PERFORMANCE AND MANAGEMENT CHARACTERISTICS OF WAIRARAPA AND TARARUA WOOL PRODUCTION SYSTEMS.

R. G. Gavigan

April 1994

A thesis presented in partial fulfilment of the requirements for the degree of Master of Agricultural Science in Farm Management at Massey University.

Massey University Library
Thesis Copyright Form

Title of thesis: Performance and Management Characteristics of Wairarapa and Tararua Wool Producing Depts

(1) (a) I give permission for my thesis to be made available to readers in Massey University Library under conditions determined by the Librarian.

(b) I do not wish my thesis to be made available to readers without my written consent for ... months.

(2) (a) I agree that my thesis, or a copy, may be sent to another institution under conditions determined by the Librarian.

(b) I do not wish my thesis, or a copy, to be sent to another institution without my written consent for ... months.

(3) (a) I agree that my thesis may be copied for Library use.

(b) I do not wish my thesis to be copied for Library use for ... months.

Signed L. G. GRAVIGAN

Date 29/4/1994

The copyright of this thesis belongs to the author. Readers must sign their name in the space below to show that they recognise this. They are asked to add their permanent address.

NAME AND ADDRESS DATE

ACKNOWLEDGEMENTS

I wish to express my thanks to Professor Warren J. Parker for his guidance and assistance throughout this study. I am also appreciative of the assistance and support provided by other staff, and students, of the Department of Agricultural and Horticultural Systems Management at Massey University.

I am indebted to the New Zealand Wool Board, in particular Messrs Lance Wiggins and John Hutchinson, for the opportunity to complete this study. The New Zealand Wool Board are very generous employers, and I look forward to my continued role within the Grower Services Division.

I am very grateful to the Wairarapa/Tararua farmers who made their farms available for the survey. Their cooperation and friendly hospitality made the field work a highlight of the study.

I would like to thank my colleague, Dr Ken Geenty, for his encouragement to undertake this study, and interest throughout. Thanks also to Jill Beedie and Sue Rivers of 'Office Solutions', for their support during the last two years.

Thanks must go to Sue Rivers for her skill and efficiency in preparing this manuscript.

Finally, I must acknowledge the patience and support of my family and friends. I look forward to spending much more time with them in the future.

I dedicate this work to my parents, Colleen and Gordon, who have always encouraged my education.

I accept responsibility for any errors or omissions in this report.

ABSTRACT

In 1992/93 the New Zealand wool industry was based on approximately 52.5 million sheep that produced 255500 tonnes of greasy wool. The New Zealand Wool Board Grower Services Group, among others, provided the 24000 sheep farmers involved in wool production with management advice and technical assistance in growing and harvesting wool which was subsequently sold, exported, processed and promoted by a network of wool industry participants.

The purpose of this study was to :

- compile a detailed database of Wairarapa/Tararua wool production systems.
- compare the database compiled with existing databases to test their suitability for describing Wairarapa/Tararua wool production systems.
- identify management variable that may be important in achieving high levels of wool production and returns.
- identify methods to improve New Zealand Wool Board extension in the Wairarapa/Tararua region.

This was achieved by a combined mail and personal interview survey of a stratified random sample of 75 Wairarapa/Tararua wool producers. Descriptive statistical methods were used to describe the physical and financial characteristics of wool production systems and the management systems employed. Multiple regression analysis was used to estimate the relative importance of different management strategies and farm physical characteristics on wool production and clean wool price.

Few significant differences in mean wool production system performance within farm class, summer rainfall, sheep flock size and summer rainfall/farm class groupings were noted in the study. Thus, the Wairarapa/Tararua region was relatively homogeneous in terms of wool production system performance over the past three seasons. A large range in values for most wool performance parameters suggested that wool production system performance on individual farms was influenced more by management variables than by farm physical attributes.

A comparison of the New Zealand Meat and Wool Boards' Economic Service (NZMWBES) Sheep and Beef Farm Survey and Wairarapa Farm Improvement Club (WFIC) databases with data collected in this study indicated that NZMWBES and WFIC data were satisfactory for describing some, but not all of the characteristics of wool production systems in the region. Therefore, in order to maintain a representative overview of Wairarapa/Tararua wool production systems it is recommended that this study should be regularly updated.

Aspects of wool production systems that could be improved on many Wairarapa/Tararua sheep farms mainly related to : the quantification of sheep breeding objectives; use of objective criteria for replacement ewe hogget and ram selection; improved summer feeding of mixed age ewes (if wool prices improve); and improved marketing (objective measurement and offer of wool to a wider range of buyers) of privately sold wool. These aspects can be addressed by New Zealand Wool Board mass extension activities, primarily through newspapers and free publications. While improvements in management for wool production are likely to increase monetary returns to the regions' wool producers, they should be promoted in the context of assisting individual wool producers to achieve their personal goals/objectives.

TABLE OF CONTENTS

Page No.

FIGURES

TABLES

Page No.

CHAPTER ONE

INTRODUCTION

1.0 CHAPTER OUTLINE

In this chapter the various components of the New Zealand wool industry are outlined. The structure and function of the New Zealand Wool Board is described, and the role of the Grower Services Group is discussed in relation to the objectives of the study.

1.1 THE NEW ZEALAND WOOL INDUSTRY

1.1.1 Export Earnings

The New Zealand wool industry produced 193000 tonnes of clean wool in the 1992/93 season, of which just over 93% was exported. This made New Zealand the second largest wool producing and exporting nation in the world, after Australia (New Zealand Wool Board, 1993a).

Wool and wool sector exports created around 15% of New Zealand's total merchandise export earnings each year during the 1980's (New Zealand Wool Board 1993a). However, this dropped significantly to 10.7% in 1990 and 7.6% in 1992 in response to lower international wool prices and a reduced national sheep flock.

New Zealand is the world's principal source of strong crossbred wools (wools stronger than 33 microns), producing 30% of total world supplies and accounting for around 60% of world trade in crossbred wool (New Zealand Wool Board, 1992a). Most of this wool is used in carpets and other interior textiles.

1.1.2 Sheep Farms

Approximately 50% of New Zealand's 27 million hectares of land is used for pastoral farming. Sheep farming for both wool and meat predominates, with around 11.6 million hectares devoted primarily to sheep and beef cattle grazing (New Zealand Meat and Wool Boards' Economic Service, 1993a). The New Zealand Meat and Wool Boards' Economic Service (NZMWBES) (1993a) noted that 12.89 million hectares of land was used for sheep and beef cattle farming in 1980/81, and projected that utilisation would be down to 10.8 million hectares by the year 2000. In 1991 there were 34300 sheep farms in New Zealand, of which 19600 wintered at least 750 sheep or equivalent sheep plus cattle stock units (NZMWBES, 1993a).

The New Zealand Wool Board (NZWB) (1993a) described a "typical" sheep farm as 400 ha in size, carrying 2200 ewes, 1000 hoggets and 100 cattle. The NZMWBES (1992) classified New Zealand sheep and beef farms into eight farm classes, as outlined in Table 1.1. Full NZMWBES Farm Class definitions are included in Appendix A.

Table 1.1 Classification of New Zealand sheep farming systems.

Source : NZMWBES (1992), New Zealand Wool Board (1993c).

NZMWBES Farm Class	Farm Type	No. of Farms	% of Farms	Average Farm Size (ha)	Average No. of Stock Per Farm		Average Per ha Production (kg)		Proportion of National Wool Production (%)	Main Sheep Breeds
					Sheep	Cattle	Wool	Meat		
1	South Island High Country	250	1	10000	8700	320	4	6	3	Merino, Halfbred, Corriedale
2	South Island Hill Country	900	4	2000	4900	270	13	33	7	Halfbred, Corriedale
3	North Island Hard Hill Country	1650	8	800	4500	400	30	79	13	Romney, Perendale
4	North Island Hill Country	4700	24	400	3500	250	46	123	29	Romney, Perendale, Coopworth
5	North Island Intensive Finishing	3350	21	200	2000	150	59	177	16	Romney, Perendale, Coopworth
6	South Island Finishing - Breeding	4450	20	360	3100	65	24	102	11	Romney, Corriedale, Coopworth, Halfbred
7	South Island Intensive finishing	3300	18	200	2600	25	79	182	19	Romney, Coopworth
8	South Island Mixed Finishing	1000	4	230	1600	10	35	185	2	Romney, Coopworth, Corriedale, Halfbred

1.1.3 Sheep Numbers

The NZMWBES (1993b) estimated that the New Zealand sheep population was 50.3 million at 30 June 1993. This was the lowest number of sheep recorded in 30 years and was down 4.3% on the previous year (Table 1.2). Decreases from 1992 occurred in all regions with sheep numbers in the North Island declining at a slightly faster rate (4.9%) than in the South Island (3.9%). The greatest decline in sheep numbers occurred in the east coast of the North Island and Marlborough/Canterbury. These regions experienced high sheep losses during the difficult spring of 1992.

The steady decline in sheep numbers since 1983 has been due to a number of factors. The removal of Government subsides on sheep meats (Rayner et al., 1989), the lower profitability of sheep compared to cattle (NZMWBES, 1993b), and, in some cases, the adoption of livestock systems which are less prone to animal health challenges, are factors that have prompted a reduction in sheep numbers. Sheep production systems are also relatively more labour intensive than cattle production systems, and some farmers have lowered input costs by reducing labour and adopting farming systems which have a lower labour demand than sheep.

Table 1.2 New Zealand breeding ewe and ewe hogget numbers 1960 to 1992.
Source : NZMWBES (1993b).

Year	Total Sheep	Breeding Ewes	Ewes as a % of sheep	Ewe Hoggets	Ewe Hoggets as % of Ewes
1960	47134	32633	69.2	7992	24.5
1965	53748	37178	69.2	9355	25.2
1970	60276	42912	71.2	11253	26.2
1975	55320	41108	74.3	9802	23.8
1976	56400	41200	73.0	10869	26.4
1977	59105	42782	72.4	11738	27.4
1978	62163	44515	71.6	11821	26.6
1979	63523	46108	72.6	12880	27.9
1980	68772	48245	70.2	13960	28.9
1981	69884	49349	70.6	13985	28.3
1982	70301	50810	72.3	13520	26.6
1983	70263	50966	72.5	13574	26.6
1984	69739	51182	73.4	13146	25.7
1985	67854	50187	74.0	12410	24.7
1986	67470	47491	70.4	12342	26.0
1987	64244	45382	70.6	11876	26.2
1988	64600	44041	68.2	12498	28.4
1989	60569	41414	68.4	11250	27.2
1990	57852	40453	69.9	10581	26.2
1991	55162	36631	66.4	N/A	N/A
1992	52568	36684	69.8	9738	26.5

1.1.4 Wool Production

Annual wool production per sheep in New Zealand is around 5.3 kg. This is among the highest in the world, but has not increased since 1955/56 (Table 1.3). In 1991/92 255500 tonnes of greasy wool was shorn from live sheep. In addition 40400 tonnes of greasy wool (16%) was harvested by the sliping process (NZMWBES, 1993b). This was the lowest level of total wool production, and highest proportion of wool harvested via sliping and skins, since the 1982/83 season (Table 1.3).

Table 1.3 New Zealand wool production.

Source : NZMWBES (1993b).

Season	Shorn Wool (000 Tonnes Greasy)	Slipe Wool & Wool on Sheepskins (000 Tonnes Greasy)	Slipe Wool & Wool On sheepskins as % of Total Production	Total Production (000 Tonnes Greasy)	Sheep at Beginning of Season (000)	Shorn Wool Produced Per sheep (kg)	Total Wool Produced Per sheep (kg)
1955-56	177.7	32.0	15	209.7	39117	4.54	5.36
1960-61	227.8	38.7	15	266.5	47133	4.83	5.64
1965-66	276.6	38.6	12	315.2	53748	5.15	5.86
1970-71	283.4	50.5	15	33.9	60283	4.70	5.54
1975-76	271.5	40.3	13	311.8	55320	4.91	5.64
1980-81	333.3	47.4	12	380.7	68772	4.85	5.54
1982-83	316.1	54.8	15	370.9	70301	4.50	5.28
1983-84	314.5	49.1	13	363.6	70263	4.48	5.17
1984-85	321.2	52.2	14	373.4	69739	4.61	5.35
1985-86	316.6	41.0	11	357.6	67854	4.67	5.27
1986-87	306.1	43.4	12	349.5	67470	4.54	5.18
1987-88	308.0	38.4	11	346.4	64244	4.79	5.39
1988-89	300.6	40.2	12	341.0	64600	4.65	5.28
1989-90	274.2	34.8	11	309.0	60569	4.53	5.10
1990-91	265.7	39.5	13	305.3	57852	4.59	5.28
1991-92	255.5	40.4	15	295.9	55162	4.63	5.36
1992-93	221.1	34.4	13	255.5	52571	4.21	4.86

Due to the wide range of sheep breeds farmed and different shearing policies employed by wool producers, the New Zealand wool clip comprises a variety of wool types and fibre diameters. These are available in a number of lengths throughout the selling season. Wool production is usually classified into three main breed groupings : crossbred (strong), halfbred (medium) and Merino (fine), and less common breed groups that produce wools with special processing characteristics are also differentiated (e.g. lustrous Lincoln and Leicester wools, highly medullated Drysdale wool, and high bulk Down wools).

Wool is further differentiated into fleece and oddment categories when appraised for sale. The different categories of wool sold at auction are noted in Table 1.4.

These data show that there have been few changes in the composition of the auction-sold component of the national clip in the past seven seasons. The most notable change has been a shift towards full fleece production in preference to second shear in 1991/92 and 1992/93. The sharp fall in wool prices during the 1990/91 season is likely to have encouraged wool producers to reduce costs by shearing less frequently.

Table 1.4 Categories of wool sold at auction. Figures are percentages of total annual shorn wool production sold at auction.

Source : New Zealand Wool Board (1987; 1988; 1989; 1990; 1991a; 1992b; 1993c).

	Season						
Category of wool	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93
Full fleece	37	39	38	38	39	42	43
Second shear	31	31	33	34	32	28	28
Lambs	8	10	9	9	9	9	8
Clothing oddments [1]	9	8	8	8	8	8	9
Skirtings [2]	6	5	4	4	4	5	5
Crutchings	3	2	2	2	2	2	2
Cotts	3	3	3	3	3	3	3
Other	3	2	3	2	3	3	2

[1] Includes second shear bellies and pieces, locks and second pieces, eyeclips and topknots.

[2] Includes first pieces, necks, bellies and backs.

1.1.5 Wool Harvesting

There is little documented evidence on the composition of the New Zealand wool harvesting industry. Gavigan (1992) surveyed Wairarapa shearing and

woolhandling operators and found that the region's 310 shearers and 314 woolhandlers were predominantly Maori, relatively untrained, worked under often difficult woolshed conditions, received little formal recognition and, on an annual basis, a relatively poor financial reward. It is not known whether these findings are indicative of other regions in New Zealand.

In spite of some deficiencies in shearer and woolhandler training and wool harvesting conditions, New Zealand wools are recognised as the best and most consistently prepared in the world. New Zealand crossbred wool, for example, commands a 25% premium over equivalent wools produced in the United Kingdom (Morrison, 1993).

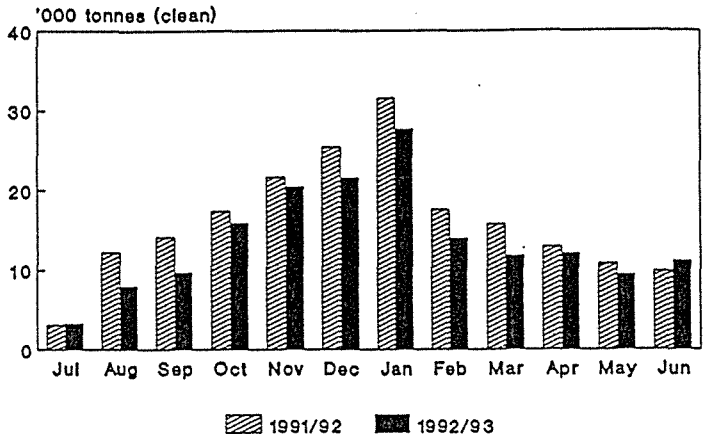
Inputs associated with wool harvesting comprise one of the largest components of sheep and beef cattle farm expenditure. In 1990/91, shearing, woolhandling and woolshed expenses (expressed as a weighted average across all farm classes) were 7.9% of total farm expenditure (NZMWBES, 1992). At that time only interest charges (a standing charge) at 20.4%, and fertiliser costs (a comparable working expense) at 8.3%, were greater.

1.1.6 Wool Selling

The monthly pattern of shorn wool sales for the 1990/91 and 1991/92 seasons is shown in Figure 1.1. The seasonal sales peaks in January correspond to the completion of the 'main shear' period (November to January) in which second shear, eight month and full wool ewes, and lambs, are shorn (Livingston and Parker, 1984).

Figure 1.1 New Zealand shorn wool sales by month.

Source : New Zealand Wool Board (1993c).



A combination of factors, including fluctuating prices, wool quality premiums, the cost of wool harvesting relative to wool returns, and advances in out-of-season shearing technology and management have recently prompted some farmers to change from traditional second shear and full wool shearing policies to out-of-season eight-monthly and pre-lamb winter shearing. This has flattened the monthly wool sales distribution slightly during the past five seasons (Conway pers. comm.).

Public auction is the most common method of selling wool in New Zealand. Between 1987 and 1993 60-65% of wool was sold by auction, 20-25% of sales were to private wool merchants and approximately 10% was sold as slipe or sheepskins (Table 1.5). As shown in Table 1.5 there has been a significant move away from auction selling to private (in-shed) sale since 1990/91. This may be attributed to farmer perceptions that the auction system can introduce large price differences for wools of identical type, that wool producers have little ability to negotiate with buyers over prices at auction, and that the

withdrawal of the NZWB from purchasing activity at auction has reduced the competitiveness of that selling system.

Table 1.5 Method of sale of New Zealand wool 1987/88 to 1992/93. Figures under 'Season' are percentage of total wool production. Source : New Zealand Wool Board (1993c).

	Season					
	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93
Wool sold at auction	4.5	64.0	66.9	67.7	62.9	60.9
Wool sold privately	4.6	24.3	22.2	19.5	23.3	25.4
Slipe	0.2	10.8	10.3	12.3	13.3	13.3
Sheepskins	0.8	0.9	0.6	0.4	0.5	0.4

There are ten registered firms of woolbrokers in New Zealand who arrange the pre-sale handling and post-sale dispatch of wool, and conduct the auction on behalf of their farmer clients. Wool auctions are held weekly throughout most of the season (July 1 to June 30) in Napier and Christchurch, and in the first part of each season for fine wools in Dunedin. Wool is purchased at auction by buyers acting for wool exporting companies, local and overseas wool processors, and merchant scourers. The auction system determines the international price for New Zealand wool.

In addition more than 100 private wool merchants/buyers operate throughout New Zealand. These merchants purchase wool on-farm and offer farmers an 'on-the-spot' price inclusive of wool handling and on-selling charges, based on latest auction sale prices and wool orders to be filled. The private merchant may on-sell to a wool exporter, sell to a merchant wool scourer, or scour and

export wool directly. They may also purchase and/or sell wool through the auction system.

All wool sold through the auction system is sampled and tested prior to sale. Sampling is conducted in wool brokers' stores, and testing and certification is carried out by one of two commercial wool testing laboratories, the New Zealand Wool Testing Authority Ltd and SGS Wool Testing Services.

All auctioned wool is objectively specified for yield (including vegetable matter content), fibre diameter, colour and medullation (when specifically requested) using internationally accepted standard test methods. Test results are used by prospective buyers of wool to determine a purchase price. They are also made available to wool producers. Fine wool growers are encouraged to test their wool for pre-sale certification of length and strength, using the Australian-developed ATLAS method (NZWB, 1993b). A New Zealand standard test for length after carding has recently been introduced and a draft test method for bulk is currently being assessed.

In contrast very little privately sold wool is tested prior to sale. Most transactions are made on the basis of a private merchant's visual assessment of wool, which can be inaccurate.

1.1.7 Wool Scouring

Wool scouring involves washing greasy wool in hot water and detergent to remove wax, suint, dirt and loose vegetable matter. Scoured wool is rinsed and dried to the required mositure content (regain).

New Zealand has one of the most cost efficient scouring industries in the world (NZWB, 1993a). It is recognised as being internationally competitive and is at the forefront of developments in scouring technology and equipment. There are 22 scouring plants in New Zealand. These either operate on a commission basis, as merchant scourers (i.e. buying wool and scouring on their own account), or in association with wool exporting companies or wool processing mills.

Approximately 82% of annual wool production was scoured in New Zealand in 1991/92 (NZWB, 1992a). The NZWB (1993a) stated that large-scale cost efficiencies and processing advantages can be achieved by purchasing New Zealand scoured wool because : wool scouring technology and plant have been specifically designed to process New Zealand wools; the uncertainties of yield calculation are removed; freight costs can be reduced by as much as 25%; costly time delays in the processing cycle are reduced; and large homogeneous parcels of wool are produced.

