an owner-operator.

Farm Labour - Most stock husbandry operations performed by the farmer with casual help for docking, weaning and dipping. Contract labour employed for pre-lamb ewe crutching and shearing.

Farm maintenance tasks performed by the farmer, but development work including scrubcutting, bulldozing, fencing and cultivation performed by casual and contract labour.

Stock Wintered

Sheep - Breed - Romney			
Ewes - Two Tooth		450	
Four Tooth		400	
Six Tooth		350	
Rising Five Year		300	
			1500
Hoggets - Ewe		500	
Wether		50	
			550
Rams			50
Total Sheep			2100
Beef Cattle - Breed - Aberdeen Angus			
Breeding Cows - Mixed Age			80
Replacements			20
Bulls			2
Total Cattle			102
Total Ewe Equivalents			2353
Ewe Equivalents per Acre			4.7
Potential Ewe Equivalents per Acre			8.0

Stock Performance

Lambing % = 90

Calving % = 80

Losses %: Ewes - 5; Hoggets - 2; Lambs (to weaning) 2; Cattle - 1.

Wool (lb) - Ewes, 10; Hoggets, 7½; Lambs 2.

Culling - Ewes - Two Tooth 6%

Four Tooth 7½%

Six Tooth 11%

Five Year 95%

Farm Policy - Farm income derived mainly from wool and sales of wether lambs and surplus ewe lambs. Farmed as a breeding concern, with some wether lambs being fattened.

Calculation of Ewe Gross Margin

Stock Performance		Capital	
Lambing	90 per cent	Value of Two Tooth Ewe	$8.00
Ewe Losses per Year	5 per cent	Sale Price of 5 Year Ewe	4.00
Life of Ram	4 years	Cost of Ram	30.00
Ewes per Ram	40		
Wool Production per Ewe	10 lbs		
" " per Lamb	2 lbs		

Expenditure per Year		Income per Year	
Ewe:		Ewe:	
Vet., Crtg., Shearing	0.35	Wool - 10 lbs at 25c	$2.50
Interest at 6%	0.48	Lamb:	
Ram	0.20	$4.00 (x 0.9)	3.60
Depreciation	1.00	2 lbs (x 0.9) at 25c.	0.45
Ewe Losses at 5%	0.30		
Lamb:			
Vet., Shearing	0.35		
Gross Margin	3.87		
	$6.55		$6.55

APPENDIX C

DETAILED VEHICLE COSTING

Vehicle - Make and Model

Four Wheel Drive:	Landrover - Regular 88, Soft Top.
Two Wheel Drive:	Trekka - Limited Slip Differential Canvas Top.
Wheel Tractor:	Massey Ferguson 35 (Petrol)
Three Wheel:	Farm Gnat.
Motor-bike:	Yamaha 80.

Depreciation

Depreciation has been charged at the rate of 20 per cent on the diminished value (which is tax deductible) which is assumed to approximate the annual decrease in market value on a "trade in" basis. No account has been taken of the Special Depreciation of 20 per cent per vehicle tax deductible on farm transport equipment. This would of course have the effect of lowering annual vehicle costs (post tax).

Interest

Interest has been charged at the rate of 6 per cent per year, and an interest rate of 6 per cent was used in calculating the present values of the respective vehicle costs.

Repairs

The yearly repairs for each vehicle are extremely variable, and depend upon several factors. These include the style of driving, the timeliness and frequency of maintenance, and the number of operations. In this analysis the author has made estimates based on information from garages servicing farm vehicles.

Operating Costs

The operating costs for each vehicle consist of fuel, oil and servicing charges for 1500 miles, covered in farm travel. For the purposes of comparison, every vehicle is assumed to travel 1500 miles.

Track Maintenance.

In each case the present farm tracks were considered adequate, hence no new tracks being required. An estimate of the difference between vehicles in the amount of wear on tracks is shown in the "cost of maintaining tracking" item in Table 5.19.