1.1.8 Wool Exporting

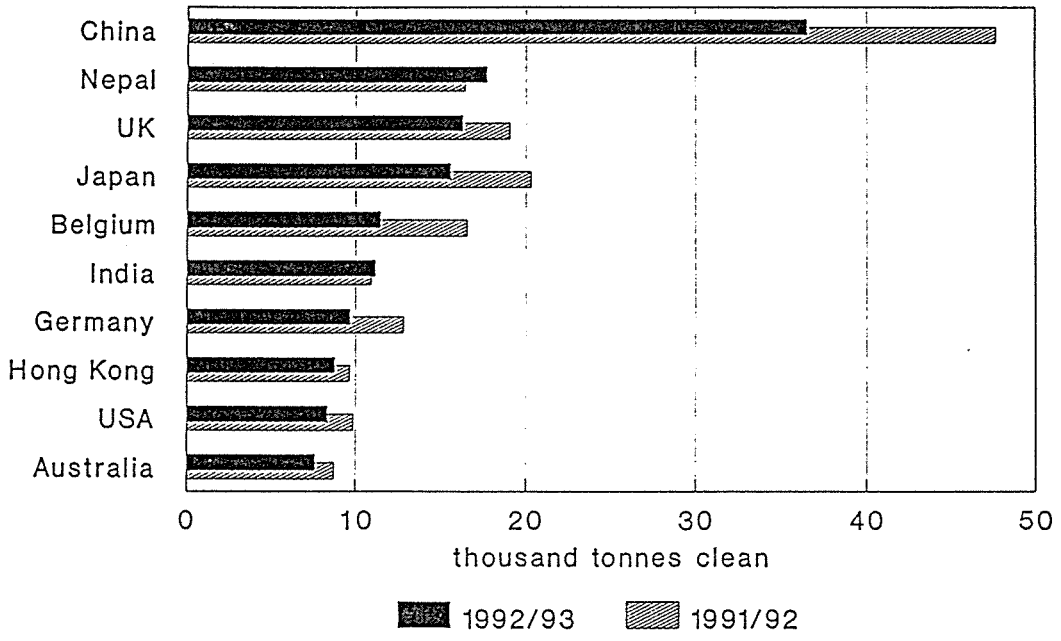
Wool exporters buy wool at auction or directly from a farmer or another buyer and sell to the overseas end-user, directly or through a network of local agents. As at July 1992 there were 137 licensed wool exporters in New Zealand. Of these, the top 22 handled 80% of wool exports (by volume).

China was the major export destination for wool from New Zealand in 1992/93, followed by Nepal, the United Kingdom and Japan (Figure 1.2). Exports to China of 36500 clean tonnes in 1992/93 were down 23% from the previous season, while exports to the United Kingdom and Western Europe of 41250 clean tonnes declined by 27%. The Commonwealth of Independent States

(CIS) imported only 1600 clean tonnes of wool in 1992/93, most of which was from NZWB stocks. This was well down on the 26664 clean tonnes exported to the USSR in 1989/90. In 1992 the NZWB negotiated to send more stockpile wool to the CIS, retaining ownership through processing up until the wool products were sold within the CIS.

Figure 1.2 New Zealand wool fibre exports to major markets.

Source : New Zealand Wool Board (1993c).



1.1.9 Wool Price

Wool prices are influenced by the supply of and demand for wool (Philpott, 1966; Reserve Bank Of New Zealand, 1982; Little, 1992; NZWB, 1992a). Supply and demand forces affect wool price in two different time frames - the 'short-run' (e.g. between wool sales within season quarters) and the 'long-run' (e.g. within a season or a number of consecutive seasons). The short-run supply of wool can be influenced by : time of year, in relation to wool harvesting patterns; weather, in relation to wool harvesting; and farmer wool stockpiling behaviour. Short-run demand can be affected by : individual woollen

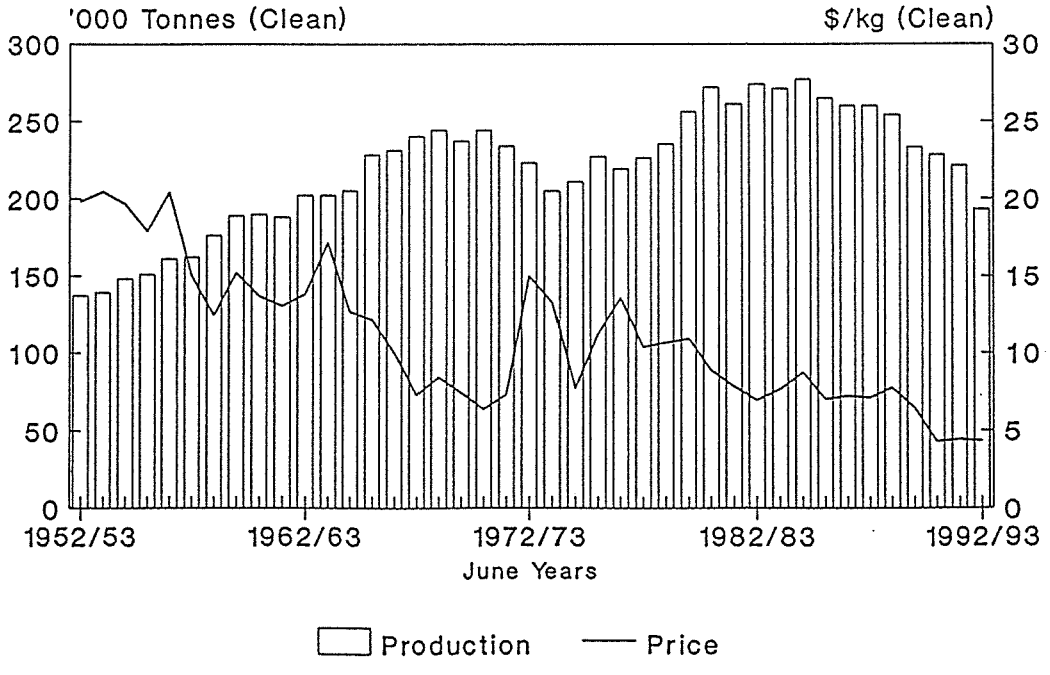
mill requirements; the effect of exchange rate movements on the cost of wool; short term changes in the cost of wool scouring; and wool exporter buying activity

The long-run supply of wool is influenced by : seasonal effects (e.g. summer rainfall) on wool production; the relative profitabilities of farm production enterprises and subsequent allocation of farm resources; and government policies that impact on sheep production. The long-run demand for wool can be affected by : economic and political trends in buyer countries and their effect on consumer incomes; fashion trends/changes in consumer preference for other textile fibres; and the cost of other (substitutable) textile fibres.

Figure 1.3 shows the trends in New Zealand wool supply and price (adjusted for inflation) since 1952/53. A general increase in production and decrease in real price is apparent.

Figure 1.3 New Zealand wool price and production (expressed in 1992/93 purchasing terms).

Source : New Zealand Wool Board (1993c).



The 'farm gate' price for New Zealand wool is also influenced by movements in the exchange rate (Britland, 1994). As New Zealand wool is valued in $US terms, a strengthening $NZ results in lower wool prices for New Zealand wool producers. This impacted on the wool prices received by farmers from 1987 to 1989, when the exchange rate and interest rates were both high, as the New Zealand Government controlled the money supply to reduce inflation (Rayner et al., 1989).

The wool price received by individual wool producers is further dependent on the processing characteristics of their wool clip. Wiggins and Beggs (1980), Pattinson (1981), McPherson (1982) and Stanley-Boden (1985) established that mean fibre diameter, bulk, fibre length, colour and vegetable matter content were the most important wool attributes influencing price. Style grade, although subjectively assessed, was also found to affect wool price.

1.1.10 Wool Processing

There are three processing systems which are commonly used to convert wool fibre into yarn: woollen, worsted and semi-worsted. The systems are distinguished by the degree of preparation of the wool fibre before spinning, which in turn imposes restrictions on the type of wools which can be processed successfully, and influences the characteristics of the yarn produced.

The woollen system, the main processing route for New Zealand wools, produces yarn which is widely used in carpets, woven fabrics and knitwear. It is a comparatively inexpensive system which can tolerate short and tender wools, but these must have low levels (1-2%) of vegetable matter

contamination. The woollen system processes 25% of Merino wool, 40% of Halfbred and Corriedale wool, and approximately 70% of crossbred wool (NZWB, 1993a).

In contrast to the woollen system, the worsted system produces a smooth, lean, compact yarn. Worsted yarns are used to produce light and medium weight woven and knitted fabrics. Because of its combing process, the worsted system does not tolerate short and very tender wools as these result in costly fibre wastage. The system can, however, cope with higher levels of vegetable matter contamination, accepting up to 6% without serious technical problems. The worsted system is used to process 70% of Merino wool, 55% of Halfbred and Corriedale wool, and 17% of crossbred wool (NZWB, 1993a).

The semi-worsted processing system was developed to produce yarns with worsted-spun characteristics, but in a shorter, more economic way. The process requires sound and freely opening wools with a minimum staple lenth of 75-125mm. The semi-worsted system processes 5% of Merino wool, 5% of Halfbred and Corriedale wool and 13% of crossbred wool.

1.1.11 New Zealand Wool End Uses

Carpets (including rugs) are the major end-use for New Zealand wool, accounting for approximately 60% of annual production. Other interior textiles, including furnishings, blankets and wool-filled bedding, account for 9%. Apparel and knitwear each consume 11%, with hand knitting yarn taking 9% (NZWB, 1993a).

New Zealand wool is also used in a wide range of other end products such as car upholstery, industrial felts, insulation, flame and molten metal protective

clothing, fire blankets and tennis ball covers. A new and specialised use for New Zealand wool was recently developed by the Wool Research Organisation of New Zealand (WRONZ). The product, brand named "Woolspill," is based on strong wool fibres which have been formed into knops that are able to absorb up to 40 times their own weight in oil. The knops are used within booms to encircle oil spills.

1.1.12 Promotion of New Zealand Wool

New Zealand wool producers, through levy payments (6% of net proceeds from wool sold) to the NZWB, spent $38.6 million on promotion of wool and wool products in 1992/93 (NZWB, 1993b). Funds were allocated in two main areas; local and Australian promotion, and international promotion through the International Wool Secretariat (IWS).

In New Zealand, assistance is given to local textile manufacturers through fashion and design services, technical help for new products and processes, and quality control techniques. Consumer marketing programmes are devised for wool products, particularly for wool carpets which retain a 75% share in the New Zealand carpet market. The NZWB administers the Woolmark brand for wool in New Zealand. It works with licensees and tests products for adherence to licence specifications.

The NZWB funds the major share of carpet promotion carried out by the Australian Wool Corporation (AWC). It works with AWC marketing staff to develop common marketing strategies wherever possible.

International promotion of New Zealand wool is carried out primarily through the IWS. New Zealand wool producers are the second largest contributor to the IWS, which represents the major southern hemisphere wool producing countries

of Australia, South Africa, Uruguay and New Zealand. Most IWS promotion work for New Zealand is in the interior textiles area, and is concentrated on the developed markets of USA, Japan and Western Europe. The NZWB (1993b) stated that Interior Textiles Division strategies include : market-driven product innovation; member-country wool preferencing; stimulation of retail demand; stimulation of contract demand; and continuation of raw wool/spinning programmes in developing countries.

The IWS works exclusively with industry partners who produce or promote products containing a minimum amount of New Zealand wool (60% for carpets, 80% for upholstery and bedding). These groups are given extra technical and promotional assistance to encourage the continued use of New Zealand wool. The IWS also transfers new wool technologies (mainly from WRONZ) to the industry.

1.1.13 Research and Development

New Zealand wool producers, through the NZWB, fund and direct research to help increase wool industry returns. In 1992/93, producers contributed $3.7 million to WRONZ. This was supplemented by $2.3 million from the New Zealand Government and just under $1 million by other wool industry participants. WRONZ is the main holder of New Zealand wool industry research contracts. Others, held by Massey University, Lincoln University, AgResearch and a number of other organisations, receive producer funding of $1 million to $1.5 million annually (NZWB, 1993b).

New Zealand wool research centres on five main areas : on-farm (e.g. wool production efficiency); measurement (e.g. bulk test development); product development (e.g. Pebblemill carpets); alternative products (e.g. Woolspill); and efficiency and performance (e.g. Chemset yarns).

1.2 THE NEW ZEALAND WOOL BOARD

1.2.1 Formation and Functions

The New Zealand Wool Board was originally established in 1944, but was reconstituted under the Wool Industry Act of 1977. This Act amalgamated the Wool Board with the former New Zealand Wool Marketing Corporation, which was the successor to the New Zealand Wool Commission.

The Wool Industry Act (1977) defined the key objective of the New Zealand Wool Board as being:

> *'To obtain, in the interests of growers, the best possible returns for New Zealand wool.'*

The NZWB (1993b) defined this objective further, stating it as:

> *'To increase demand for New Zealand wool and the efficiency and effectiveness of the industry to maximise the long-term returns to New Zealand wool growers.'*

While not stated, the first definition implies that returns 'for New Zealand wool' are of a monetary nature. However the NZWB definition suggests that returns 'to New Zealand woolgrowers' may include non-monetary outcomes such as farmer satisfaction/enjoyment in producing wool, and long term sustainability of wool production systems. It is important, therefore that the NZWB look beyond wool price as a measure of success in serving wool producers.

The Wool Industry Act (1977) outlined the Wool Board's functions as :

(1) To promote the use of New Zealand wool in new and existing markets.

(2) To maintain a marketing system suited to the world's textile markets.

(3) To market New Zealand wool in competition with other textile fibres.

(4) To bring efficiencies into wool preparation, handling, distribution, shipping and handling.

(5) To develop new and existing markets for wool, both inside and outside New Zealand.

(6) To provide information on market requirements to guide planning of wool production and preparation.

(7) To encourage production of types of wool suited to market requirements.

(8) To undertake or initiate research into wool and sheep.

(9) To maintain information on wool production costs and the economic state of the wool industry.

(10) To make payments to woolgrowers in order to maintain, stabilise and enhance returns from wool sales.

Some of these functions are carried out by the NZWB through funding of other organisations. For example, function (1) is undertaken largely by the IWS, while function (9) is carried out by the NZMWBES. Functions (3) and (5) have only recently been addressed by the Board through the formation of a subsidiary wool marketing company, New Zealand Wool Services International (NZWSI). This company aims to lift marketing standards and the image of New Zealand wool by ensuring a reliable service for the end-user. It also aims to bring wool producers closer to processors and thereby increase grower knowledge of market requirements and the impact of these requirements on returns.

The NZWB ceased to carry out function (10) when it suspended its minimum price and market support schemes in 1991, following a sharp decline in world wool markets (NZWB, 1993d).

The Wool Board is governed by ten directors (NZWB, 1993d). These include: six directors elected by the Meat and Wool Board's Electoral Committee; two directors nominated by the Minister of Agriculture and Fisheries; one director nominated by the Board Itself; and the director-general of the Ministry of Agriculture and Fisheries or his/her alternate.

1.2.2 New Zealand Wool Board Activities

All NZWB activities are funded by wool growers through the payment of a six percent levy on all wool sold. The main activities relate to the promotion of wool, identifying means to maintain the competitive advantage of wool over synthetics, and providing wool growers with an extension service.

The NZWB promotes New Zealand wool and wool products world wide through the IWS. These activities have been discussed in Section 1.1.12.

Morrison (1993) stated that the NZWB has a key role in funding research to maintain wool's superiority over synthetics. The Board's annual investment in research and development is around $5 million, most of which is directed to WRONZ. Taking the broader OECD definition of research and development to include product development and technology transfer, total investment is around $11 million.

The Grower Services group of the New Zealand Wool Board was established in 1991. The purpose of the Group, defined by the Grower Services plan (NZWB, 1991b) is:

'To provide leadership, act as a catalyst for change, and provide a range of services to wool growers aimed at maximising the net return from their enterprise through improved breeding, feeding and management, harvesting and preparation; to provide leadership and improve communication within the industry to facilitate technology transfer and innovation on sheep and raw wool topics, and the production of fibre well suited to the needs of the textile industry.'

The Groups' objectives have changed since its inception as the Raw Wool Services division in 1973 (Wiggins pers. comm.). At that time, with a staff of one, the Division's main objective was improving clip preparation standards through mass extension activities (publications and involvement in field days and seminars) and training a very limited number of leading woolhandlers. As the number of staff and breadth of expertise increased within the Division, the range of services offered to farmers was also expanded. In 1992/1993 the nine Wool Production Officers in the Grower Services Group ran 44 woolhandling and 30 wool classing courses (NZWB, 1993b). They were also involved in 83 field days and seminars, and 44 discussion groups, and made 282 farm visits to provide advice to farmers on wool clip preparation, sheep breeding, farm management and wool selling. The Grower Services Group was also prominent in facilitating debate on marketing issues for the national clip when the NZWB released 'A Study of the Raw Wool Marketing System for New Zealand Wool' (Little, 1992) in mid-1992. Wool Production Officers organised 50 meetings nationwide to encourage farmers to debate the issues raised in the report.

Wool Production Officers each service large geographical areas containing 2000 to 3000 wool producers. It is therefore believed that these clients can be most effectively serviced by mass extension activities (e.g. field days, seminars and

industry-funded publications). However, a formal system for identifying the problems/opportunities confronting wool producers (i.e. the focus of mass extension) does not exist. There is no system in place for monitoring

the impact of Grower Services Group and wider NZWB activities, or for identifying on-farm research priorities likely to benefit farmers. It is thought that regular formal communication with a representative sample of farmers could indicate extension activities and research likely to improve levels of wool production and returns.

1.3 PURPOSE AND SCOPE OF THE STUDY

Consultancy conducted on a one-to-one basis with a farmer is usually initiated by the farmer in response to a problem or opportunity within the farming system. The consultant then acts in a problem solving or investigative capacity specific to that farm. In contrast, farm consultants engaged primarily in mass extension activities such as field days, seminars and publications, have the responsibility to identify current and potential farming system problems/opportunities themselves, before addressing these via a suitable extension technique.

The author is employed by the NZWB as a Wool Production Officer (WPO). Based in Masterton, he services the Wairarapa/Tararua region, offering assistance in all aspects of wool production, wool preparation and wool selling/marketing to approximately 2280 wool growers (Department of Statistics New Zealand, 1992). Mass extension techniques (e.g. field days, seminars, media publications, industry funded publications) are used by the author to address wool production system problems/opportunities, and to pass on information to wool producers and the secondary wool industry in the area. Individual consultancy is not actively sought and is only undertaken if requested by a farmer.

Aspects of Wairarapa/Tararua wool production systems that require improvement have historically been identified by informal communication with wool producers, farm consultants and wool brokers. This method is thought to be inadequate for determining where extension resources should be allocated for a number of reasons. First, the WPO mainly has contact with farmers that are considered progressive rather than a representative sample of the wool producers in the region. Second, other farm consultants in the region also deal mainly with the more progressive farmers, therefore perpetuating the problem of

non-representative farmer feedback. Third, wool brokers are in contact only with those wool producers who sell through the auction system. They are mainly concerned with a narrow aspect of the farming system; wool clip preparation and selling.

The NZMWBES (NZMWBES, 1992) and Wairarapa Farm Improvement Club (WFIC) (Baker et al, 1993) farm production databases also have been used to identify production trends and yield gap opportunities in Wairarapa/Tararua wool production systems. However these sources of information are not regarded as being representative of the region because of the number and/or location of the farms involved. The NZMWBES Annual Sheep and Beef Farm Survey (NZMWBES, 1993a), for example, collects information from only 22 Wairarapa farms and these are aggregated within the East Coast North Island Production Region, which includes data for Gisborne and Hawkes Bay as well as the Wairarapa/Tararua region. The NZMWBES survey has the additional problem of being some 18 months out-of-date by the time it is published. The WFIC data, on the other hand, is based on a convenience sample of farmers who used the WFIC services. These farmers are considered to be more progressive, and the WFIC database also comprises a greater proportion of summer dry properties than is representative of the Wairarapa/Tararua region.

The compilation of a database based on a surveyed representative sample of wool producers would therefore assist the WPO and other consultants/extension workers to describe the wool production systems and activities of wool growers, more accurately and to identify the problems/opportunities facing the region's wool producers. This would allow efficient allocation of limited time and financial resources to extension activities in the region. It would also establish the suitability of the other databases for describing Wairarapa/Tararua wool production systems. The database compiled as part of this study was

intended to compliment the NZMWES and WFIC databases by enabling their comparison with a more representative set of regional data.

The personal interview required to assemble such a database would also introduce the WPO to some farmers who had had no previous contact with the NZWB or any other information/technology transfer personnel.

1.4 OBJECTIVES OF THE STUDY

The objectives of the study were therefore set within the context of improving the performance of Wairarapa/Tararua wool production systems through more pertinent extension :

(1) to compile a detailed database of Wairarapa/Tararua wool production systems from a representative sample of wool producers;
(2) to compare the database compiled in (1) above with NZMWBES and WFIC databases, to test their suitability for describing Wairarapa/Tararua wool production systems;
(3) to identify management variables that are important in achieving high levels of wool production and returns; and
(4) to identify methods to improve the effectiveness of the New Zealand Wool Board Wool Production Officer in servicing the needs of Wairarapa/Tararua wool producers.

CHAPTER TWO

PREPARATION AND ADMINISTRATION OF THE SURVEY

2.0 CHAPTER OUTLINE

In this chapter the Wairarapa/Tararua region is described, and the selection of the survey districts and sample population is discussed. This is followed by an account of the administration of the survey, including the timing of the survey and interview procedure, and the preparation of completed questionnaires for computer analysis. In the final section the statistical methods used to analyse the survey data are outlined.

2.1 THE WAIRARAPA/TARARUA REGION

2.1.1 Location

The Wairarapa/Tararua region is approximately 60 kilometres wide and 180 kilometres long. It is bounded on the west by the Tararua and Rimutaka ranges and on the south and east by the sea. The northern boundary runs south-east from Takapau to the east coast (Figure 2.1).

The Wairarapa region comprises the territorial local authorities of South Wairarapa, Carterton and Masterton. The Masterton Territorial Local Authority includes the area north of Masterton to Mount Bruce. The remaining northern districts included in this study (Eketahuna, Pahiatua, Pongaroa) form part of the Tararua Territorial Local Authority.

2.1.2 Population

The main centre of the Wairarapa/Tararua region is Masterton which has a population of 18500. The region's other towns are Martinborough, Featherston, Greytown, Carterton, Eketahuna and Pahiatua. A trend in recent years to utilise Featherston and Greytown as dormitory towns for Hutt Valley employees is increasing the population in these towns. Road access to Wellington is improving rapidly and this trend is likely to continue.

The region contains nearly 3.2% of New Zealand's land area but with 44045 residents has only 1.33% of the country's total population (Wairarapa Business Development Centre, 1991)

Figure 2.1 Location of the Wairarapa/Tararua region in relation to the North Island of New Zealand.

2.1.3 Servicing Industries

Spall (1987) noted that compared to other districts in New Zealand the Wairarapa is relatively isolated, with no effective coastal ports and only a small local (Masterton) airfield. In hill country areas many roads are narrow and unsealed. However servicing industries are well established in the region, with saleyards at Martinborough, Carterton, Masterton and Pahiatua; fertiliser works at Waingawa and Mangatainoka; and limeworks at Martinborough, Masterton and Mauriceville. Three wool brokers and four private wool buyers, based in Masterton, service the Wairarapa/Tararua region. Sawmills located in the Wairarapa operate with a combined production capacity of around 50000 m^3 of sawn timber per annum. In 1990 a Japanese company, Juken Nissho, purchased the forest milling rights to 11354 ha of Wairarapa forest and opened a large laminated beam mill in Masterton in 1991. Wairarapa-Tararua dairy farmers are serviced by Tui Milk Products which has manufacturing sites at Pahiatua, Mangatainoka and Longburn (Palmerston North).

2.1.4 Topography and Soils

Three natural physiographic features were identified in the survey area by Noble (1985) :

(1) Axial mountain ranges and foothills. Only the eastern side of the Ruahine Ranges are included in this region. They are steep and rugged with peaks rising to over 1500 m asl.

(2) Central lowlands. These comprise a central trough of plains, terraces and low hill country formed from very young sedimentary rocks.

(3) Eastern hill country. This consists of rolling to steep hill country east of the central lowlands, below 600 m asl and formed of cretaceous and tertiary sedimentary rocks. This area also includes some steeper ranges (the Waewaepa Range (760 m asl), the Puketoi Range (800 m asl) and the Aorangi Mountains (980 m asl)).

The rock types in the Wairarapa/Tararua region are sedimentary and form a very complex pattern (Spall, 1987). The river terrace systems are made up of recent gravels and alluvial flood plain deposits. Most hill country consists of tertiary sediments of sandstone, siltstone, mudstone or limestone, but part of the region is covered by loessial deposits overlying these sediments. Loess, jointed mudstone, greywacke and alluvium are the four most extensive rock types and comprise 53 percent of the Wairarapa/Tararua area.

Booth and Gibbs (1969) stated that the variety of rock materials, as well as changes in the local conditions of formation, have led to Wairarapa soils differing widely in their texture, structure, nutrients, drainage and other properties. The soils of the Wairarapa/Tararua hill country were classified into four main and two intermediate groups based on formation and fertility by King (1982) :

Group 1 - high fertility hill soils derived from siltstone, mudstone and limestone.

Group III - medium fertility soils derived from poorer siltstone, limestone and loess.

Group V - soils from greywacke, sandstone and conglomerate.

Group VI - low fertility soils from poor greywacke and argillite.

Group II & IV - contain the mixtures of fertility classes.

Farm production data indicates that productivity is positively associated with natural soil fertility status, although significant within-group variation exists (King 1982). This variation is most likely due to differences in rates of fertiliser application and farm management practices.

2.1.5 Climate

The Wairarapa climate is generally regarded as being hot and dry in summer and cold and wet in winter, although considerable variation in rainfall and temperature has been noted throughout the region. The weather of the Wairarapa is controlled to a large extent by the Rimutaka and Tararua Ranges (Thompson, 1982). When westerly winds blow across the region, the ranges shelter the lowland areas and can cause high temperatures with dry weather. Southerly and easterly winds can enhance rainfall as airmasses are forced to ascend over the ranges. In extreme conditions heavy rainfall can lead to serious flooding on the plains.

Annual rainfall ranges from about 800 mm in the Wairarapa Valley to more than 2000 mm on the Puketoi Range and over 4000 mm on the summit of the Ruahine Range. Monthly and average rainfall for selected Wairarapa/Tararua sites is presented in Table 2.1. Most eastern coastal hill country has an annual rainfall of between 1000 mm and 1400 mm. However much of this rain falls during the winter from easterly and southerly winds, and summers are generally dry. Very little rain comes from the west as a result of the rainshadow effect of the Ruahine and Tararua Ranges. Thompson (1982) noted that it is usual for the Wairarapa region to experience a dry period each year, especially in summer when rainfall is least and temperatures are highest.

A feature of the eastern hill country is the effect of topography on microclimate. North and north-westerly facing slopes and ridges can become very dry while

south-westerly slopes are more sheltered and subject to far less variation in moisture content (Noble, 1985).

Table 2.1 Monthly and annual rainfall (mm) for selected Wairarapa/Tararua sites.

Sources : Baker et al. (1993), Thompson (1982), Burgess (1980).

Site	Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mangamutu	1951-80	91	75	89	99	127	128	137	115	111	128	113	119	1332
Eketahuna	1941-70	97	94	99	122	155	170	152	147	130	150	135	130	1581
Mt Bruce	1941-70	168	157	191	203	279	292	277	272	216	224	198	206	2683
Ihuraua	1941-70	74	69	81	86	124	127	127	122	94	97	84	94	1179
Wangaehu	1941-70	69	64	86	84	122	119	119	119	86	81	71	81	1101
Mt Holdsworth	1941-70	175	71	218	310	293	448	331	295	241	245	179	183	2989
Tiraumea	1941-70	100	80	90	110	150	160	150	140	120	140	110	130	1450
Te Ore Ore	1941-70	56	51	69	66	94	97	91	89	66	66	58	66	869
Pongaroa	1941-70	97	81	112	122	198	170	180	191	104	119	86	114	1517
Castlepoint	1941-70	64	58	71	79	114	109	107	104	74	64	53	74	971
Tinui	1940-93	64	69	75	93	123	126	134	126	88	72	59	71	1100
Gladstone	1941-70	58	53	66	64	107	109	107	107	71	66	58	69	935
Greytown	1941-70	79	66	86	81	114	117	119	104	91	91	81	86	1115
Martinborough	1941-93	51	50	52	64	82	86	89	88	66	63	53	65	809
Pirinoa	1941-70	74	71	94	84	127	124	124	107	97	87	79	79	1149
Cape Palliser	1941-70	71	69	86	79	119	109	119	104	74	76	58	79	1043

2.1.6 Pasture Production

Radcliffe (1975), MacKay et al. (1990) and Parker et al. (1993a) have published pasture growth rate data for Wairarapa sites. The annual pattern of growth

indicates that the flush of spring growth commences in mid-August/September and reaches a marked spring peak by October/November. Nearly half the annual growth is produced during this period. Pasture growth rates generally drop sharply in December/January, coinciding with dry conditions when average potential evapotranspiration usually exceeds monthly rainfall.

Radcliffe (1975) found that approximately 16% of annual pasture production was produced in the winter, 46% in spring, 11% in summer and 22% in autumn at a Masterton site. Significant differences in the distribution of pasture production are observed in higher altitude areas of the Wairarapa/Tararua region where spring growth occurs later but, with more reliable December rainfall, often continues into January. Autumn pasture production tends to be higher in these areas, but lower winter soil temperatures reduce winter pasture production (Spall, 1987). This pattern of growth has strongly influenced the types of farming systems used in the Wairarapa/Tararua region.

2.1.7 Sheep Farming Systems

Sheep and beef cattle farming is the main agricultural activity in the Wairarapa-Tararua region. According to the most recent Department of Statistics New Zealand (1992) information there are 2282 farms carrying sheep in the region, 1446 of which have flocks of 500 or more sheep. However, The Wairarapa Business Development Board (1991) indentified 1787 sheep and beef cattle farms in an area which better resembles the area surveyed in this study.

The Wairarapa Business Development Board (1991) indicated that the average Wairarapa hill country sheep farm is 415 ha in size. This figure is significantly lower than that reported from surveys by Parker (1984), Gray et al. (1989), Baker et al. (1993) and Parker et al. (1993) with averge farm sizes of 602 ha, 679 ha, 748 ha and 762 ha respectively. It should be noted that the surveys

by Parker (1984) and Gray et al. (1989) were representative of only small geographical areas of the Wairarapa/Tararua region.

In terms of topography, Parker (1984) in a survey of Bideford, Wangaehu and Ihuraua properties found the average farm had 69% steep or non-cultivatable hill land, 24% rolling to moderate hill country and 7% flats. Gray et al. (1989) in their Pongaroa survey, found that the typical farm had less than 30% steep country, over 50% of rolling to moderate hill land and less than 10% flats.

Both Parker (1984) and Gray et al. (1989) reported an increase in subdivision on survey farms in the previous five years to an average number of paddocks per farm of 34 (Parker, 1984) and 51 (Gray et al., 1989). Much of this was associated with the development of improved electric fence technology and recognition of the importance of improving pasture utilisation. Parker (1984) considered most farms to have good sheep handling facilities. Nearly all farms surveyed had at least one reliable source of water during summer dry periods (Parker, 1984; Gray et al., 1989) although many farmers considered improvements to stock water supplies a priority.

Baker and Todd (1981) estimated the Wairarapa hill country maintenance phosphate fertiliser requirement to be 1.5 kg elemental phosphate (P) per stock unit wintered. Both Parker (1984) and Gray et al. (1989) found that phosphate application rates were below maintenance levels on around 50% of the farms surveyed, although in both surveys application rates in the year of study were below those applied in a 'normal' year.

Baker et al. (1993) stated that phosphate application per stock unit on Wairarapa Farm Improvement Club (WFIC) farms increased by 34% in 1992/93 from the previous season, which was ahead of the national average increase in fertiliser sales. However, 1992/93 WFIC average phosphate application rates

were still below maintenance at 0.63 kg P/su. Average phosphate application increased as sheep farm class improved from 0.29 kg P/su on store (steep, dry hill country) properties, to 0.71 kg P/su on low rainfall semi-fattening properties, to 1.08 kg P/su on high rainfall semi-fattening properties, to 1.23 kg P/su on fattening farms.

Baker et al. (1993) noted increases in sulphur and nitrogen application on WFIC farms of 39% and 54% respectively in 1992/93 relative to 1991/92 levels. Trends in nitrogen and sulphur application rates between farm classes were similar to those for phosphate.

Parker (1984) and Gray et al. (1989) found similar farmer age and farm ownership/operation trends in their respective north-east Wairarapa and Pongaroa surveys. Parker (1984) noted an average farmer age of 41 years and an average farm ownership period of 12 years, while Gray et al. (1989) found farmers were aged 43 years on average and had been responsible for the financial management of their properties for an average of 14 years. The New Zealand Rural Support Trust (1992) recorded an average farmer age of 43 years in a 1991 survey of 1151 East Coast North Island sheep and beef cattle farmers.

2.1.8 Sheep and Beef Cattle Farm Extension Services

The Wairarapa region is serviced by a number of groups and individuals involved in sheep and beef cattle farm extension/consultancy. Agriculture New Zealand, the New Zealand Wool Board, Massey University, the Meat Research and Development Council (MRDC), the Wairarapa Farm Improvement Club (WFIC) and private consultancy/rural valuation firms provide Wairarapa farmers with one of the strongest farm extension/consultancy bases in New Zealand.

Sheep farm discussion groups have been a feature of the Wairarapa for at least 15 years (McLaren, 1990). Around 17 discussion groups met on a regular basis during 1993. These were administered by Agriculture New Zealand and private farm consultants. Parker et al. (1993b) found that 14% of sheep and beef cattle farmers in a Wairarapa survey attended Agriculture New Zealand discussion groups and 19% of farmers attended other discussion (farmer) groups.

The WFIC is a feature of farm extension in the area. The club was formed in 1963 and currently has 96 farmer members. It is administered by four private consultants working for two separate firms (Baker, 1993). Baker (1993) outlined the key functions of the WFIC as being :

- to provide field advisory services in the Wairarapa and surrounding districts to members;
- to run lectures, field days and demonstrations instructing in the care and management of farms;
- to participate in the provision of research; and
- to co-operate with other organisations in practical, experimental or investigative work for the benefit of club members.

The WFIC also administers a database of financial and physical farm data. Baker (1993) stated its prime purpose as being :

- to provide a factual summary of both physical and financial achievements for a property;
- to provide the means of comparing properties by farm type and category;
- to assist in identifying strengths and weaknesses in performance achievements of a particular property; and

- to provide an indication of levels of performance achievable through identification of the achievements of the top 10% of farmers.

Massey University has conducted on-farm research trials and based Wairarapa extension activities at its Wairarapa farm 'Riverside' since 1978 (Parker et al., 1993b). However, local farmer and research interest in Riverside farm has appeared to decline since 1986. A review of Riverside farm activities and it role in Wairarapa research and extension is currently being undertaken (Parker, 1993).

The MRDC administers 23 sheep and beef cattle monitoring farms throughout New Zealand. One of these farms is situated at Alfredton in the North-east Wairarapa. The aim of the MRDC farm programme is to plan and implement a programme that will increase farmer awareness of manageable factors affecting their business. It is also designed to motivate farmers to modify their farming systems to increase productivity and profitability, while minimising risk. A third aim of the programme is to increase communication between farmers, consultants and scientists (McLaren, 1993).

2.1.9 Sheep and Beef Cattle Farm Performance

Several surveys have described levels of performance achieved on Wairarapa/Tararua sheep and beef cattle farms (Parker, 1984; Journeaux, 1987; Gray et al., 1989; NZMWBES, 1992; Baker et al., 1993), but the annual surveys by the NZMWBES (1992) and Baker et al. (1993) are thought to be the most representative of the Wairarapa/Tararua region. However, as discussed in Section 1.3, these databases are considered to have shortcomings. Although the NZMWBES Sheep and Beef Farm Survey sample is randomly selected and stratified by geographical region and sheep numbers (NZMWBES, 1992), it comprises only 22 Wairarapa farms (ten Class 3 farms, ten Class 4 farms and

two Class 5 farms). Survey results are generally published by farm class (e.g. Class 3 - North Island Hard Hill Country) and by production region (e.g. East Coast North Island) only. Because of the small Wairarapa region sample size and grouping of data into broad regional categories it is thought that NZMWBES survey results do not provide an accurate representation of performance on Wairarapa/Tararua sheep and beef cattle farms.

The WFIC database is based on a sample of 96 Wairarapa farmers (Baker et al., 1993). However all sampling units are WFIC members and these are thought to be representative of more progressive farmers. Farms are classified according to their ability to finish sheep and cattle and, to some extent, by susceptibility to summer drought. It is thought that WFIC data may overestimate average levels of production achieved on Wairarapa/Tararua sheep and beef cattle farms. The WFIC database also comprises a greater proportion of summer dry properties than is representative of the Wairarapa/Tararua region.

Similar classification systems for NZMWBES and WFIC farms allow a comparison of these databases (Table 2.2). NZMWBES Class 3 (North Island Hard Hill country) corresponds to WFIC Class 1 (store properties), NZMWBES Class 4 (North Island hill country) corresponds to WFIC Class 2 (semi-fattening properties) and NZMWBES Class 5 (North Island intensive finishing farms) corresponds to WFIC Class 3 (fattening properties). Data can also be compared between the NZMWBES East Coast North Island production region and the WFIC all farms average (Table 2.3)

Table 2.2 Comparison of NZMWBES and WFIC sheep and beef cattle farm performance indices for comparable class groupings (1990/91 data).

Source : NZMWBES (1992) and Baker et al. (1991).

Parameter	NZMWBES Class 3	WFIC Class 1	NZMWBES Class 4	WFIC Class 2	NZMWBES Class 5	WFIC Class 3
Av. farm size (eff.ha)	607	1379	376	739	215	512
Total stock units	4933	9902	4040	7003	2584	2688
Stock units/eff.ha	8.1	7.2	10.7	9.5	12.0	12.3
Stock units as sheep (%)	68	87	64	78	63	72
Lambing (%)	91.9	76.9	100.6	93.4	98.3	117.2
Calving (%)	80.6	86.3	85.7	88.7	85.2	71.6
Greasy wool/ssu (kg/su)	4.6	3.9	5.3	4.9	5.1	4.8
Greasy wool/sheep ha (kg/ha)	38	29	56	47	62	60
Av. net greasy wool price (c/kg)	278	295	279	285	276	296
Av. export lamb price ($/ha)	21.09	18.03	22.46	20.45	24.23	23.70

Table 2.3 Comparison of NZMWBES East Coast North Island Production Region and WFIC "all farms" average performance indices (1990/91 data).

Source : NZMWBES (1992) and Baker et al. (1991).

Parameter	NZMWBES East Coast North Island	WFIC Total All Farms
Av. farm size (eff.ha)	444	729
Total stock units	4052	6873
Stock units/eff.ha	9.1	9.4
Stock units as sheep (%)	67	78
Lambing (%)	96.9	93.9
Calving (%)	82.9	86.0
Greasy wool/ssu (kg/ssu)	5.0	4.72
Greasy wool/sheep ha (kg/ha)	46	45
Av. net greasy wool price (c/kg)	282	288
Av. export lamb price ($/hd)	22.78	20.70

Table 2.2 indicates that WFIC farms tend to be much larger than the properties surveyed by the NZMWBES. Thus, WFIC Class 1, Class 2 and Class 3 farms

were 2.3, 2.0 and 2.4 times respectively larger than their average NZMWBES counterparts. As a consequence total stock units wintered were much greater on WFIC farms. NZMWBES Class 3 and Class 4 farms showed higher average stocking rates than WFIC equivalents, while NZMWBES Class 5 farms had a slightly lower average stocking rate than WFIC Class 3. The most obvious difference in survey results was in the percentage of stock units wintered as sheep. WFIC farm classes consistently wintered a higher average percentage of stock units as sheep than NZMWBES classes in 1990/91.

Average lambing percentages were considerably higher for NZMWBES farm classes in all but the NZMWBES Class 5 - WFIC Class 3 comparison. The trend was reversed with calving percentage, with NZMWBES class averages lower in all but the NZMWBES Class 5 - WFIC Class 3 comparison. NZMWBES farm class averages were higher than corresponding WFIC data for all other indices noted in Table 2.2 except average net greasy wool price. This was expected as the drier and less humid climate in the Wairarapa favours the production of better than average coloured (whiter) and subsequently higher priced wools.

The difference in farm size and total stock units wintered between WFIC and NZMWBES survey farms was again stressed by data in Table 2.3. However all other average indices presented in Table 2.3 indicated very similar levels of performance. There appeared to be a stronger association between NZMWBES East Coast North Island Production Region and WFIC average data than between NZMWBES and WFIC farm class data.

2.2 SELECTION OF THE SURVEY AREA AND SURVEY FARMERS

2.2.1 Selection of the Survey Area

The study centred on the Wairarapa/Tararua region because of the author's employment in the area as a New Zealand Wool Board Wool Production Officer. This proved an advantage because the author already had some knowledge of the region, its farmers and the wool production systems used.

The entire Tararua region was not covered in the survey because of the unavailability of a wool producer population list that was stratifiable by sheep flock size for the area north of Coonoor to Takapau (northern boundary of the Tararua Territorial Local Authority). This area was thought to contain approximately 60 percent of the farmers in the Tararua region (Cottrill pers. comm.), amounting to approximately 450 farms with sheep flock sizes greater than 499 sheep (Department of Statistics New Zealand, 1992). Despite the exclusion of a large proportion of the Tararua Territorial Local Authority, the Wairarapa/Tararua survey region did include farms of all NZMWBES North Island farm classifications (refer to section 1.0.2) in both summer dry and summer moist environments, and was therefore 'representative' of the range of farming conditions experienced in the Wairarapa and Tararua regions.

2.2.2 Selection of the Survey Farms

(i) Sampling Method

Sampling is an essential ingredient of survey research and can be justified on the grounds of reducing the cost and increasing the speed of collecting information about a population (Cochran 1953; Collins 1972; Smith 1975).

Smith (1975) stated that where feasible, probability samples should be employed because they can be used to estimate how precisely the sample represents the working universe. Nachmias and Nachmias (1976) and Zikmund (1991) described several methods of probability sampling, noting that stratified sampling can be used to ensure that different groups in a population are adequately represented in a sample so that the level of accuracy in estimating parameters is increased and the random sample error reduced. It was therefore decided that stratified random sampling (stratification by sheep flock size) with proportional allocation (i.e. sizes of samples from different strata are proportional to the sizes of the strata) would be used for the Wairarapa/Tararua survey.

(ii) Population List

Obtaining a Wairarapa/Tararua wool producer population list, stratified by sheep flock size, was the first step in generating the survey sample. It was initially thought that such a list would be available from the Department of Statistics New Zealand, but the Department only provides this information for studies of national importance. The next best alternative to compile a population list was to develop a comprehensive list of shearing and woolhandling operators' farmer clients.

The collection of Wairarapa/Tararua shearing and woolhandling operator client lists began in October 1992 as part of a survey of these wool industry participants (Gavigan, 1992). Shearing contractors and open-shed operators were asked if they were willing to provide a list of their clients and their approximate sheep flock size, and to identify farmers who carried out their own shearing and woolhandling. All operators (considered the complete population of operators south of Pahiatua) were, at that time, willing to do so. Each

operator was then sent an information sheet requesting farmer client names, addresses and sheep flock size estimates in December 1992.

The shearing and woolhandling operators, however, required much prompting, initially by letter and subsequently by telephone, to return completed information sheets. By September 1993, 26 out of the 31 client lists had been returned. Two shearing and woolhandling operators ceased business in early 1993 and their runs were taken over by larger established contractors. Three operators were unwilling to provide information for different reasons. One was "too busy", one felt that the information was "commercially sensitive" (i.e. could be used by other operators to "take over his woolsheds"), and one operator considered that his clients "wouldn't want to be involved in a Wool Board survey". The exclusion of data from these operators (together servicing approximately 90 farmers) prevented a complete wool producer population list from being compiled.