VEHICLE COSTS PER YEAR

VEHICLE	First Year	Second Year	Third Year	Present Value
FOUR WHEEL DRIVE				
Depreciation	610	428	313	
Interest	184	184	184	
Repairs	100	200	400	
Operating Costs	100	100	100	
Total	$994	$912	$997	$2,586
TWO WHEEL DRIVE				
Depreciation	415	330	264	
Interest	124	124	124	
Repairs	100	150	300	
Operating Costs	60	60	60	
Total	$699	$764	$748	$1,967
WHEEL TRACTOR				
Depreciation	358	287	229	
Interest	108	108	108	
Repairs	50	100	150	
Operating Costs	120	120	120	
Total	$636	$615	$607	$1,657
THREE WHEEL VEHICLE				
Depreciation	140	112	90	
Interest	42	42	42	

Repairs	100	100	100	
Operating Costs	100	100	100	
Total	$382	$354	$332	$954

MOTOR BIKE

Depreciation	99	79	63	
Interest	30	30	30	
Repairs	-	8	40	
Operating Costs	19	19	19	
Total	$148	$136	$152	$389

APPENDIX D

PARTIAL BUDGETTING ANALYSIS

Partial budgetting was used to estimate the change in post tax cash income with the addition of an extra permanent man on each of the Case Study Farms. In order to do this a number of assumptions and estimates were made. These are stated below.

MARGINAL REVENUE - The additional revenue in three cases is made up from sales of extra wool, and extra stock - both sheep and cattle. In the other two cases additional revenue is made up by extra wool and extra sheep.

Wool - In each of the five cases the weight of extra wool has been calculated according to the shearing practices on the particular farm. In four cases the extra wool has come from all extra sheep. On farm 11 however, the extra wool has come only from the extra ewes. For each farm the wool price used is the average price for the total wool clip for that year.

Sheep and Cattle - The sale prices received for the extra sheep on each case farm approximate the actual prices received for other sheep sold. Where no comparison was available, or where it was felt that such an approximation was unrealistic, the author estimated prices based on a "Guide to Current (1965-66) Farm Costs and Prices", compiled by Mr. N. Watson of the Farm Management Department, Massey University. Cattle prices have been calculated in the same manner.

MARGINAL COSTS - The marginal costs taken into account have been concerned with wages and associated labour costs, as well as the extra (variable) costs incurred with higher farm production.

Permanent Wages - The wages paid to a permanent man have been set at $2,000 per annum. No particular working hours, overtime rates or bonus payments have been included. The employee is given free electricity, but pays telephone charges. To simplify payment, rations and perks are included in wages.

Associated Labour Costs - The electricity paid by the farmer is estimated at $80 per annum and is tax deductible. Farm stores, which consists of various tools, as well as shovels, spades and fencing equipment, is estimated at $100 per annum.

The employee insurance cost of $24 is workers' compensation insurance. This is based on the rate of $2.40 insurance per $200 wages. The house insurance is a Fire/General Risk/Earthquake policy calculated for a house valued at $7000 located in a country area. The charge is a standard rate set by the Insurance Association of New Zealand.

The other housing costs are interest and principle repayment costs. These are based on the cost of a new house at $7000, and the interest charges and debt servicing on $7,000 after one year. The rate of interest is assumed to be 6 per cent per annum. The terms of the loan are assumed to be a table mortgage over 20 years. The principle repayment per annum, including the first full year, being $350 per annum.

Variable Costs - The variable costs have been defined as the farm costs incurred as a result of higher farm production.

Animal health costs include docking costs, ewe vaccinations prior to lambing, and drenching. The total cost has been estimated at 9c. to 10c. for every extra sheep. Freight costs have been calculated for each farm on the extra stock and wool sold, and the distance from sale yards and rail heads.

Shearing costs have been calculated at 25c per sheep shorn.

Vehicle expenses have been estimated at from 10 per cent to 30 per cent above the actual vehicle expenditures.

Subtracted Costs - In each partial budget, costs have been subtracted for two reasons. In each case lower taxation resulting from the Alternative Policy has decreased marginal costs. Also permanent labour has substituted for other forms of labour. This has resulted in a reduction in the casual and contract wage costs on the five farms.