The final compiled population list comprised 749 farmers with a sheep flock size (total sheep wintered) of 500 or more sheep. This was 75 percent of the 996 farms wintering 500 or more sheep in the survey area identified by the Department of Statistics New Zealand (1992). The compiled population list identified only 20 out of 612 (three percent) farmers in the survey area with less than 500 sheep (probably because farmers with very small flocks often shear their own sheep and would therefore be unknown to the shearing and woolhandling operators).

In summary, stratifying the Wairarapa/Tararua wool producer population by using shearing and woolhandling operator information influenced the survey in four ways :

(1) the survey area excluded approximately 60 percent of farmers (around 450 farms with sheep flock sizes greater than 499 sheep) in the Tararua Territorial Local Authority due to only shearing and woolhandling operators from Pahiatua south providing information;

(2) a complete population list was not able to be compiled due to three uncooperative shearing and woolhandling operators;

(3) few farmers undertaking their own shearing and woolhandling were identified by operators; and

(4) only a very small proportion of farmers with less than 500 sheep were identified and added to the population list.

Thus while the ability to stratify by sheep flock size enabled a more representative sample to be drawn from the population list compiled, the incomplete population list rendered the sample less than fully representative of the survey area.

(iii) Sample Selection

The following sheep flock size strata were defined for the sampling procedure :

(1) less than 500 total sheep;
(2) 500 to 999 total sheep;
(3) 1000 to 1999 total sheep;
(4) 2000 to 4999 total sheep;
(5) 5000 or more total sheep;

The number of farms from strata (2) to (5) to be included in the final sample was determined by proportional allocation based on Department of Statistics New Zealand (1992) information. The total sample size was restricted to 90 farms because this was thought to be the maximum number of sampling units that could be surveyed by personal interview in the time available (two months).

Systematic sampling (Freund, 1988) was used to select sampling units from within strata. Because farms were grouped by location within strata, systematic sampling began with the first unit in each stratum. This ensured a good geographical spread of survey farms. Only three percent of stratum (1) - type farms were identified in the population list, and it was decided that it would be most efficient to survey each of these 20 farms by mail.

The final sample thus comprised 110 farms :

(1) 20 farms with less than 500 total sheep (mail survey);
(2) 10 farms with 500 to 999 total sheep;
(3) 22 farms with 1000 to 1999 total sheep;
(4) 44 farms with 2000 to 4999 total sheep;
(5) 14 farms with 5000 or more total sheep.

(iv) Informed Consent

A letter explaining the nature and purpose of the survey was sent, with the questionnaire form (refer to Appendix B), to the sample of stratum (1) farmers on 1 October. These farmers were asked to return completed questionnaires by 1 November. Only two stratum (1) farmers returned questionnaires, both of which were incomplete. A further two farmers telephoned the author, one stating that he was unable to assist in the survey because of illness, the other stating that she was not prepared to spend the time required to complete the

questionnaire. The low response rate to the stratum (1) farmer mail survey prompted the decision to concentrate purely on the personal interview of strata (2) - (5) farmers. this decision was not expected to compromise the overall objectives of the study (refer to Section 1.4).

Consent from stratum (2) to stratum (5) farmers was sought by telephone during early October. In order to contact the 90 farmers between the hours of 7pm and 9pm within two weeks, two Masterton women were employed to assist in this process. Both women had experience in working and communicating with farmers and had an excellent telephone manner. This was considered to be important in ensuring farmers reacted favourably to the survey. Farmers were told of the purpose of the survey, and what information and time they would need to contribute. The response to telephone calls was very good, with only three farmers not prepared to be surveyed. Of these, two farmers were "too busy", and the other farmer felt that "information from his farm would be of little use".

2.3 SCHEDULE OF INTERVIEWS

Appointments to conduct personal interviews with the respondents were made during the initial telephone contact. Each telephone caller was allocated a two week period between October 25 and December 5 within which to schedule approximately 30 appointments. Care was taken to schedule interviews so as to minimise driving time between them. In this way it was possible to schedule up to five interviews per day.

Farmers to be interviewed were posted a copy of the questionnaire and an interview appointment reminder notice between October 4 and October 22. They were asked to complete the first three sections of the questionnaire

(Appendix B). Farmers had at least 14 days prior to the interview and receipt of the questionnaire to complete this task.

2.4 QUESTIONNAIRE DESIGN

2.4.1 Questionnaire Layout

A number of farm management questionnaires were studied to formulate ideas about questionnaire layout and design (Parker, 1984; Livingston and Parker, 1984; Journeaux, 1987; Parker, 1992), and some questions from these surveys were adapted for the present study.

The questionnaire was divided into ten sections and included a total of 19 pages (refer to Appendix B). Section A requested information about wool production and wool prices for the three previous seasons, and the compilation of 1992/93 wool account sales documents and/or wool receipts. Section B sought information on stock numbers and their performance for the three seasons from 1990/91. Section C requested information on the costs of wool harvesting and selling for the 1992/93 season. Each of these sections required the respondent to refer to farm records which may not be readily accessible, hence the request for farmers to complete these sections prior to the visit.

Sections D, E and F dealt with sheep breeding, grazing management and animal health respectively. These sections were placed consecutively in the questionnaire to address components of the farming system affecting wool production. Sections on wool harvesting and wool selling (Sections G and H respectively) were placed next as they completed the logical progression of wool to the point of sale.

Sections I and J sought data on information sources used by farmers as well as their personal objectives and attitudes towards aspects of the wool industry. Questions about the farm were placed at the beginning of Section J to increase respondents' confidence prior to the more personal questions placed in the middle and end of this section.

2.4.2 Question Preparation

Guidelines for question preparation were obtained from Payne (1951), Erdos (1970), Morton-Williams (1972), Warwick and Lininger (1975), De Lamater (1982) and Benjamin (1987).

Two broad types of questions were employed; open response (or free answer questions) and closed response (or fixed alternative questions).

Nachmias and Nachmias (1976) and Benjamin (1987) pointed out that closed response questions can be either dichotomous (e.g. Yes/No) or multiple choice (e.g. Never/Sometimes/Often/Always). Both these forms were used extensively throughout the questionnaire. They require relatively little time to answer, which was an important consideration because of the length of the questionnaire. In addition, closed response questions are generally easy to code for analysis.

There is a danger that multiple choice questions (e.g. questionnaire Section D Question 2, Appendix B) can "put words in the respondents' mouth" or provide "face-saving" answers which would otherwise not have been considered. On the other hand, listed options can prevent the respondent from overlooking factors. A category for 'other' was included in all multiple choice options to allow the respondent flexibility in answering these questions.

Open response questions provide the opportunity for self-expression. They do not prompt the respondent to give an answer s/he thinks is wanted rather than the facts (Nachmias and Nachmias, 1976; Department of Statistics, 1986; Benjamin, 1987). Open response questions were asked where the farmers' views, opinions or reasons were sought, or where the number of possible answers was considered to be too diverse to include in a multiple choice question. The recording of answers to open response questions was given close attention during the interview, and additional information to that provided by the respondent was often obtained by prompting. The use of prompting was not expected to introduce bias because all surveys were conducted by the same interviewer.

Retaining the original sense of replies to open response questions during coding can be difficult. Similar responses were grouped into categories to minimise the number of answer codes.

2.4.3 Pre-Testing the Questionnaire

A draft copy of the questionnaire was pre-tested on three Wairarapa/Tararua farmers. As for the subsequent survey, questionnaires were posted to the farmers who were asked to complete the early sections. The pre-test farmers were then visited and assisted to complete the remainder of the questionnaire.

A small number of changes were made to question wording, and the section concerning wool harvesting and selling costs was moved forward in the questionnaire so that it could be completed by farmers prior to the personal interview. It was also decided to collect wool account sales documents and/or wool receipts for 1992/93 only, as pre-test farmers considered that collecting this information for three complete seasons would be difficult.

Two copies of the final questionnaire per farmer surveyed were then printed.

2.5 TIMING OF THE SURVEY AND INTERVIEW PROCEDURE

Interviews took place between 26 October 1993 and 2 December 1993. Respondents were generally happy to be surveyed during this time as docking and hogget shearing had in most cases been completed and there was a slight lull in farm activities prior to main shear and the weaning of lambs.

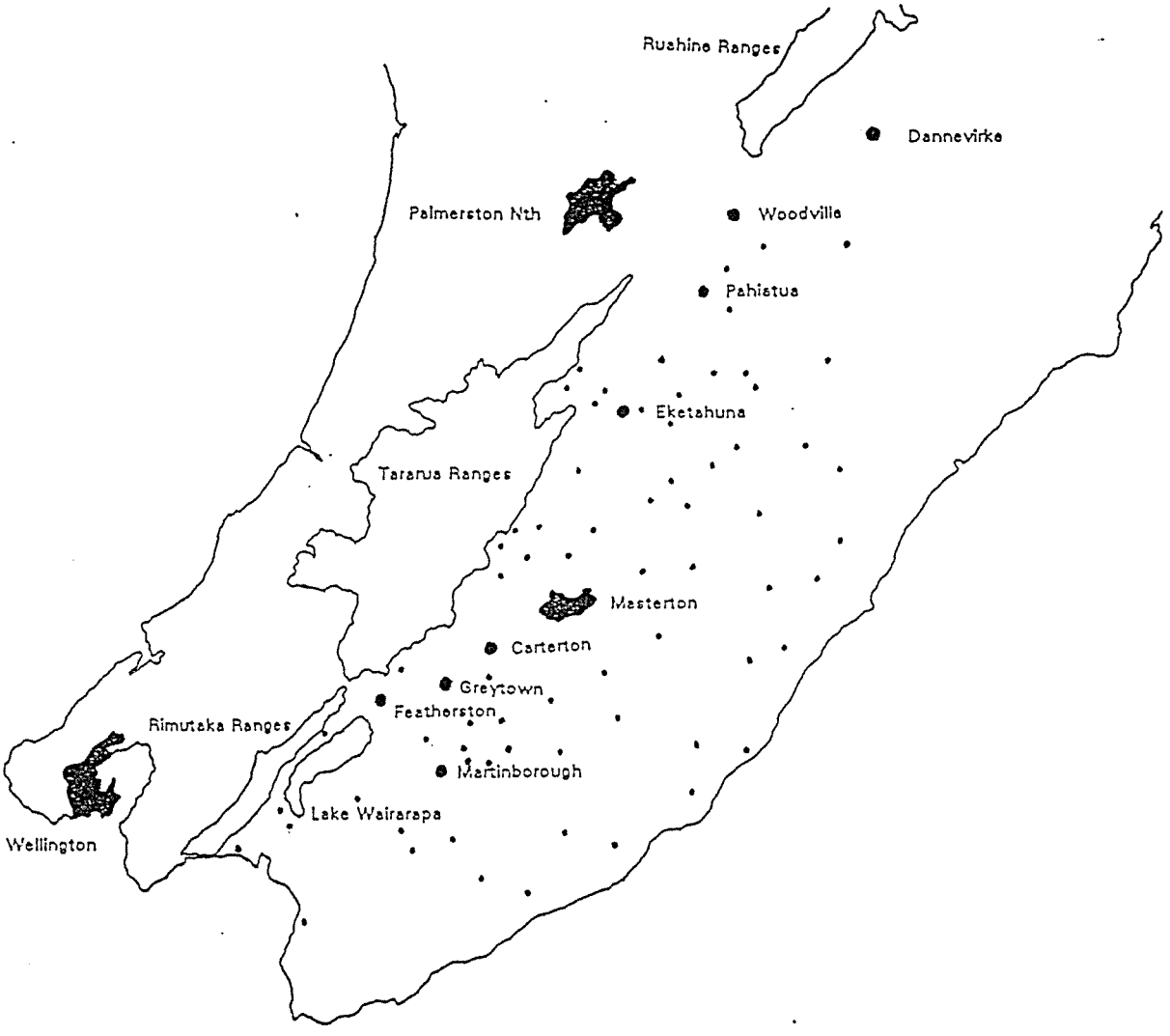
As noted in Section 2.0.2 (iv), farmers were contacted by telephone during early October and were posted an interview appointment reminder notice soon after. Farmers were then telephoned by the author one or two days prior to the proposed farm visit to confirm the meeting and obtain directions to the farm if these were not already known (Figure 2.2). This technique was successful with farmers interviewed within a month of receiving the questionnaire and reminder notice. However, six farmers with interviews scheduled five or more weeks after questionnaire posting were ultimately excluded from the survey. When contacted by telephone to confirm their interviews, these farmers noted that they had "received the questionnaire, saw that the interview was a long way off, put the questionnaire away and forgot all about it". A later interview date in order to provide more time to complete the questionnaire was requested by these farmers, but the need to complete the survey meant that this was not possible.

Personal interviews were conducted between 7:00am and 9:00pm at farmers' homes. Interviews began with a brief personal introduction and discussion of current events, such as the wool market, pasture growth or the weather. Farmers were told of the author's association with the Wairarapa/Tararua region, both as a New Zealand Wool Board Wool Production Officer and as the son of a local farmer. This helped to put the farmer at ease.

The first three sections of the questionnaire (already completed by the respondent) were discussed and checked for completeness and correctness. The remainder of the questionnaire was then completed with the author reading out questions and recording answers, while the respondent referred to another copy of the questionnaire. Six farmers were found not to have completed questions requiring reference to records prior to their interview. In these cases, the other sections were completed with the author's assistance and the respondents were asked to complete the remaining questions in their own time and mail the questionnaire to the author at a later date. Despite the provision of a postage-paid return-addressed envelope, a mailed reminder notice and reminder telephone call, these questionnaires were never received.

The personal interviews took, on average, one hour to complete. The quickest interview required 40 minutes, while the longest ran for two hours 45 minutes. An average of three interviews were conducted per day, with six interviews being the most completed in a day. At the conclusion of the survey, 75 completed questionnaires had been collected.

Figure 2.2 Location of farms surveyed in the Wairarapa/Tararua region.



2.6 COMPUTER CODING AND ANALYSIS

During the early stages of questionnaire preparation it was decided that the survey results would be analysed using the SPSSx computer programme (SPSS Inc., 1988). This programme provided a comprehensive set of procedures for data transformation and file manipulation, and a large number of statistical routines for analysis of data.

The questionnaire therefore incorporated data entry coding boxes (refer to Appendix B). These boxes were numbered according to the column of data entry. At the completion (or near-completion) of every 80 columns, a new record was commenced.

The preparation of coding boxes required the estimation of the number of possible answers and the dimension of each reply. A single coding box could provide for up to nine possible answer variations. The number of coding boxes was adjusted accordingly to the expected range of replies.

Questions were coded after field work was completed. Kilograms of wool produced, wool prices, lambing percentages and similar metric data were entered directly into the appropriate coding boxes. Dichotomous questions with Yes/No response options were consistently coded Yes = 1 and No = 2. Responses to multiple-choice questions were coded in the same order as options listed in the questionnaire. Care was taken to classify open ended questions so as to maintain the original sense of the answer. This was difficult for some questions because of the wide range of responses.

The stock unit conversion factors used in this study were those revised by the NZMWBES and the Ministry of Agriculture and Fisheries in 1992 (NZMWBES, 1992).

Wool production was expressed on a clean weight basis to remove variation due to differences in wool yield. Average yields were calculated for individual farms by analysing wool account sales documents and wool receipts. Wool clip composition (i.e. proportions of fleece and oddment wool) and component yields were used to calculate average yield. Where recorded wool clip information was unavailable, farmers were asked to estimate the proportions of fleece and oddment wool produced on their farm. Component yields were then assigned using information from nearby survey farms which employed similar shearing policies.

2.7 STATISTICAL ANALYSIS

Two types of statistical analysis of the survey data were conducted. First, descriptive statistics were used to describe the characteristics of wool production systems and the management systems employed. Survey farms were grouped by NZMWBES Farm Class, summer rainfall, sheep flock size and summer rainfall/NZMWBES Farm Class category to analyse land, subdivision, livestock, and physical and financial performance characteristics. Tests for significant differences between means ($P < 0.05$) were carried out using Duncan's Multiple Range Test for farm class, sheep flock size and summer rainfall/farm class groupings. A two-sample Student *t* test was applied to the summer rainfall groupings.

Questions related to the management of wool production systems comprised mainly ordinal measurements and some nominal measurements. Although some authors feel that ordering is the sole mathematical property applicable to ordinal measurements (Norusis, 1988), oneway analysis of variance and two-sample Student *t* tests were used to calculate mean scores and test for significant

differences between mean responses to ordinal measurement based questions. The similarity between standard deviation values within a question set provided justification of this approach. Where few significant differences in management practices were identified, results are presented as frequencies and crosstabulations for the entire survey sample. Where significant differences between category means were more common, results are presented for individual group categories. Freund (1988) and Norusis (1988) provide a description of these statistical tests and estimating procedures.

Second, statistical tests were used analyse the association between management practices, farm physical characteristics and wool production system performance (Townsley and Parker, 1987). Multiple regression analysis was used for this purpose, and is discussed in more detail in Chapter Four.

CHAPTER THREE

CHARACTERISTICS OF WAIRARAPA/TARARUA WOOL PRODUCTION SYSTEMS

3.0 CHAPTER OUTLINE

Components of the Wairarapa/Tararua wool production systems surveyed, including the farmers, the land and livestock, the levels of performance achieved and the management practises used are described in this chapter. The results of the survey are compared with those from other studies, and are discussed in the context of improving wool production and returns on Wairarapa/Tararua farms.

3.1 THE FARMERS

3.1.1 Age and Farming Employment

The age and farming-employment details of farmers surveyed are outlined in Table 3.1. The average age of farmers was 44 ± 1 years. Farmers with NZMWBES Class 4 (hill country) properties were significantly ($P < 0.05$) older (mean 45 years) than NZMWBES Class 3 (hard hill country) farmers. The oldest farmer surveyed (aged 70 years) was still actively farming.

The average period of current farm ownership was 13 ± 1 years, with a maximum of 50 years. Nine farm managers were interviewed, and had managed operations on their current properties for an average of nine years.

Four of those managers were family members managing family trust farming operations.

The farmers surveyed had been involved in full time farming (including farm labouring and shepherding) for an average of 23 ± 1 years.

Table 3.1 Age and farm-employment details of farmers surveyed.

Parameter	Mean	Standard Error	Minimum	Maximum	Total n
Farmer age (years)	44	1	29	70	73
Years of current farm ownership	13	1	1	50	65
Years employed as farm manager	9	1	3	18	9
Years full time farming	23	1	1	50	73

3.1.2 Farmer Aims

Farmer aims varied considerably (Table 3.2) with only eight percent of farmers stating that maximising profit or "making as much money as possible" was their primary aim. Many farmers (34 percent) felt that while maximising profit was important, "enjoying the farming lifestyle" was equally important, and that one aim should not compromise the other. A significant proportion of farmers (15 percent) placed enjoying the farming lifestyle ahead of all other goals, and were willing to forego income in order to achieve this.

The challenge of "farming well and producing top stock" was of paramount importance to 20 percent of the farmers surveyed. While achieving this goal satisfied their self-concept and made them successful in the eyes of their

farming peers, most of these farmers noted that the financial reward that followed "being a top producer" was important.

The aims of eight percent of farmers surveyed centred on their children. Three respondents were farming to help their sons onto a farm, one farmer's main aim was to make the money necessary to complete his children's secondary school education, and two farmers stated that "bringing children up on a farm" was their main motivation in farming.

Table 3.2 Main aim in farming of farmers surveyed.

Aim	Percentage of Farmers	Number of Farmers (Total n = 74)
Maximise profit and enjoy lifestyle	34	25
Enjoy farming lifestyle	15	11
Maximise profit	8	6
Enjoy lifestyle and be a top producer	8	6
Be a top producer	7	5
Maximise profit and be a top producer	5	4
Make a living	4	3
Create future financial security	4	3
Help sons into farming	4	3
Improve the farm/conserve the land	3	2
Buy a farm	3	2
Bring children up in healthy environment	3	2
Educate children	1	1
Make farm management easier	1	1

3.1.3 Farmers' Attitudes Towards the Wool Industry

Farmers surveyed were asked to give their views on the future of the New Zealand wool industry (Table 3.3). Twenty percent of farmers felt the wool industry had a good future and that wool prices would improve. Many of these

farmers considered that wool is a natural product with a 'green' image and therefore has appeal to consumers. Some farmers were confident that "wool will never be matched by synthetics" and that it will retain and even increase its market share. A number of respondents felt that New Zealand's high wool clip preparation standards would ensure a good future for the wool industry.

Table 3.3 Perceptions of the future of the wool industry of farmers surveyed.

Perception	Percentage of Farmers	Number of Farmers (Total n = 73)
Industry governed by commodity cycle	48	35
Future poor/low wool prices will continue	22	16
Future good/wool prices will improve	20	15
Future poor unless wool marketing improved	10	7

The greatest proportion of farmers (48 percent) considered that the profitability of the New Zealand wool industry was governed by world wool supply and demand and that wool prices would "fluctuate like prices for other commodities". Most of these farmers felt that there was little that could be done to prevent this "commodity cycle" and hoped that "everything would not be down at once" (i.e. low wool prices, lamb prices and beef prices).

Twenty-two percent of wool producers thought that the New Zealand wool industry had a very poor future, and that wool prices would remain low or fall even lower. One farmer stated "the real wool price has been trending downward for the last 30 years and will be zero by the year 2000". In contrast to the more optimistic farmers, a number of respondents considered that "consumers seem to have lost the perception that wool is a quality fibre" and that New Zealand wool was losing market share to both poorer quality wools from other countries, and synthetic fibres.

A small proportion of farmers (10 percent) believed that the New Zealand wool industry's future was bleak unless the marketing of wool was improved. Most of these farmers favoured a system of "centralised marketing" or "single desk selling" whereby wool was purchased by a single organisation (in one case the NZWB) and marketed directly to first stage wool processors. It was suggested that this marketing organisation could also become involved in the further processing (e.g. scouring, spinning, product manufacturing) of New Zealand wool.

3.1.4 New Zealand Wool Board Performance

The farmers surveyed were asked to rate the performance of the NZWB over the past five years. Their responses are summarised in Table 3.4. Wool Board performance was rated 'average' by the greatest proportion (37 percent) of farmers. Slightly more farmers rated performance 'good' or 'very good' (35 percent) then 'below average' or 'poor' (28 percent).

Table 3.4 Rating of New Zealand Wool Board performance by farmers surveyed.

Performance rating	Percentage of Farmers	Number of Farmers (Total n = 73)
Very good	8	6
Good	27	20
Average	37	27
Below average	18	13
Poor	10	7

The respondents made a variety of comments supporting their assessment of NZWB performance. Farmers that were relatively happy with the Wool Board's undertakings stated that they had "done a good job under difficult (world economic) conditions", had "handled market support and the stockpile well" and had "been very fair" in providing wool producers with retrospective wool price supplementation. One farmer stated that "it is easy but unfair to be critical (of Wool Board performance) in hindsight", while another considered that "the Wool Board has been a bashing board for frustrated farmers". This farmer felt that "farmers underestimate the effort of the Board and its management".

A number of the respondents who were critical of NZWB performance were dissatisfied with the way in which wool market intervention had obscured market signals. These farmers felt that the Wool Board had tried to "influence" or "control" the wool market rather then provide wool producers with price support. Three farmers considered that the Board should have recognised the 1990 wool price collapse earlier and lowered minimum prices rather than deplete market support funds.

Fifteen percent of the farmers suggested that the NZWB should become more involved in wool marketing. Some of these farmers felt that the Wool Board should be "marketing like the Dairy Board".

Five farmers were concerned that the Wool Board was not allocating enough levy money to research and development through the Wool Research Organisation of New Zealand. Four farmers felt that they knew very little about how the wool levy was spent because the NZWB did not communicate well with wool producers. A small proportion of survey farmers (6 percent) commented that since the Wool Board ceased wool market support in 1991, they "have not received value for money" for wool levies paid.

3.1.5 Agriculture - Related Publications Read by Farmers

The frequency with which farmers read various wool/agriculture related publications are described in Table 3.5. The most frequently read publication was 'Woolclips', a weekly newspaper column written by the local NZWB WPO; other publications were mostly read relatively frequently by farmers. The percentage of farmers reading 'Wool Market Review' often or always (48%) was considerably greater than the percentage of wool producers nationwide (12%) receiving the publication (Wool Market Review requires that wool producers request the periodical). This suggests that either Wool Market Review is read by a much greater proportion of Wairarapa/Tararua wool producers, or that there was large degree of respondent answer bias associated with this question.

Table 3.5 **Agriculture-related publications read by farmers surveyed. Figures under 'Frequency' are the percentage of responses in each category. Mean score was calculated by summing the values of the codes (Never = 1, Sometimes = 2, Often =3, Always = 4) and dividing this by the number of responses.**

Publication	Frequency				Total n	Mean Score	±se
	Never	Sometimes	Often	Always			
Wool Report	5	37	40	18	74	2.7	0.1
Wool Market Review	37	15	28	20	74	2.3	0.1
Woolclips	1	34	38	27	74	2.9	0.1
NZ Farmer	22	13	35	30	74	2.7	0.1
Rural News	15	24	42	19	74	2.6	0.1
Countrywide	13	23	42	22	74	2.7	0.1
Straight Furrow	12	27	45	16	74	2.6	0.1

3.1.6 Agriculture - Related Events Attended by Farmers

Attendance of agriculture-related events by farmers was significantly related to sheep flock size. Results are therefore presented as survey sample averages (Table 3.6) and for individual sheep flock size categories (Table 3.7).

Overall, sheep farm discussion groups were the event most frequently attended (41 percent) by farmers (Table 3.6). However, 41 percent of farmers never attended discussion groups, consistent with the large proportion of survey farmers that never attended most other events. The lowest proportion of farmers 'never' attending an event was for agricultural and pastoral shows. However, because 58 percent of survey farmers attended annual shows only sometimes, these events were considered to be a more unreliable point of farmer contact than the mean score ranking indicated.

Differences in farmer attendance behaviour most commonly arose between the largest (Group 4; ssu > 4000) and smallest (Group 1; ssu < 1500) sheep flock size categories (Table 3.7). Group 4 farmers attended farm discussion groups more frequently ($P < 0.05$) than Group 1 and Group 3 (ssu 2501 - 4000) farmers. They were also more likely to attend WFIC events and Hill Country Farmer of the Year field days than Group 1 farmers.

Table 3.6 Agriculture-related events attended by farmers surveyed. Figures under 'Frequency' are percentage of responses in each category. Mean score was calculated by summing the values of the codes (Never = 1, Sometimes = 2, Often = 3, Always = 4) and dividing this by the number of responses.

Event	Frequency				Total n	Mean Score	±se
	Never	Sometimes	Often	Always			
Farm discussion groups	41	18	9	32	74	2.3	0.2
National Agricultural Field Days	39	50	11		74	1.7	0.1
WFIC[1] events	69	11	11	9	74	1.6	0.1
Agricultural and Pastoral shows	19	58	18	5	74	2.1	0.1
Federated Farmers meetings	51	37	11		74	1.6	0.1
HCFOY[2] field days	37	27	24	12	74	2.1	0.1
NZ Wool Board events	38	47	15		74	1.8	0.1
MRDC[3] Focus Farm field days	65	19	13	3	74	1.5	0.1

1 Wairarapa Farm Improvement Club.
2 Hill Country Farmer of the Year.
3 Meat Research and Development Council.

Table 3.7 Agriculture-related events attended by farmers classified by number of sheep stock units wintered. Mean score was calculated by summing the values of the codes (Never = 1, Sometimes = 2, Often = 3, Always = 4) and dividing this by the number of responses.

Event	Group 1 (ssu< 1500)	Group 2 (ssu1501 - 2500)	Group 3 (ssu2501-4000)	Group4 (ssu>4000)	Total n	Mean Score	±se
Farm discussion groups	1.5^{b}	2.6^{ac}	2.2^{bc}	3.1^{a}	74	2.3	0.2
National Agricultural Field Days	1.4^{a}	1.8^{ab}	1.9^{b}	1.7^{ab}	74	1.7	0.1
WFIC[1] events	1.2^{a}	1.6^{ab}	1.6^{ab}	2.1^{b}	74	1.6	0.1
Agricultural and Pastoral shows	2.1	2.2	2.3	1.8	74	2.1	0.1
Federated Farmers meetings	1.6	1.5	1.6	1.9	74	1.6	0.1
HCFOY[2] field days	1.6^{a}	2.3^{ab}	2.1^{ab}	2.5^{b}	74	2.1	0.1
NZ Wool Board events	1.7	1.8	1.3	1.7	74	1.5	0.1
MRDC[3] field days	1.3^{ab}	1.8^{a}	1.3^{b}	1.7^{ab}	74	1.5	0.1

1 Wairarapa Farm Improvement Club.
2 Hill Country Farmer of the Year.
3 Meat Research and Development Council.
a,b,c Means within rows with different superscripts are significantly different at $P < 0.05$.

3.1.7 Discussion and Application of Results

Prior surveys of Wairarapa/Tararua farmers (Parker, 1984; Journeaux, 1987; Gray et al., 1989) have noted an average farmer age of 38 to 43 years, and an average farm ownership period of 10 to 12 years. Farmers in the current survey were slightly older (44 years) and had owned farms longer (13 years) than these earlier surveys.

It was not surprising that hard hill country country farmers were significantly younger than those on easier hill country. Younger farmers are likely to cope better with the physical demands of steeper contour, and more development work (e.g. fencing), associated with hard hill country.

McRae (1993) outlined the goals of Northern Rangitikei and Central Coastal Hawkes Bay sheep and beef cattle farmers and noted that they were generally more concerned with the security and well being of the farm family than with improvements in productive and economic efficiency. Even after those basic needs were addressed only 25 percent of the farmers in these districts held goals that related directly to increased production and profitability. Half of the sample population had goals that related to achievement or self-satisfaction, while the other 25 percent were most concerned with matters related to the succession of the farm business assets. Similar farmer goals were found in the Wairarapa/Tararua survey, with maximising profit being the primary aim of only 13 percent of the farmers surveyed, and enjoying the farming lifestyle (self-satisfaction) being important to 49 percent of the respondents. Goals involving future financial security and the well-being of children were most important to 15 percent of the farmers.

The results of the Wairarapa/Tararua survey and Massey University's Farmer First Research programme (McRae, 1993; McRae et al., 1993a; McRae et al., 1993b) suggest that while the potential for improvement in the performance of wool production systems (and other farm production systems) is considerable, it may not be achieved through current methods of research and technology transfer. NZWB WPO's should attempt to address the different goals/objectives of wool producers by targeting groups within the wool producing population with similar needs, rather than providing a single generic message to the industry.

Most of the Wairarapa/Tararua farmers had a reasonable knowledge of the factors affecting the wool market. They appeared to realise that there was relatively little the NZWB could do to influence the wool market in the short-term, and that recent price trends were the result of macroeconomic factors rather than the actions of the Wool Board.

The survey farmers' good knowledge of the factors affecting the wool industry was also reflected in their rating of NZWB performance. Farmers consistently rated the Board according to their judgement of the effectiveness of its actions, and this did not appear to be influenced by the level of wool price. While 28 percent of farmers rated Wool Board performance 'below average' or 'poor', a number of these based their rating on what the Board had neglected to do rather than what it had done. These farmers stated that they would be very supportive of the NZWB if it chose to be 'more aggressive' in the wool industry and the wool market. The survey suggested that there would be strong farmer support for a more pro-active and higher profile NZWB.

Prior to the survey it was believed that mass extension activities best serviced the large number of wool levy paying NZWB clients in the Wairarapa/Tararua region. It was therefore thought that the analysis of farmer reading and event-

attendance behaviour may indicate which farming publications and agriculture-related events could be used most successfully by the NZWB to disseminate information. Most agriculture-related publications specified were read relatively frequently by Wairarapa/Tararua survey farmers. However, publications that required a subscription (i.e. Wool Market Review, New Zealand Farmer) were more likely to be never read than free publications. It is suggested that publications such as 'Wool Report' and 'Woolclips' (never read by only 5 percent and 1 percent of survey farmers respectively) are best for NZWB mass extension. Both of these publications are written and published by the NZWB. Other free farming publications (Rural News, Countrywide, Straight Furrow) were frequently read by farmers and could be used by the Wool Board as a medium for the dissemination of wool industry information. The NZWB should negotiate the regular publication of wool-related information in these farming newspapers.

Although farm discussion groups had the highest mean score for frequency of attendence, this was influenced by the number of farmers 'always' attending these meetings. A large proportion of farmers never attended discussion groups, and those that run large (ssu $>$ 4000) farms were more likely ($P < 0.05$) to attend. This may indicate that these farmers are more successful and less in need of NZWB advice/assistance. Most of the other agriculture-related events (e.g. field days) were attended infrequently by Wairarapa/Tararua farmers.

Overall, the picture of farmer attendance at field days, meetings and other agriculture-related events suggests that these are less appropriate for technology transfer than publications. The NZWB should therefore allocate most time and financial resources to mass extension through newspapers and industry-funded publications. This recommendation, however, is based on frequency of farmer use rather than a measure of the impact of these methods

of technology transfer on learning, skills development or other parameters of management. More detailed investigation of the impact of alternative extension methods for wool producers is warranted.

3.1.8 Conclusions

The wool producers in the Wairarapa/Tararua survey had a variety of farming circumstances and goals/objectives, and attitudes towards the wool industry and the NZWB. These can not all be addressed by a single generic (extension) message, thus the NZWB WPO must plan and target mass extension activities to assist and inform different groups of farmers if wool production and returns, and satisfaction from producing wool, are to be improved in the region. The most efficient mass extension activities are likely to be based on newspaper and industry funded publications.

3.2 LAND, SUBDIVISION AND LIVESTOCK

3.2.1 Farm Area

Land, subdivision and livestock characteristics of the farms surveyed are presented in Tables 3.8 to 3.11. The average total area of farms surveyed was 488 ± 45 ha and the average effective area was 427 ± 38 ha. Farms with NZMWBES Class 3 (North Island hard hill) characteristics were significantly larger than farms with NZMWBES Class 5 (North Island intensive finishing) characteristics in both total area and effective area (Table 3.8). Farms classified as 'summer dry' were significantly larger than those in the summer moist districts (Table 3.9).

Table 3.8 Land, subdivision and livestock characteristics of farms classified by NZMWBES Farm Class.

Parameter	Class 3	Class 4	Class 5	Total n	Mean	± se
Total farm area (ha)	688[b]	473[ab]	348[a]	74	488	45
Effective farm area (ha)	552[b]	439[ab]	290[a]	74	427	38
Number of paddocks	54	43	44	73	46	3
Average paddock size (ha)	11.5[b]	9.7[b]	6.9[a]	73	9.4	0.6
su wintered per ha						
1992/93	8.9	9.7	9.9	73	9.6	0.2
1991/92	9.1	10.1	10.1	68	9.9	0.2
1990/91	8.8[b]	10.0[a]	10.8[a]	66	9.9	0.2
Sheep su as % of total su						
1992/93	78.1[b]	75.0[b]	65.7[a]	73	73.6	1.5
1991/92	79.7	77.2	71.8	68	76.6	1.3
1990/91	82.5	80.1	76.6	66	79.9	1.2

a, b Means within rows with different superscripts are significantly different at $P < 0.05$.

Table 3.9 Land, subdivision and livestock characteristics of farms classified by summer rainfall category.

Parameter	Summer Moist	Summer Dry	Total n	Mean	± se
Total farm area (ha)	347[a]	621[b]	74	488	45
Effective farm area (ha)	317[a]	532[b]	74	428	38
Number of paddocks	41	50	73	46	3
Average paddock size (ha)	8[a]	11[b]	73	9	1
su wintered per ha					
1992/93	9.4	9.7	73	9.6	0.2
1991/92	10.0	9.8	68	9.9	0.3
1990/91	10.0	9.8	66	9.9	0.3
Sheep su as % of total su					
1992/93	76	71	74	73.6	2
1991/92	79	75	68	76.6	2
1990/91	81	79	66	79.9	2

a, b Means within rows with different superscripts are significantly different at $P < 0.05$.

Table 3.10 Land, subdivision and livestock characteristics of farms classified by number of sheep stock units wintered.

Parameter	Group 1 (ssu ≤ 1500)	Group 2 (ssu 1501 - 2500)	Group 3 (ssu 2501-4000)	Group 4 (ssu > 4000)	Total n	Mean	± se
Total farm area (ha)	168[c]	363[b]	473[b]	953[a]	74	488	44
Effective farm area (ha)	158[c]	315[b]	416[b]	826[a]	74	427	37
Number of paddocks	29[c]	39[bc]	46[b]	72[a]	73	46	3
Average paddock size (ha)	6.7[b]	8.7[ab]	10.2[a]	11.7[a]	73	9.3	0.6
su wintered per ha							
1992/93	9.2	9.4	10.0	9.8	74	9.6	0.2
1991/92	9.9	9.7	10.4	9.8	69	9.9	0.2
1990/91	10.9	9.5	10.0	9.9	67	10.0	0.3
Sheep su as % of total su							
1992/93	70.5	69.7	78.1	75.8	74	73.5	1.5
1991/92	74.6	74.1	80.1	77.5	69	76.6	1.2
1990/91	80.0	77.9	81.6	80.3	67	79.9	1.1

a, b, c Means within rows with different superscripts are significantly different at $P < 0.05$.

Table 3.11 Land, subdivision and livestock characteristics of farms classified by summer rainfall/NZMWBES Farm Class category.

Parameter	Type 1 (Summer moist/ Class 3)	Type 2 (Summer moist/ Class 4)	Type 3 (Summer moist/ Class 5)	Type 4 (Summer dry/ Class 3)	Type 5 (Summer dry/ Class 5)	Type 6 (Summer dry/ Class 5)	Total n	Mean	± se
Total farm area (ha)	493^{ab}	318^{a}	318^{a}	818^{b}	679^{b}	365^{a}	74	488	45
Effective farm area (ha)	404^{ab}	305^{a}	282^{a}	651^{b}	618^{b}	294^{a}	74	428	38
Number of paddocks	52	37	45	55	52	44	73	46	3
Average paddock size (ha)	8^{ac}	8^{a}	7^{a}	14^{b}	12^{bc}	7^{a}	73	9	1
su wintered per ha									
1992/93	8.8	9.6	9.9	8.9	10.0	9.8	73	9.6	0.2
1991/92	9.2	10.2	10.0	9.0	10.1	10.1	68	9.9	0.2
1990/91	9.0^{ab}	10.2^{ab}	10.4^{ab}	8.7^{b}	9.8^{ab}	11.2^{a}	66	9.9	0.2
Sheep su as % of total su									
1992/93	79^{b}	78^{b}	69^{ab}	77^{b}	71^{ab}	63^{a}	73	74	2
1991/92	81	79	74	79	74	70	68	77	1
1990/91	83	81	78	82	78	75	66	80	1

$^{a, b, c}$ Means within rows with different superscripts are significantly different at $P < 0.05$.

As would be expected, farm areas were significantly larger on properties wintering more than 4000 ssu (Table 3.10), however properties wintering 1501-2500 ssu (Group 2) and 2501-4000 ssu (Group 3) were not significantly different in terms of land area.

Grouping the farms by summer rainfall/NZMWBES Farm Class category (Table 3.11) indicated that summer moist farms were more uniform in terms of size than summer dry farms. Tables 1 to 6 (Appendix C) show the large degree of variation in total and effective farm area found within summer rainfall/NZMWBES Farm Class categories.

3.2.2 Subdivision

The average total number of paddocks on the farms surveyed was 46 ± 3 (Tables 3.8 to 3.11). Significant differences in the number of paddocks were present only when farms were grouped on the basis of sheep flock size. This

was because sheep flock size is closely related to farm area, which is thought to be the major determinant of total number of paddocks.

Average paddock size better indicated levels of subdivision. The average paddock size on the survey farms was 9.4 ± 0.6 ha, however significant differences between mean paddock size were present when farms were grouped in different ways. Average paddock size was significantly smaller on NZMWBES Class 5 farms than on Class 3 and Class 4 farms (Table 3.8), and paddocks on summer moist farms were significantly smaller than those on summer dry properties (Table 3.9). Farms running higher numbers of sheep stock units (Groups 3 and 4 in Table 3.10) had significantly larger average paddock sizes than those with a lower proportion of sheep stock units. Table 3.11 again showed the summer moist category to be more homogeneous than the summer dry category, with no significant differences between summer moist farm classes.

3.2.3 Livestock

(i) Sheep Breeds

Romney sheep were the main breed of ewe farmed on 80 percent of the properties surveyed. Coopworth, Perendale and Romney-Border Leicester cross ewes were farmed on seven, five and four percent of survey farms respectively. Romney-Coopworth cross, English Leicester and Drysdale ewe flocks were other breeds identified.

The use of Romney rams was predominant (84 percent of the farms). Coopworth and Perendale rams were used on six and four percent of farms respectively, with Border Leicester, Drysdale, Suffolk, South Dorset, Poll Dorset

and Texel rams each used on one percent of survey farms. There were no significant differences in the main breed of ewe or ram used between the categories used to group the survey farms.

(ii) Stocking Rates

The average winter stocking rate on farms surveyed was 9.6 ± 0.2 su/ha in 1992/93, 9.9 ± 0.2 su/ha in 1991/92 and 9.9 ± 0.2 su/ha in 1990/91. While there appeared to be an annual trend towards higher winter stocking rates on easier classes of farm (i.e. Class 5 and Class 4 in Table 3.8), mean winter stocking rates for NZMWBES Farm Class categories were significantly different only in 1990/91. Mean winter stocking rates were not significantly different in any year for summer rainfall (Table 3.9) and sheep stock unit (Table 3.10) groupings, and were significantly different between Type 4 and Type 6 properties in 1990/91 only (Table 3.11). There appeared to be a general trend from 1990/91 to 1992/93 toward lower winter stocking rates, particularly on NZMWBES Class 5 survey farms.

(iii) Sheep : Cattle Ratio

Sheep constituted, on average, 74 percent of total stock units wintered in 1992/93, 77 percent in 1991/92 and 80 percent in 1990/91. Sheep stock units as a percentage of total stock units were significantly different between NZMWBES Farm Class and summer rainfall/NZMWBES Farm Class group categories, but these differences were not consistent across all years (Table 3.8 and Table 3.11). There were no significant differences between mean sheep : cattle ratios within summer rainfall and sheep flock size groupings.

3.2.4 Discussion and Application of Results

As outlined in Section 2.1.8, NZMWBES (NZMWBES, 1993a) and WFIC (Baker et al., 1993) databases are considered to have shortcomings for describing the Wairarapa/Tararua region. Comparisons between these databases and that for the more comprehensive survey reported here can therefore be considered a test of their suitability for describing Wairarapa/Tararua wool production systems.

The Wairarapa/Tararua survey farm size data corresponded more closely with NZMWBES data than WFIC data. Average Wairarapa/Tararua survey total farm area was 488ha compared with 480 ha for the NZMWBES East Coast North Island Production Region database (NZMWBES, 1993a). A similar trend was noted for effective farm area, with averages of 427 ha, 442 ha and 748 ha for Wairarapa /Tararua, NZMWBES and WFIC databases respectively.

When farm class farm size data were compared, the Wairarapa/Tararua and NZMWBES databases again corresponded closely, but WFIC farm size averages were considerably higher than those for the other databases.

Despite the NZMWBES farm survey (NZMWBES, 1993a) including only 24 Wairarapa farms, and grouping farms from outside the Wairarapa/Tararua area into regional (e.g. East Coast North Island) and topography (e.g. North Island Hard Hill Country) classifications, it appeared to adequately describe the farm size characteristics of Wairarapa/Tararua sheep and beef cattle farms. If the Wairarapa/Tararua survey database is not updated regularly, NZMWBES Sheep and Beef Farm Survey results could be used to monitor Wairarapa/Tararua sheep farm sizes.