PARTIAL BUDGETS

ALTERNATIVE LABOUR POLICY

Farm 1

Marginal Revenue:

Wool A/c		
536 lbs at 31.5c /lb.		$169
Sheep A/c		
31 6 yr. ewes at $4.69	145	
32 2th ewes at $7.50	240	
25 M/S lambs at $4.50	117	502
Cattle A/c		
3 cows at $40.00	120	
3 steers at $87.55	263	383
Marginal Revenue:		$1,054

Marginal Costs:

Permanent Wages		$2000
Associated Labour Costs		
Electricity	80	
Farm Stores	100	
Insurance - Employee	24	
- House	24	
Extra House - Interest	420	
- Principle Repayment	350	$998
Variable Costs		
Animal Health	9	
Freight	19	
Shearing	22	
Vehicle Expenses	217	$267
		$3,265
Less: Casual Mustering	600	
General Wages	68	
Taxation Difference	479	$1147
Net Marginal Costs		$2,118

Farm 6

Marginal Revenue:

Wool A/c			
380 lbs at 31c/lb		118	
Sheep A/c			
46 Ewe lambs at $2.50	115		
47 Wthr. " " 4.50	211		
19 C.F.A. Ewes at 4.50	85	411	
Cattle A/c			
No change			
Marginal Revenue			$529

Marginal Costs:

Permanent Wages		$2000	
Associated Labour Costs			
Electricity	80		
Farm Stores	100		
Insurance - Employee	24		
- House	24		
Extra House - Interest	420		
- Principle Repayment	350	$998	
Variable Costs			
Animal Health	11		
Freight	19		
Shearing	28		
Vehicle Expenses	39	$97	
			$3,095
Less: Permanent Wages (20 weeks)	850		
Fencing	369		
General	66		
Crutching	124		
Taxation Difference	358	$1767	
Net Marginal Costs			$1,328

Farm 10

Marginal Revenue:

Wool A/c			
231 lbs at 29.17c/lb		$67	
Sheep A/c			
63 lambs at $5.00	315		
26 C.F.A. Ewes at $4.50	117	$432	
Cattle A/c			
4 Weaners M/S at $46	184	$184	
Marginal Revenue			$683

Marginal Costs:

Permanent Wages		$2000	
Associated Labour Costs			
Electricity	80		
Farm Stores	100		
Insurance - Employee	24		
- House	24		
Extra House - Interest	420		
- Principle Repayment	350	$998	
Variable Costs			
Animal Health	8		
Freight	26		
Shearing	13		
Vehicle Expenses	146	$193	
			$3,191
Less: Youth - 1 year	1000		
Crutching	100		
Taxation Difference	20	$1120	
Net Marginal Costs			$2,071

Farm 11

Marginal Revenue:

Wool A/c			
560 lbs at 28c/lb		$157	
Sheep A/c			
56 C.F.A. Ewes at $4.50	252		
56 Lambs at $5.02	281	$513	
Cattle A/c			
No Change		-	
Marginal Revenue			$670

Marginal Costs:

Permanent Wages		$2000	
Associated Labour Costs			
Electricity	80		
Farm Stores	100		
Insurance - Employee	24		
- House	24		
Extra House - Interest	420		
- Principle Repayment	350	$998	
Variable Costs			
Animal Health	11		
Shearing	11		
Freight	29	$51	
			$3,049

Less:

Half Casual Wages	1037		
Taxation Difference	705	$1742	
Net Marginal Costs			$1,307

Farm 13

Marginal Revenue:

Wool A/c			
115 lbs at 30c/lb		$35	
Sheep A/c			
8 C.F.A Ewes at $4.50	36		
14 W.F. Lambs at $5.13	72	$108	
Cattle A/c			
3 Weaners M/S at $44	132	$132	
Marginal Revenue			$275

Marginal Costs:

Permanent Wages		$2000	
Associated Labour Costs			
Electricity	80		
Farm Stores	100		
Insurance - Employee	24		
- House	24		
Extra House - Interest	420		
- Principle Repayment	350	$998	
Variable Costs			
Animal Health	2		
Freight	7		
Shearing Expenses	5		
Vehicle Expenses	43	$57	
			$3,055
Less: Youth - Wages	866		
General Wages	106		
Taxation Difference	594	$1566	
Net Marginal Costs			$1,489