The importance of subdivision for improving sheep and cattle farm performance has been reported by a number of authors. For example, Bell (1980) stated that 'adequate' subdivision was a key to achieving good grazing management and subsequent high animal production, but did not specify levels of subdivision considered adequate. Fitzharris and Wright (1981), in a survey of Gisborne hill country farms, noted that farms with twenty or more paddocks had significantly higher production and profitability than those with fewer paddocks. They believed that paddock numbers were probably more important than paddock size, but this statement can be questioned when farms of different size are compared (i.e. larger farms tend to have more paddocks (Table 3.10)). Subdivision was identified in a review of management features common to successful farms in King Country Farmer of the Year competitions (Parker 1983). These farms had at least 40 main paddocks and in some instances nearly double this number. A high number of paddocks has been associated with a high number of lambs per hectare (Fitzharris and Wright, 1984) and greater ewe lamb live weights in autumn (Townsley and Parker, 1987).

The Wairarapa/Tararua survey average of 46 paddocks per farm was higher than Parker's (1984) survey of North East Wairarapa farms (average 34 paddocks) and lower than for the Pongaroa district (average 51 paddocks) (Gray et al., 1989). The number of paddocks was closely related to farm and sheep flock size, which raises questions about the use of this index for predicting farm performance as suggested by Fitzharris and Wright (1981). A ratio of average paddock size to average mob size may be a better indicator of farm performance.

Parker (1984) found that the Romney was the main sheep breed (33 percent) on north-east Wairarapa farms. Although this figure appeared low, a further 30 percent of farmers at that time were changing to Romney from either Perendale or Coopworth sheep. The present study (80 percent of farms running Romney

ewes) suggests that the trend to Romneys continued through the late 1980's. Around 90 percent of Pongaroa farmers used Romney or Romney cross sheep (Gray et al., 1989). The predominance of Romney and other strong crossbred ewes and rams on Wairarapa/Tararua survey farms will result in a narrow range of wool types being produced in the region. In particular, crossbred wools of low bulk and high fibre diameter will predominate. These attributes have been identified as negative features of the New Zealand wool clip (Carter, 1993; Van Brussel, 1993; New Zealand Wool Board, 1993b). If pre-sale objective measurement of wool identifies significant price premiums for higher bulk wool in the future, few Wairarapa/Tararua farmers will be in a position to receive premiums unless a breed change or crossbreeding programme is effected (Wickham, 1993a). The NZWB should carefully monitor processor requirements and price premiums for these raw wool characteristics to assess the profitability of possible on farm changes to sheep breeding programmes. Such estimates should account for possible associated depressions in fleece weight (Wickham, 1993a).

Surprisingly, there were no significant differences in the main breed of ram used on different Classes of farm. It was thought that intensive finishing (NZMWBES Class 5) farms would be more likely to use terminal meat sires than steeper hill country farms producing a greater proportion of store lambs (e.g. NZMWBES Class 3, hard hill country farms). Similarly, while a general trend toward slightly higher stocking rates on easier farms was observed, the non-significant differences in winter stocking rates between farm classes in two out of three seasons suggests that inherent differences in the productive capacity of, for example, hard hill country and intensive finishing farms were largely cancelled out by farmer/management factors, and that the Wairarapa/Tararua area was relatively homogeneous in terms of stock units wintered.

The Wairarapa/Tararua survey noted average winter stocking rates of 9.9 su/ha, 9.9 su/ha and 9.6 su/ha in 1990/91, 1991/92 and 1992/93 respectively, while the comparable figures for the WFIC were 9.4, 9.6 and 9.4. Therefore, WFIC data (Baker et al., 1993) provides an acceptable indication of winter stocking rates on Wairarapa/Tararua sheep farms. This was reinforced by the close agreement between the Wairarapa/Tararua survey data and the WFIC database in terms of stock units wintered as sheep. Eighty percent, 77 percent and 74 percent of total stock units wintered in the present study were sheep in 1990/91, 1991/92 and 1992/93 respectively, compared with 78 percent, 77 percent and 73 percent for WFIC farms. By contrast, NZMWBES data gave percentages approximately 10 percent lower than either of the other databases in the 1990/91 and 1991/92 seasons.

Each database showed a decline in the percentage of total stock units wintered as sheep from 1990/91, in association with the sharp decline in wool prices during the 1990/91 season. However, because average stocking rate decreased only slightly between 1990/91 and 1992/93, the reduction in sheep numbers was almost compensated for by an expansion of more profitable cattle production enterprises.

The change in sheep:cattle ratio was likely also due to the belief that sheep perform better on farms running proportionally more cattle. Fitzharris and Wright (1981;1984) stated that higher wool production was consistently achieved on east coast North Island hill country farms with a greater proportion of cattle. They suggested that this was because cattle provided greater grazing flexibility and hence pasture control, and diluted animal health challenges such as those presented by parasites. Townsley and Parker (1987) also found that greater ewe lamb live weights in autumn were positively associated with the proportion of cattle stock units wintered. The relationship between sheep :

cattle ratios and wool production on farms in this study is investigated in Chapter Four.

3.2.5 Conclusions

Despite large differences in farm size there were few significant differences in the subdivision and livestock characteristics of Wairarapa/Tararua properties grouped according to different criteria.

The NZMWBES Sheep and Beef Farm Survey provided a similar description of farm size to the current Wairarapa/Tararua survey, while results from the WFIC were more comparable in relation to winter stocking rates and sheep:cattle ratios in the region.

3.3 LAMBING PERCENTAGE AND WOOL PRODUCTION

3.3.1 Lambing Percentage

The average lambing percentage (lambs docked to ewes mated) on farms surveyed was 96 ± 2 percent in 1992/93, 104 ± 2 percent in 1991/92 and 102 ± 2 percent in 1990/91. There were few significant differences between means within the farm classification groupings, and no consistent differences across years (Tables 3.12 to 3.15). There was a trend towards higher lambing percentages on "easier" country (Table 3.12). Summer dry survey farms had a lower (not significant) mean lambing percentage than summer moist farms in 1990/91 (Table 3.13), possibly due to drought conditions in 1989/90 adversely affecting ewe live weights at mating on these farms. Differences were not apparent in 1991/92 and 1992/93, when unusually wet summers preceeded these lambings. Thus there was considerable variation in lambing percentage within groups of farms with similar summer rainfall and class of country (Tables 7 to 12, Appendix C).

Table 3.12 Lambing percentage and wool production on farms classified by NZMWBES Farm Class.

Parameter	Class 3	Class 4	Class 5	Total n	Mean	± se
Lambing %						
1992/93	91[b]	95[ab]	103[a]	73	96	2
1991/92	100	105	107	70	104	2
1990/91	98	104	103	68	102	2
Clean wool production per ssu (kg/ssu)						
1992/93	4.0	4.4	4.7	62	4.4	0.2
1991/92	4.1	4.4	4.5	62	4.4	0.1
1990/91	4.0	4.7	4.3	62	4.4	0.3
Clean wool production per ha (kg/ha)						
1992/93	27.7	32.2	29.4	62	30.6	1.0
1991/92	29.6	35.0	33.8	62	33.6	1.2
1990/91	28.7[b]	36.3[a]	36.8[a]	62	34.7	1.2

[a, b] Means within rows with different superscripts are significantly different at $P < 0.05$.

Table 3.13 Lambing percentage and wool production on farms classified by summer rainfall category.

Parameter	Summer Moist	Summer Dry	Total n	Mean	± se
Lambing %					
1992/93	92	99	70	96	2
1991/92	105	104	67	105	2
1990/91	106	100	65	103	2
Clean Wool production per ssu (kg/ssu)					
1992/93	4.3	4.4	70	4.4	0.2
1991/92	4.4	4.4	65	4.4	0.1
1990/91	4.6	4.3	62	4.4	0.2
Clean wool production per ha (kg/ha)					
1992/93	30.5	29.7	70	30.1	1.2
1991/92	34.8	31.5	65	33.2	1.4
1990/91	36.9	32.3	62	34.7	1.5

Table 3.14 Lambing percentage and wool production on farms classified by number of sheep stock units wintered.

Parameter	Group 1 (ssu ≤ 1500)	Group 2 (ssu 1501-2500)	Group 3 (ssu 2501-4000)	Group 4 (ssu > 4000)	Total n	Mean	± se
Lambing %							
1992/93	102^{b}	90^{a}	98^{ab}	95^{ab}	73	96	2
1991/92	101	103	109	104	70	104	2
1990/91	102	100	106	102	68	102	2
Clean wool production per ssu (kg/ssu)							
1992/93	4.8	4.3	4.3	4.2	63	4.4	0.2
1991/92	4.2	4.5	4.5	4.3	63	4.4	0.1
1990/91	4.2	4.6	4.7	4.2	63	4.4	0.3
Clean wool production per ha (kg/ha)							
1992/93	29.0	28.8	34.1	30.8	63	30.8	1.0
1991/92	31.2	33.1	37.6	32.1	63	33.7	1.1
1990/91	35.0	34.6	37.4	32.3	63	34.8	1.2

a, b Means within rows with different superscripts are significantly different at $P < 0.05$.

Table 3.15 Lambing percentage and wool production on farms classified by summer rainfall/NZMWBES Farm Class category.

Parameter	Type 1 (Summer moist/ Class 3)	Type 2 (Summer moist/ Class 4)	Type 3 (Summer moist/ Class 5)	Type 4 (Summer dry/ Class 3)	Type 5 (Summer dry/ Class 4)	Type 6 (Summer dry/ Class 5)	Total n	Mean	± se
Lambing %									
1992/93	82^{b}	95^{ab}	98^{ab}	98^{ab}	96^{ab}	105^{a}	73	96	2
1991/92	94	107	105	104	102	108	70	104	2
1990/91	95^{ab}	109^{a}	99^{ab}	99^{b}	96^{ab}	106	68	102	2
Clean wool production per ssu (kg/ssu)									
1992/93	3.6	4.5	4.0	4.3	4.2	5.1	62	4.4	0.2
1991/92	3.9	4.6	4.5	4.3	4.3	4.4	62	4.4	0.1
1990/91	4.0	4.7	4.5	4.1	4.5	4.2	62	4.4	0.1
Clean wool production per ha (kg/ha)									
1992/93	24.7^{a}	33.1^{b}	31.0^{ab}	29.9^{ab}	31.0^{ab}	28.4^{ab}	62	30.6	1.0
1991/92	28.3	36.5	38.7	30.6	32.8	30.8	62	33.6	1.0
1990/91	28.1^{a}	38.5^{b}	40.6^{ab}	29.1^{a}	32.9^{ab}	34.5^{ab}	62	34.7	1.0

a, b Means within rows with different superscripts are significantly different at $P < 0.05$.

3.3.2 Wool Production

Clean wool production per sheep stock unit averaged 4.4 kg in 1990/91, 1991/92, and 1992/93. Average clean wool production per hectare changed annually, in association with changes in sheep stocking rate per hectare (34.7 kg in 1990/91, 33.6 kg in 1991/92 and 30.6 kg in 1992/93). Wool production was consistent across farm categories and the range in wool production within summer rainfall/NZMWBES Farm Class categories (Tables 7 to 12, Appendix C) was very large.

3.3.3 Discussion and Application of Results

The small number and lack of consistent differences between group categories or across years in lambing performance and wool production was surprising. Significant differences in lambing percentage and wool production were expected between farms of different NZMWBES Farm Class due to the historical evidence reported (NZMWBES, 1993a) and the large difference in land

production potential. In particular it was thought that factors normally associated with hard hill country (e.g. lower natural soil fertility, poorer producing pasture species and subsequent lower annual pasture production; steeper contour, less subdivision and subsequent less effective pasture management) would result in significantly lower sheep performance compared with "easier" hill country and intensive lowland finishing farms.

Also, farms located in summer moist areas were expected to out-perform those in dry areas due to the positive effects of higher summer and autumn pasture growth rates on wool production and ewe liveweights at mating (Armstrong and Brown, 1986, Coop, 1986; Rattray, 1986). It was also thought that farms with smaller sheep flock sizes (i.e. ssu $\leq$ 2500) may achieve higher lambing percentages and wool production than larger farms (i.e. ssu $>$ 2500) as a result of being farmed more intensively, but flock size effects were not apparent in this survey. It can be inferred from these data that farmer and management factors had more influence on physical farm performance (in terms of lambing percentages and wool production) than state variables (e.g. farm location and size). The considerable variation in performance noted within individual farm groupings supported this hypothesis (see Tables 7 to 12, Appendix C), as did the weak correlations between factors such as the proportion of stock units wintered as sheep ($r = -0.274$), summer feeding of mixed age ewes and fertiliser application, and wool production per sheep stock unit (see Chapter Four for a more comprehensive analysis of factors associated with wool production). A number of earlier studies have also indicated that personal factors, such as farmer age and family goals, and other farm management factors such as labour, subdivision, stocking rates, grazing management and stockmanship, have a significant influence on sheep production (Bell, 1980; Fitzharris and Wright, 1981; Parker, 1983; Fitzharris and Wright, 1984; Armstrong and Brown, 1986; Townsley and Parker, 1987; Gretton, 1991 McRae et al., 1993a). Although farm class may influence potential production

as suggested by the maximum levels of physical performance achieved in the respective farm group categories (Tables 7 to 12, Appendix C), its use to classify farms for the purpose of describing actual performance in the Wairarapa/Tararua region is questionable.

Wool production in crossbred sheep is altered mainly by feeding level during the summer and early autumn (Wickham and Bigham, 1973; Sumner and Rattray, 1980; Sumner and Smeaton, 1981; Hawker and Crosbie, 1985), and the level of nutrition from weaning through to mating is important in determining ewe mating live weights and subsequent twinning rate and barrenness (Coop, 1986). Summer rainfall, therefore, could be expected to have a large impact on physical performance levels on Wairarapa/Tararua farms. The absence of significant differences between farms in the summer dry and wet categories for both wool production and lambing percentage was probably due to the relatively moist summers experienced throughout the Wairarapa/Tararua region during the period 1990-1993 (Baker et al., 1993). The large range in physical performance within farm groupings (Tables 7 to 12, Appendix C) also suggest that farm management factors strongly influence lambing percentage and wool production.

Agreement between the Wairarapa/Tararua survey annual lambing percentage and those reported by the WFIC and NZMWBES was poor. The WFIC database, which comprises proportionally more summer dry farms, reflected the effects of the 1989/90 drought more strongly than the Wairarapa/Tararua survey. Thus the WFIC 1990/91 average lambing percentage was eight percent lower than that for the Wairarapa/Tararua survey, presumably due to poor ewe condition at mating as a result of severe 1989/90 summer feed restrictions. In contrast, the NZMWBES East Coast North Island Production Region showed a 1990/91 average lambing percentage of 102 percent, 5 percent higher than for the present study.

The Wairarapa/Tararua survey and WFIC average lambing percentages were 96 percent and 108 percent respectively in 1992/93. The large difference was probably due to high lamb loses in the Tararua district resulting from southerly storms. This further demonstrates the need for a wide geographical spread of sample farms to provide representative results for a region.

Wool production indices between databases were compared by converting Wairarapa/Tararua survey clean wool production to greasy wool production using an average yield conversion factor of 76 percent. Care is therefore required when interpreting the comparisons as neither the NZMWBES nor the WFIC include lambs' wool sold as slipe in their wool production calculations (Davison, Baker pers. comm.). In the Wairarapa/Tararua survey an assumed average quantity of wool sold on lambs' backs of 0.64 clean kg (0.8 kg greasy) per lamb was included in the wool production indices. Wool production per sheep stock unit was approximately 0.8 kg (greasy) above the NZMWBES individual farm class performance in 1990/91 and 1991/92. Wool production per hectare was also considerably higher for the Wairarapa/Tararua survey than the NZMWBES sheep and beef farm survey (44 kg vs 31 kg in 1991/92). Not all of this difference could be attributed to the inclusion of (lamb) slipe wool in Wairarapa/Tararua survey calculations. WFIC indices were 4.7 kg/ssu, 4.9 kg/ssu and 5.3 kg/ssu for the 1990/91, 1991/92 and 1992/93 seasons respectively, considerably lower than the 5.8 kg/ssu per season in the current study. Once again, differences between databases could not be attributed entirely to the slipe wool conversion factor.

Prior to the survey it was considered that the WFIC database, because it involved farmers thought to be relatively progressive, would overestimate average Wairarapa/Tararua wool production (particularly for the uncharacteristically moist summers of 1991/92 and 1992/93). Similarily, as

NZMWBES wool production indices were higher than those for the WFIC, it was thought that they would further overestimate performance in the region. The higher overall average in the present study may suggest that a significant proportion of WFIC members respond more quickly to changes in the relative profitability of different farm production enterprises than the average Wairarapa/Tararua sheep and beef cattle farmer, and that they have placed more emphasis on lamb and/or beef production than on wool production during the last three seasons. It may also indicate that Wairarapa/Tararua farmers are achieving higher average levels of wool production than other East Coast North Island wool producers.

3.3.4 Conclusions

There were few significant differences in lambing and wool production performance between categories of farm, when Wairarapa/Tararua properties were grouped in different ways. However, considerable variation in performance between farms within farm class groupings was noted. These data suggested that farmer and farm circumstances, and management factors more strongly influence wool production than state variables, and that there is potential for improving lambing percentage and wool production on many Wairarapa/Tararua farms.

Agreement between the lambing percentage and wool production data from this study and that from the NZMWBES and WFIC databases was poor. The Wairarapa/Tararua survey should therefore be regularly updated if these performance parameters are to be accurately monitored to indicate the impact of previous, and need for future, extension activities in the region.

3.4 FINANCIAL RETURNS FOR WOOL

3.4.1 Average Clean Wool Price

The average clean wool price received was 379 c/kg in 1990/91, 345 c/kg in 1991/92 and 352 c/kg in 1992/93. There were few significant differences in wool price between farms when they were grouped in different ways, and none of these were consistent across all years (Tables 3.16 to 3.19). Summer dry farm average wool prices were higher than those for summer wet properties (Table 3.17), but this difference was significant only in 1991/92. Large farms (Group 4) realised a higher average wool price than small farms (Group 1) ($P > 0.05$) in all years (Table 3.18). There was a large variation in average clean wool price between similar farm types (Tables 13 to 18, Appendix C).

Table 3.16 Financial returns for wool and costs of harvesting wool on farms classified by NZMWBES Farm Class.

Parameter	Class 3	Class 4	Class 5	Total n	Mean	± se
Average clean wool price (c/kg)[1]						
1992/93	345	352	355	70	352	4
1991/92	355	340	347	67	345	4
1990/91	379	378	380	63	379	4
Wool income per ssu ($/ssu)						
1992/93	13.92	15.35	16.53	61	15.25	0.58
1991/92	14.39	15.04	15.44	61	14.97	0.38
1990/91	15.63	17.53	16.37	60	16.85	0.62
Wool income per ha ($/ha)						
1992/93	95.55	112.81	104.49	61	107.21	3.56
1991/92	103.87	118.20	118.39	61	114.95	3.93
1990/91	110.75[b]	136.43[a]	132.38[ab]	60	129.63	4.85
Wool harvesting cost 1992/93[2]						
$/ssu	3.04	3.65	3.70	71	3.54	0.15
$/clean kg	0.80	0.88	0.81	70	0.84	0.03
Wool cartage cost 1992/93						
$/ssu	0.29	0.20	0.28	35	0.23	0.02
$/clean kg	0.07	0.05	0.05	35	0.05	0.005
Wool return 1992/93[3]						
$/clean kg	2.62	2.62	2.73	69	2.64	0.06
$/ssu	10.75	11.34	13.20	69	11.62	0.52
$/ha	73.59	81.61	81.29	69	79.92	3.24

a, b Means within rows with different superscripts are significantly different at $P < 0.05$.
1 Average clean wool price net of selling costs, insurance and wool levy.
2 Wool harvesting cost includes shearing, woolhandling and woolshed supply costs.
3 Wool return = wool income - (wool harvesting cost + wool cartage cost).

3.4.2 Wool Income

Wool income was expressed on a per sheep stock unit and per hectare basis. Average wool income per sheep stock unit was $16.85 in 1990/91, $14.97 in 1991/92 and $15.25 in 1992/93. Average wool income per hectare was $129.63 in 1990/91, $114.95 in 1991/92 and $107.21 in 1992/93. As wool income is a function of wool production and wool price, both of which differed very little between survey farm group categories, there were few significant differences in wool income indices between farm classifications, and none were consistent across all years.

Table 3.17 Financial returns for wool and costs of harvesting wool on farms classified by summer rainfall category.

Parameter	Summer Moist	Summer Dry	Total n	Mean	± se
Average clean wool price (c/kg)[1]					
1992/93	349	354	69	351	4
1991/92	337[a]	351[b]	64	344	4
1990/91	372	381	60	377	4
Wool income per ssu ($/ssu)					
1992/93	14.79	15.76	69	15.29	0.71
1991/92	14.84	15.21	64	15.02	0.54
1990/91	17.13	16.56	60	16.85	0.80
Wool income per ha ($/ha)					
1992/93	106.19	105.47	69	105.82	5.14
1991/92	116.98	110.36	64	113.77	5.06
1990/91	138.89[a]	119.73[b]	60	129.63	6.37
Wool harvesting cost 1992/93[2]					
$/ssu	3.36	3.72	71	3.54	0.21
$/clean kg	0.83	0.86	70	0.84	0.05
Wool cartage cost 1992/93					
$/ssu	0.21	0.25	35	0.23	0.04
$/clean kg	0.05	0.06	35	0.05	0.007
Wool return 1992/93[3]					
$/clean kg	2.63	2.66	69	2.65	0.08
$/ssu	11.30	11.94	69	11.62	0.76
$/ha	80.51	79.34	69	79.92	4.51

a, b Means within rows with different superscripts are significantly different at $P < 0.05$.
1 Average clean wool price net of selling costs, insurance and wool levy.
2 Wool harvesting cost includes shearing, woolhandling and woolshed supply costs.
3 Wool return = wool income - (wool harvesting cost + wool cartage cost).

3.4.3 Wool Costs

Wool costs (collected for the 1992/93 season only) were partitioned into wool harvesting costs (including the costs of shearing, woolhandling, crutching and woolshed supplies) and wool cartage costs. The average wool harvesting cost was $3.54 per sheep stock unit and $0.84 per kg clean wool produced. The average wool cartage cost was $0.23 per sheep stock unit and $0.05 per kg clean wool. There were no significant differences between category means within survey groupings for any wool cost indices.

Table 3.18 Financial returns for wool and costs of harvesting wool on farms classified by number of sheep stock units wintered.

Parameter	Group 1 (ssu ≤ 1500)	Group 2 (ssu 1501 - 2500)	Group 3 (ssu 2501- 4000)	Group 4 (ssu > 4000)	Total n	Mean	± se
Average clean wool price (c/kg)[1]							
1992/93	338	351	360	357	70	352	4
1991/92	338	343	340	356	67	345	4
1990/91	369	384	379	382	63	379	5
Wool income per ssu ($/ssu)							
1992/93	16.44	14.99	15.22	15.06	62	15.33	0.58
1991/92	14.07	15.05	15.20	15.31	62	14.99	0.38
1990/91	15.00	18.05	17.74	16.00	61	16.84	0.61
Wool income per ha ($/ha)							
1992/93	96.64[b]	100.92[ab]	121.04[a]	110.74[ab]	62	108.37	3.69
1991/92	104.90	111.83	127.11	114.73	62	115.58	3.92
1990/91	117.25	135.74	140.29	124.02	61	130.41	4.83
Wool harvesting cost 1992/93[2]							
$/ssu	3.48	3.15	3.69	3.79	72	3.53	0.15
$/clean kg	0.80	0.76	0.87	0.92	71	0.84	0.03
Wool cartage cost 1992/93							
$/ssu	0.28	0.23	0.18	0.25	35	0.23	0.02
$/clean kg	0.06	0.05	0.04	0.06	35	0.05	0.005
Wool return 1992/93[3]							
$/clean kg	2.57	2.73	2.70	2.63	70	2.66	0.06
$/ssu	12.35	11.77	11.77	11.04	70	11.71	0.52
$/ha	72.43	77.05	91.35	81.09	70	80.98	3.36

a, b Means within rows with different superscripts are significantly different at $P < 0.05$.
1 Average clean wool price net of selling costs, insurance and wool levy.
2 Wool harvesting cost includes shearing, woolhandling and woolshed supply costs.
3 Wool return = wool income - (wool harvesting cost + wool cartage cost).

3.4.4 Wool Returns

Wool returns were calculated for the 1992/93 season by subtracting wool harvesting and wool cartage costs from wool income. The average wool return was $2.64 per kg clean wool produced, $11.62 per sheep stock unit and $79.92 per hectare. The only significant difference between category means was between Type 1 and Type 6 farms (Table 3.19) for the $/SSU index. Variation in wool returns within summer rainfall/NZMWBES Farm Class categories (Tables 13 to 18, Appendix C) was substantial.

Table 3.19 Financial returns for wool and costs of harvesting wool on farms classified by summer rainfall/NZMWBES Farm Class category.

Parameter	Type 1 (Summer moist/ Class 3)	Type 2 (Summer moist/ Class 4)	Type 3 (Summer moist/ Class 5)	Type 4 (Summer dry/ Class 3)	Type 5 (Summer dry/ Class 5)	Type 6 (Summer dry/ Class 5)	Total n	Mean	±se
Average clean wool price (c/kg)[1]									
1992/93	322[b]	352[a]	363[a]	362[a]	353[a]	350[ab]	70	352	4
1991/92	346[ab]	330[b]	359[ab]	361[a]	354[a]	339[ab]	67	345	4
1990/91	387	373	379	374	385	382	63	379	4
Wool income per ssu ($/ssu)									
1992/93	11.79[b]	15.76[ab]	14.37[ab]	15.52[ab]	14.73[ab]	18.08[a]	61	15.25	0.58
1991/92	13.61	14.93	16.00	14.97	15.20	15.04	61	14.97	0.38
1990/91	15.99	17.56	16.76	15.37	17.48	16.10	60	16.86	0.62
Wool income per ha ($/ha)									
1992/93	79.64[b]	114.79[a]	112.90[ab]	107.49[ab]	109.84[a]	98.48[ab]	61	107.21	3.56
1991/92	98.75	119.38	137.24	107.72	116.43	104.92	61	114.95	3.93
1990/91	113.08[ab]	143.38[b]	151.88[ab]	109.01[a]	126.50[ab]	118.44[ab]	60	129.63	4.85
Wool harvesting cost 1992/93[2]									
$/ssu	2.52	3.60	3.29	3.43	3.72	3.95	71	3.54	0.15
$/clean kg	0.78	0.85	0.81	0.81	0.91	0.81	70	0.84	0.03
Wool cartage cost 1992/93									
$/ssu	0.26	0.20	0.20	0.31	0.20	0.33	35	0.23	0.02
$/clean kg	0.08	0.04	0.05	0.07	0.05	0.05	35	0.05	0.005
Wool return 1992/93[3]									
$/clean kg	2.41	2.65	2.81	2.77	2.59	2.68	69	2.65	0.06
$/ssu	9.18[b]	11.90[ab]	11.24[ab]	11.93[ab]	10.66[ab]	14.50[a]	69	11.62	0.52
$/ha	61.00	86.35	78.60	83.04	75.82	83.07	69	79.91	3.24

a, b Means within rows with different superscripts are significantly different at $P < 0.05$.
1 Average clean wool price net of selling costs, insurance and wool levy.
2 Wool harvesting cost includes shearing, woolhandling and woolshed supply costs.
3 Wool return = wool income - (wool harvesting cost + wool cartage cost).

3.4.5 Discussion and Application of Results

The lower average clean wool prices (significant in 1991/92 only) associated with summer moist survey farms were probably due to the tendency for wool to discolour (unscourable yellow discolouration) in summer wet environments (Sumner and Scott, 1990). Price discounts for discoloured wool have been significant during the past three seasons. For example, full fleece wools were discounted an average of 8 c/kg clean per unit of discolouration from 1990/91 to 1992/93, with a maximum discount of approximately 30 c/kg clean per unit of discolouration above Y - Z = 4.0 in 1992/93 (New Zealand Wool Board, 1993e). The wet summer conditions experienced throughout the

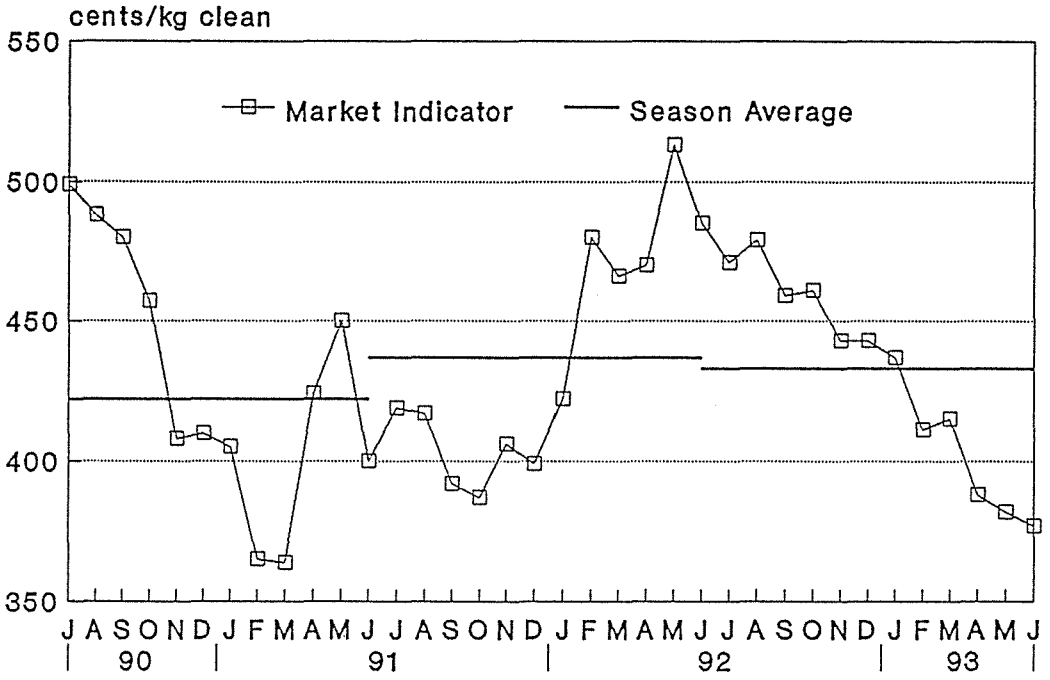
Wairarapa/Tararua region since 1990/91 may explain the lack of a wool price differential between the summer rainfall farm categories. Farmers producing wool in summer moist environments can reduce the incidence of unscourable yellow discolouration by shearing prior to the onset of warm, wet weather conditions, or by adopting a shearing policy (e.g. second shear) which results in relatively short wool that is quick to dry during the period of potential discolouration.

The tendency for large farms to realise a higher average wool price than small farms (non significant) may have been influenced by the greater saleability of larger lines of wool, but may also have resulted from proportionally more summer dry farms being in the larger farm category.

The very large range in average clean wool price noted for Wairarapa/Tararua survey farms within the same summer rainfall/NZMWBES Farm Class category is of considerable interest (Tables 13 to 18, Appendix C). A difference in average clean wool price of up to 133 c/kg may have been due to a number of factors. Time and frequency of wool selling is thought to have had the largest impact on average wool price. As Figure 3.1 shows, the Wool Market Indicator range was 136 c/kg clean in 1990/91, 124 c/kg clean in 1991/92 and 108 c/kg clean in 1992/93. Farmers selling a large proportion of their wool clip at a time of low wool prices (e.g. late vs early 1992/93) were disadvantaged. Those selling at a wool market high point, or selling a smaller proportion of their total clip at several times during a season (e.g. split flock eight-month shearing policy) would have received higher average wool prices.

Figure 3.1 Wool Prices 1990/91 - 1992/93.

Source : New Zealand Wool Board



Clip preparation standards can also influence average wool price. Wool clips in which processing faults (short or tender wool, discoloured wool, cotted wool, wool containing vegetable matter) were separated from better wool may have received higher prices when sold. However, wool removed from the main line drops appreciably in value, so care is required to ensure that improvement in the quality of the main line compensates for this (Regnault and Chynoweth, 1985; Freeman, 1992). It was not possible to collect detailed information from farmers on clip preparation methods, but prior experience by the author in visiting Wairarapa/Tararua woolsheds has indicated that clip preparation standards (including the removal of wool processing faults, and appropriate fleece : oddment ratios) are variable.

Farmers producing fine crossbred wool received considerably higher prices during the past three seasons than farmers producing strong crossbred wool. For example, in 1992/93 and 1991/92 there was a premium of 140 c/kg clean for 31 micron fleece over 35 micron fleece. In 1990/91 the premium was 40 c/kg clean (New Zealand Wool Board, 1993d). In 1992/93 and 1991/92 farmers received, on average, an extra 40 c/kg clean per micron for wool finer than 35 microns. However, because of the predominance of strong woolled crossbred sheep in the Wairarapa/Tararua region (refer to Section 3.2.3) only a small proportion of survey farmers would have benefited from fine wool premiums. Farmers that produced finer wool as a result of poor sheep feeding (Ferguson, 1981) would have had overall returns reduced because of associated lower wool production per sheep.

The considerable variation in per sheep stock unit and per hectare wool incomes within summer rainfall/farm class categories (Tables 13 to 18, Appendix C) resulted from variation in wool production and wool price between farms. Wool production, as discussed previously, is a function of farmer and farm management factors, and wool price is dependent on wool market fluctuations and, to a lesser extent, wool quality. The variation indicates that there is potential for wool production, selling strategies or wool quality, or all three factors, to be improved on many farms.

Several factors may have contributed to the large range in cost indices for wool harvesting. Frequency of shearing, lambing percentage and number of lambs (and other sheep) sold without being shorn all influence the per sheep stock unit cost of wool harvesting. Variation in per kilogram wool harvesting costs could be attributed to variation in shearing policies (i.e. frequency of shearing), per sheep stock unit wool production, and the number of lambs sold woolly (wool sold on lambs' backs was included in wool production calculations). The

amount of crutching, shearing and woolhandling performed by survey farmers, family members and/or farm labour employed on a full-time basis will also influence wool cost indices. The cost of wool harvesting, which is dependent on such factors as farm location (distance from shearing and woolhandling operator base), woolshed night pen capacity, speed of shearers (influence on open shed rates), wool harvesting staff pay rates and operator margins would also have contributed to variation in wool harvesting costs between farms.

Variation in wool cartage costs is likely to be mainly attributable to variation in wool production performance (per sheep stock unit index), wool bale weights (per kilogram index) and the distance to the nearest wool depot.

It was not possible to make comparisons between the Wairarapa/Tararua survey, NZMWBES (NZMWBES, 1993a) and WFIC (Baker et al, 1993) databases for all financial (wool) indices for each of the last three seasons. NZMWBES 1992/93 data was unavailable, and the WFIC did not calculate per hectare wool income, per sheep stock unit wool harvesting, wool cartage and wool return (Wairarapa /Tararua survey basis) indices. However, Wairarapa/Tararua survey prices, on a greasy basis, were within 1 c/kg of WFIC prices in each of the last three seasons. Agreement with NZMWBES average wool prices was not as good, with differences of 13 c/kg greasy and 6 c/kg greasy in 1991/92 and 1990/91 respectively.

NZMWBES and WFIC wool income per sheep stock unit figures were on average $1.25 and $2.33, respectively, lower than Wairarapa/Tararua survey indices over the last three seasons. Correction for wool sold on lambs' backs (estimated $0.30/ssu average 1990/91 to 1992/93) would not account for these differences. NZMWBES wool income per hectare indices were also around $25 lower than for the Wairarapa/Tararua survey data. The average

cost of shearing, woolhandling, crutching and woolshed supplies was $0.84/kg clean on survey farms, compared with $1.00/kg clean on WFIC farms.

3.4.6 Conclusions

The few significant differences in financial performance parameters between farms suggests that management variables had more impact on financial wool production system performance than state variables. The considerable variation in wool price, wool income and the cost of harvesting wool between farms with similar topography and summer rainfall supports this hypothesis and indicates that there is potential for improving financial returns on many Wairarapa/Tararua farms.

There was close agreement on wool prices between the WFIC database and the Wairarapa/Tararua survey, but neither the WFIC database nor the NZMWBES Sheep and Beef Farm Survey accurately described other financial performance characteristics for wool. The Wairarapa/Tararua survey should therefore be regularly updated if financial wool production system performance (and associated yield gap opportunities) is to be monitored in the region.

3.5 SHEEP BREEDING

3.5.1 Sheep Breeding Objectives

The sheep breeding objectives of farmers surveyed are outlined in Table 3.20. The majority of farmers placed equal emphasis on breeding for wool and meat production, in order to produce a "dual purpose type of sheep". Only a small proportion of farmers (23% in total) quantified their sheep breeding objectives (e.g. "6 plus kg of wool per sheep stock unit, 120 plus percent lambs survival to sale, finishing lambs at 18 plus kg carcass weight") A number of farmers stated they "want to produce as much meat and wool as they can", but did not indicate how that perceived potential compared with current production. Three farmers (4%) noted that recent NZWB seminars and press releases had influenced them to breed for "finer" crossbred wool, in line with wool processor requirements. Lamb production was the primary sheep breeding objective for 13 percent of the farmers surveyed, and of these several considered that wool was "almost just a by-product" of sheep meat production on their farms. Breeding for "easy care" sheep and/or good conformation in conjunction with meat and/or wool production was mentioned by nine percent of the farmers surveyed.

Table 3.20 Sheep breeding objectives of farmers surveyed.

Sheep breeding objective	Percentage of Farmers	Number of Farmers (Total n = 72)
Meat and wool/no quantified targets	49	35
Meat and wool/quantified targets[1]	21	15
Meat production/no quantified targets	12	8
Fine crossbred wool	4	3
Easy care/meat production/no quantified targets	4	3
Wool production/no quantified targets	3	2
Conformation/easy care/wool production/no quantified targets	3	2
Meat production/quantified targets	1	1
Easy care sheep	1	1
Easy care/meat and wool/no quantified targets	1	1
Conformation/meat and wool/quantified targets	1	1

[1] Quantified targets should be interpreted as desired levels of performance, stated by farmers (e.g. 120 percent lambing, 6 kg wool per ssu).

3.5.2 Ewe Hogget Selection

The importance placed on various replacement ewe hogget selection criteria by farmers surveyed is shown in Table 3.21. Selection was specified as the final culling of ewe hoggets (usually around hogget shearing) and this did not apply to pre-winter selection of replacement ewe lambs. Overall, survey farmers placed considerably more importance on subjective selection criteria than objective criteria. Thus structural soundness, freedom from black wool fibres, visual body size, wool character/fleece structure and face cover were ranked in succession as the most important traits for hogget selection. Measured fleece weight was generally considered by farmers to be the least important criteria for ewe hogget selection. Other less common ewe hogget selection criteria used by farmers were freedom from dags (one farmer), visual wool bulk (one farmer) and oestrus activity (three farmers).

Table 3.21 Replacement ewe hogget selection criteria used by farmers surveyed. Figures under 'Importance' are percentage of responses in each category. Mean score was calculated by summing the values of the codes (No = 1, Little = 2, Average = 3, Great = 4) and dividing this by the number of responses.

Selection criterion	Importance				Total n	Mean Score	± se
	No	Little	Average	Great			
Structural soundness	0	1	16	83	69	3.8	0.1
Black fibres	4	3	10	83	69	3.7	0.1
Visual body size	6	4	22	68	69	3.5	0.1
Wool character/fleece structure	12	13	42	33	69	3.0	0.1
Face cover	6	16	48	30	69	3.0	0.1
Visual fleece weight	22	13	35	30	69	2.7	0.1
Visual wool fineness	19	19	41	21	69	2.7	0.1
Measured body weight	36	7	22	35	69	2.6	0.2
Visual wool whiteness	28	17	29	26	69	2.5	0.1
Measured fleece weight	52	7	16	25	69	2.1	0.2

Fleece weighing was used by 22 percent of farmers and liveweight measurement by 54 percent of farmers for selecting replacement ewe hoggets. These values were higher than those for the selection criteria information shown in Table 3.21. Although only 22 percent of farmers weighed hogget fleeces, 41 percent of farmers placed average or great importance on hogget fleece weighing for selection purposes. This discrepancy may have been due to question bias (i.e. putting words in the respondent's mouth) introduced by the multiple choice question in Question 2 Section D of the questionnaire (refer to Appendix B).

Farming publications (e.g. NZ Farmer and associated supplements) were the source of advice/information used most frequently by farmers to assist in replacement ewe hogget selection (Table 3.22). NZWB publications (e.g. newspaper articles and free publications) were the next most frequently used source. Wool broker representatives most commonly assisted with ewe hogget selection, with ram breeders and other farmers used slightly less often. The NZWB WPO and farm management consultants were the least frequently used source of information or advice for ewe hogget selection.

Table 3.22 Sources of advice/information, used by farmers surveyed, to assist in selecting replacement ewe hoggets. Figures under 'Frequency' are percentage of responses in each category. Mean score was calculated by summing the values of the codes (Never = 1, Sometimes = 2, Often = 3, Always = 4) and dividing this by the number of responses.

Source of advice/information	Frequency				Total n	Mean Score	±se
	Never	Sometimes	Often	Always			
Farming publications	32	43	22	3	69	2.0	0.1
NZ Wool Board publications	42	36	20	2	69	1.8	0.1
Wool broker representative	54	30	7	9	69	1.7	0.1
Ram breeder	60	19	20	1	69	1.6	0.1
Other farmer	61	22	16	1	69	1.6	0.1
Stock agent	81	13	4	2	69	1.3	0.1
NZ Wool Board Officer	88	7	3	2	69	1.2	0.1
Farm management consultant	81	15	4	0	69	1.2	0.1

3.5.3 Ram Selection

Farmers placed greater importance on objective selection criteria for selecting rams than for selecting replacement ewe hoggets (Table 3.23). However, subjective criteria (conformation, structural soundness, freedom from black fibre, and visual body size) were still considered the most important overall criteria for selecting sires. Measured fleece weight, ranked fifth, was of

average or great importance in ram selection for 89 percent of the farmers surveyed. Selection index and measured body weight were of average or great importance to 78 percent and 66 percent of survey farmers respectively, but were ranked, on average, behind subjective criteria such as wool character/fleece structure and face cover.

Table 3.23 Ram selection criteria used by farmers surveyed. Figures under 'Importance' are percentage of responses in each category. Mean score was calculated by summing the values of the codes (No = 1, Little = 2, Average = 3, Great = 4) and dividing this by the number of responses.

Selection criteria	Importance				Total n	Mean Score	± se
	No	Little	Average	Great			
Structural soundness	1	0	12	87	74	3.8	0.1
Conformation	0	1	20	79	74	3.8	0.1
Black fibre	8	1	7	84	74	3.7	0.1
Visual body size	3	5	31	61	74	3.5	0.1
Measured fleece weight	7	4	30	59	74	3.4	0.1
Wool character/fleece structure	7	7	39	47	74	3.3	0.1
Face cover	4	12	45	39	74	3.2	0.1
Selection index	18	4	34	44	74	3.1	0.1
Visual wool fineness	12	14	46	28	74	2.9	0.1
Measured body weight	12	22	30	36	74	2.9	0.1
Visual fleece weight	30	11	27	32	74	2.6	0.1
Visual wool whiteness	24	13	37	26	74	2.6	0.1

As with ewe hogget selection, farmers sought advice and/or information to assist in selecting rams fairly infrequently (Table 3.24). When assistance was sought, ram breeders were the most common source of help, followed by other farmers, farming publications and NZWB publications. Farm Management Consultants and the NZWB WPO were the least used sources of information for ram selection.

Table 3.24 Sources of advice/information, used by farmers surveyed, to assist in selecting rams. Figures under 'Frequency' are percentage of responses in each category. Mean score was calculated by summing the values of the codes (Never= 1, Sometimes = 2, Often = 3, Always = 4) and dividing this by the number of responses.

Source of advice/information	Frequency				Total n	Mean Score	±se
	Never	Sometimes	Often	Always			
Ram breeder	16	22	23	39	74	2.9	0.1
Other farmer	50	20	27	3	74	1.8	0.1
Farming publications	43	42	14	1	74	1.7	0.1
Wool broker representative	69	14	5	12	74	1.6	0.1
NZ Wool Board publications	54	31	14	1	74	1.6	0.1
Stock agent	70	16	7	7	74	1.5	0.1
Farm management consultant	85	11	4	0	74	1.2	0.1
NZ Wool Board Officer	92	7	1	0	74	1.1	0.1

Factors influencing the decision on where to buy rams varied considerably within the survey sample (Table 3.25). The most common basis of the decision was "reputation of the ram breeder", cited in 29 percent of cases. Ram breeder reputation was usually conveyed amongst commercial farmers by "word of mouth". Discussion groups, field days, stock sales and social events were all mentioned as places where farmers discussed the sourcing of rams. Eleven percent of farmers had a long history of buying rams from a particular breeder, and would not change due to "satisfaction with the sheep" and "loyalty". Twelve percent of farmers bred their own rams and eighteen percent of farmers would only buy rams bred on "similar country" to their own. Stock agents and wool broker representatives directed farmers where to buy rams in eight percent and four percent of cases respectively, while four percent of farmers surveyed would only buy rams from a member of the Wairarapa Romney Improvement Group.

Table 3.25 Basis of decision from whom to purchase rams.

Basis of decision	Percentage of Farmers	Number of Farmers (Total n = 74)
Ram breeder reputation	18	13
Breed own rams	12	9
Rams bred on similar country	11	8
Long relationship with breeder	11	8
Advice from stock agent	8	6
Reputation of breeder from similar country	8	6
Advice from wool broker representative	4	3
Buy from WRIG[1] members	4	3
Buy from objective breeder	4	3
Objective breeder from similar country	4	3
View rams at fielddays, A and P Shows	3	2
Buy from family	3	2
Reputation of objective breeder	3	2
WRIG[1] member from similar country	3	2
Buy from friend	1	1
Advice from shearing contractor	1	1
Price at auction	1	1
Ram breeder advertisements	1	1

[1] Wairarpa Romney Improvement Group.

3.5.4 Discussion and Application of Results

Morris et al. (1982) stated that the national objective for sheep improvement is to increase export earnings. The results of this survey suggest that the farmer's objective is to derive extra satisfaction and income from sheep production. As satisfaction is difficult to quantify, a simpler criterion of improvement may be to increase net farm income. However, in some cases there may be conflict between the satisfaction (e.g. producing visually pleasing wool) and income (e.g. improving fleece weight) components of farmers' breeding objectives. Wickham and McPherson (1985) noted that defining breeding objectives is less

complex if it is assumed that aesthetic factors are unimportant and that optimum benefits equate with optimum monetary profitability.

Sheep breeding objectives come in a variety of forms with varying degrees of complexity. Until recently, they were generally in the form of a written description an ideal animal. Alternatively, a list of traits to be improved was often used. The recent tendency has been to write the objective in the form of an equation (Wickham and McPherson, 1985; Wickham, 1993b). This approach is more applicable to ram breeders than commercial farmers (ram buyers).

Bendall and Bendall (1993) considered that a ram breeder's sheep breeding objectives must be based on objective measurements of production characteristics, measured in a fairly competitive environment (i.e. parallel to that experienced in a commercial farm system). They suggested that a commercial farmer's objectives should be the same. Morris et al. (1982) believed that for general purpose wool breeds such as the Romney, Coopworth and Perendale (92 per cent of ewes run on Wairarapa/Tararua survey farms) the major breeding objectives should be to increase numbers of lambs weaned, fleece weight and weaning weight (i.e dual-purpose emphasis).

Seventy percent of Wairarapa/Tararua survey farmers indicated they had dual purpose (meat and wool) sheep breeding objectives, in line with the recommendation of Morris et al. (1982). Most of these farmers placed equal emphasis on breeding for meat and wool production. This was considered a sound approach, as Wickham (1993b) stated that although breeding objectives need to be set for future conditions, there is great scope for getting predictions of future prices wrong, and little or no progress has been made in developing more accurate techniques of future prediction. It is suggested that the 27 percent of survey farmers placing sheep breeding priority on the production of

one commodity at the expense of another are exposing themselves to greater price risk.

The small proportion (23 percent) of Wairarapa/Tararua farmers who quantified their sheep breeding objectives was a feature of the survey. It is thought that the process of quantifying breeding objectives (e.g. 6.5 kg wool/ssu, 125% lambing, lambs finished at 18 kg carcass weight), then determining current levels of performance and working towards objectives (with frequent monitoring of performance), is likely to be associated with high/improving levels of performance. The analysis of survey data for the last three seasons supported this hypothesis, with farmers who quantified their sheep breeding objectives found to produce significantly ($P < 0.05$) more clean wool per sheep stock unit (4.9 ± 0.3 kg) than farmers who did not (4.1 ± 0.1 kg). Interestingly, farmers who quantified their sheep breeding objectives received a significantly ($P < 0.05$) lower average net clean wool price than farmers who did not set targets (347 c/kg vs 364 c/kg), possibly because of the association between heavier fleece weights and stronger wool. The latter characteristic can be discounted when sold. However, the lower wool price was offset by higher wool production, so that farmers who quantified their sheep breeding objectives received, on average, $2.08 higher wool income per sheep stock unit than other farmers. This aspect of sheep breeding should be addressed through a NZWB extension programme. Farmers stating breeding/production objectives as being "to produce as much as I can" (essentially 72 percent of Wairarapa/Tararua survey farmers) should be encouraged and assisted to quantify targets, and to develop a breeding programme based on objectively measured traits that will allow these targets to be met.

Wickham and McPherson (1985) and Wickham (1993b) suggested that traits appearing as selection criteria should be (or have a high genetic correlation with) an objective trait, have a reasonably high heritability and be easily

assessed in the young animal. Summer et al. (1986) stated that objective identification of selection criteria was essential to identify superior animals in breeding. It was interesting, therefore, to note the large emphasis placed on subjective sheep selection criteria by Wairarapa/Tararua survey farmers. Although structural soundness was generally considered the most important ewe hogget and ram selection criteria by the survey farmers, Morris et al. (1982) stated that there is considerable variance of opinion in the sheep industry as to how far from the breed average structural characteristics such as feet, jaws and teeth can stray before sheep become unsound to the detriment of net income. The economic effects of structural deformities in sheep have never been adequately analysed for the New Zealand wool industry.

Absence of black wool fibres was generally considered one of the most important ewe hogget and ram selection criteria by farmers surveyed. However, like structural soundness, the economic importance of black spots has never been defined clearly.

Fleece character has been shown to have no influence on wool price (Mullaney and Sanderson, 1970), have a low heritability in hoggets and be poorly related to the important wool production traits (Rae, 1958; Elliot et al., 1979; Wickham, 1985). However wool character was ranked, on average, well above measured fleece weight and measured body weight as a ewe hogget selection criteria, and above measured body weight and selection index as a ram selection criteria.

Future NZWB mass extension should promote the use of objective criteria for selecting replacement ewe hoggets and rams. The purchase of rams from breeders with objectives that are based on objective measurements of

productive characteristics should also be promoted since this will accelerate genetic progress in a flock (Rae, 1964; Baker et al., 1987; Dobbie, 1988).

Although farming publications were the most frequently used source of information for ewe hogget selection it is suggested that they provide little scientifically-based animal breeding information. These publications have been observed to favour a 'popular press' approach and stud-stock news. NZWB publications, the next most frequently used source, have a sound scientific base and promote the use of objective selection, but analysis of data did not show that farmers who read Wool Board publications were more likely to use objective sheep selection techniques. Wool broker representatives were used relatively frequently to assist with ewe hogget selection, and they are known to favour the use of subjective selection criteria (e g. wool character/fleece structure, black fibres, visual fleece weight). Wool broker representatives could be trained by the NZWB to use and promote the use of objective selection techniques. This may require the NZWB to fund a course run by outside specialists in animal breeding since wool brokers have been reluctant to attend 'Wool Board' courses in the past.

The greater emphasis placed on objective selection criteria for ram selection, relative to ewe hogget selection, is thought to be a function of the availability of this information. As ram breeders were the most common source of ram selection advice, it could also be assumed that some breeders actively promote the use of objective selection criteria. Other ram breeders should be encouraged to do the same.

Survey results indicated a general lack of objectivity in Wairarapa/Tararua survey farmers' decisions where to buy rams. This is probably due to many commercial farmers having poorly defined breeding objectives, and the

unavailability of information that allows a formal comparison of the ram breeders' objectives and their flock performance. A sire referencing scheme would provide valuable comparisons of ram flocks, but it may be difficult to involve a significant proportion of Wairarapa/Tararua ram breeders in such a scheme.

3.5.5 Conclusions

The Wairarapa/Tararua survey identified a general lack of objectivity in sheep breeding practices. Relatively few farmers quantified their breeding objectives, used objective criteria for ewe hogget and ram selection, or were objective in their choice of source of rams, despite studies reporting associations between objective sheep breeding practices and higher sheep performance. This suggests that there is considerable potential to increase wool production system performance in the region by improving sheep breeding.

Future NZWB mass extension activities should promote the use of objective sheep breeding techniques. These activities should include more frequent publication of NZWB articles in farming publications, and encouraging ram breeders and wool broker representatives to promote and use objective breeding practices.

3.6 GRAZING MANAGEMENT

3.6.1 Pasture Shortage

The months of most severe pasture shortage on the farms surveyed are detailed in Table 3.26. The majority of summer moist survey farms (86 percent) experienced their most severe pasture shortage in August or September. Only 39 percent of farmers in summer dry areas noted that pasture was most limiting in mid-to-late summer (January, February or March). The balance had pasture shortage problems during the winter months.

Climatic conditions (low temperatures, lack of moisture, wind) resulting in low pasture growth rates, either alone (70%) or in combination with other factors such as low soil fertility, high feed requirements due to winter shearing or lambing, or porina damage, were noted as the primary reason for pasture shortages.

Table 3.26 Month of most severe pasture shortage on summer moist and summer dry farms surveyed.

Month	Summer Moist (n = 36)		Summer Dry (n = 38)	
	No. of Farms	% of Farms	No. of Farms	% of Farms
Jan			2	5
Feb			6	16
Mar			7	18
Apr				
May				
Jun				
Jul	3	8	4	10
Aug	14	39	9	24
Sept	17	47	9	24
Oct	2	6	1	3
Nov				
Dec				

3.6.2 Feeding Priorities

Young, growing stock (lambs, ewe hoggets and yearling cattle) generally received highest feeding priority during a summer feed shortage (Table 3.27). Breeding stock (mixed age ewes and breeding cows) were lower priority than replacement animals, but above older non-breeding cattle during summer feed deficits.

Young stock, with the exception of unsold lambs, received feeding priority during winter feed shortages on survey farms (Table 3.28). In-lamb mixed age ewes moved up in ranking, ahead of lambs destined for sale and breeding cows. Two-year and older non-breeding cattle were most likely to have their feed allocation reduced during a winter feed shortage.

Consistent with summer feed shortage feeding priorities, mixed age ewes, breeding cows and older non-breeding cattle were most commonly used to "clean up" low quality pasture on survey farms during the summer/autumn period. Dairy grazers were also used for this purpose on five percent of farms surveyed.

Table 3.27 Livestock feeding priorities at time of summer feed shortage on farms surveyed. Figures under 'Priority' are percentage of responses in each category. Mean score was calculated by summing the values of the codes (High = 1, Medium = 2, Low = 3) and dividing this by the number of responses.

Class of Stock	Priority			Total n	Mean Score	± se
	High	Medium	Low			
Replacement ewe lambs/hoggets	75	17	8	60	1.3	0.1
Other lambs	71	14	15	52	1.4	0.1
Yearling cattle	33	49	18	57	1.8	0.1
Breeding cows	20	32	48	44	2.3	0.1
Mixed age ewes	22	29	49	65	2.3	0.1
2 yr and older cattle (non-breeding)	14	17	69	42	2.5	0.1

Table 3.28 Livestock feeding priorities at time of winter feed shortage on farms surveyed. Figures under 'Priority' are percentage of responses in each category. Mean score was calculated by summing the values of the codes (High = 1, Medium = 2, Low = 3) and dividing this by the number of responses.

Class of Stock	Priority			Total n	Mean Score	± se
	High	Medium	Low			
Replacement ewe lambs/hoggets	62	28	10	69	1.5	0.1
Yearling cattle	48	38	14	65	1.7	0.1
Mixed age ewes	40	32	28	72	1.9	0.1
Other lambs	31	22	47	32	2.2	0.2
Breeding cows	25	25	50	48	2.3	0.1
2 yr and older cattle (non-breeding)	13	38	49	53	2.4	0.1

3.6.3 Grazing Management Techniques

The various grazing management techniques used on survey farms are outlined in Table 3.29. Formal feed budgeting (written calculations) and objective monitoring of pasture cover were seldom used by farmers. Rotational grazing and break feeding were employed on 85 percent and 68 percent of survey farms respectively, while weighing stock to determine whether liveweight targets were being achieved by feeding regimens was used by 50 percent of the farmers. Farmers with more than 4000 ssu wintered were more likely to use pasture monitoring and livestock weighing for feeding management than farmers with less than 1500 ssu, and farmers on hill country farms were more frequent uses of livestock weighing than farmers on intensive finishing farms.

Table 3.29 Use of grazing management techniques by survey farmers. Figures under 'Response' are percentage of responses in each category.

Technique	Response		Total n
	Yes	No	
Feed budgeting	7	93	74
Pasture cover monitoring	16	84	74
Rotational grazing	85	15	74
Break feeding	68	32	74
Weighing stock	50	50	72

3.6.4 Fertiliser Application

Farmers were asked to indicate the level of fertiliser application to their farm over the last three years. Fertiliser had been applied at above maintenance levels on 16 percent of farms, at maintenance levels on 47 percent of farms and at below maintenance levels on 27 percent of farms. Ten percent of the farms had not received fertiliser during this time.

3.6.5 Sources of Information for Feeding/Grazing Management

Information and/or advice was sought relatively infrequently to assist with grazing management (Table 3.30). Farmers with large farms (ssu > 4000) used farm management consultants and farm discussion groups more frequently ($P < 0.05$) to assist with grazing management than farmers with small farms (ssu < 1500). Respondents farming NZMWBES Class 3 and Class 4 properties were more likely ($P < 0.05$) to use farm management consultants and discussion groups as sources of grazing management information than NZMWBES Class 5 farm farmers.

Table 3.30 Sources of advice/information used by farmers to assist with grazing management. Figures under 'Frequency' are percentage of responses in each category. Mean Score was calculated by summing the values of the codes (Never = 1, Sometimes = 2, Often = 3, Always = 4) and dividing this by the number of responses.

Source of advice/information	Frequency				Total n	Mean Score	±se
	Never	Sometimes	Often	Always			
Farm management consultant	47	26	22	5	74	1.9	0.1
Discussion group	42	24	27	7	74	2.0	0.1
Other farmer	35	28	31	5	74	2.1	0.1
Farming publications	23	51	23	3	74	2.1	0.1

3.6.6 Discussion and Application of Results

Long-woolled breeds of sheep in New Zealand (e.g. Romney, Coopworth, Perendale) have a pronounced seasonal pattern of wool growth (Wickham and Bigham, 1973; Wickham, 1985; Hawker, 1985; Sumner, 1985). Wickham (1985) noted that a pen feeding experiment with wethers showed a two-fold increase in the responsiveness of wool growth to increases in feed intake from late winter to early summer. While the relative (percent) effects in summer and winter were similar, the absolute effect of plane of nutrition on wool growth was 6.1 g/day versus 2.7 g/day. This seasonal pattern of growth has important implications for the quantity and quality of wool produced on Wairarapa/Tararua farms. Flocks that are fed on a high plane of nutrition during the summer and autumn will produce more wool than flocks subjected to lower levels of summer/autumn feeding, ceteris paribus. Good summer/autumn feeding of mixed age ewes is important for high wool production, as this class of sheep produces, on average, approximately 70 percent of the total wool clip. This can be difficult to achieve when farm management dictates that young stock receive feeding priority or when dry summer conditions limit pasture growth.

As expected, the survey indicated that winter was the period of most severe pasture shortage on summer moist farms. However, it was surprising to observe that 61 percent of farms classified as summer dry experienced their greatest pasture shortage during winter months. In contrast Journeaux (1987) found that severe winter/spring pasture deficits on Wairarapa properties where bull beef was an enterprise were almost exclusive to farms in summer wet areas.

As indicated above, good winter feeding of sheep alters the absolute level of wool production relatively little. However, during winter if wool fibres thin to less than 10-12 microns in diameter the wool follicle becomes inactive and the fibre is shed. Shedding can be accentuated by low levels of winter feeding (Rattray, 1982) and this generates wool quality faults such as tenderness, break and cotting, all of which can result in wool price discounts at sale. The relatively high average winter feeding priority for mixed age ewes on survey farms suggests that the Wairarapa/Tararua wool clip should be relatively sound, although there is likely to be considerable variation between farms.

It was thought that analysis of feeding priorities during summer feed shortages may indicate the potential for improving wool production by better summer feeding of mixed age ewes. At present wool prices, priority feeding of ewes at the expense of other classes of stock (e.g. lambs, bulls) can not justified on the basis of improving wool production alone. However, when associated benefits of better summer feeding such as heavier ewe mating weights and subsequent higher lambing percentages due to better summer feeding are considered, the practice may be worthwhile. Care would need to be taken to ensure that replacement stock are not disadvantaged, as this could negatively affect future flock productivity.

Wool production on some Wairarapa/Tararua survey farms was likely to be limited by the use of mixed age ewes to clean up long (rank) feed in the late summer and autumn. Both the quality of grass (proportion of green material) and the proportion of clover in the sward influence wool growth (Rattray, 1986). This may be due to differences in the content and quality of protein, the digestibility or energy content, or mineral composition of the herbage.

Little has been documented on the use of feeding/grazing management techniques by Wairarapa/Tararua sheep farmers. Parker (1984) noted that 60 percent of farmers in his North-East Wairarapa survey weighed ewes and lambs to assist the management of feeding. This was slightly above the 50 percent observed in the Wairarapa/Tararua survey. Gray et al. (1989) found that 14 percent of Pongaroa survey farmers prepared a written feed budget at the start of the winter, and 68 percent used scales to measure liveweight. These proportions were higher than for the present study.

Pasture monitoring and livestock weighing were more likely ($P < 0.05$) to be used on large (ssu > 4000) farms than small (ssu < 1500) farms. Also, more farmers on hill country properties used livestock weighing than those on intensive finishing farms. Given the comparative size of these farming operations and subsequent time involved in using the techniques, these trends were opposite to those expected, but may indicate that larger farms have more flexibility in terms of labour and can therefore more easily carry out weighing operations.

The rates of fertiliser application observed on Wairarapa/Tararua survey farms were in line with the findings noted in Section 2.1.7. They were above the application rates reported by Parker (1984) and Gray et al. (1989), and consistent with the increase in fertiliser application to WFIC farms reported by Baker et al. (1993).

The tendency of farmers with large (ssu > 4000) properties, and/or farms classified as hard hill country or hill country, to use farm management consultants and farm discussion groups to assist with grazing management was an interesting outcome of the analysis. These associations could be due to the cost of consultancy services representing a lower proportion of expenditure on a large farm than a small farm, and to a farmer perception that intensive finishing farms have relatively less potential for development or improvement than other classes of farm.

3.6.7 Conclusions

The results of the Wairarapa/Tararua survey suggest that while, on average, mixed age ewe winter feeding priorities are relatively high and likely to maintain wool quality (in terms of tensile strength), there is potential to improve wool production by better summer feeding of ewes on a large proportion of farms. However, current wool prices do not justify feeding ewes at the expense of finishing stock during the summer. The changing price relativities between wool, lamb and beef should be monitored to determine the future profitability of this practise.

3.7 ANIMAL HEALTH

3.7.1 Sheep Health Challenges

Animal health problems did not generally limit sheep performance on the survey farms (Table 3.31), however some farmers noted that flystrike was a problem in some seasons if "dipping was not up to the mark". Internal parasites were the most serious challenge to flock health and performance, but again were under control through drenching programmes. Three farmers mentioned that drench resistance was present on their properties. Isolated cases of pinkeye, lice, copper deficiency and cobalt deficiency were noted. The only significant difference between farm classification means for animal health problems was for internal parasites, with these being more serious on NZMWBES Class 3 than NZMWBES Class 4 farms.

Table 3.31 Impact on sheep production of animal health problems on farms surveyed. Figures under 'Impact' are percentage of responses in each category. Mean score was calculated by summing the values of the codes (No = 1, Little = 2, Average = 3, Serious = 4) and dividing this by the number of responses.

Animal Health Problem	Impact				Total n	Mean Score	± se
	No	Little	Average	Serious			
Internal parasites	8	16	65	11	74	2.8	0.1
Flystrike	7	46	36	11	74	2.5	0.1
Footrot	30	54	13	3	74	1.9	0.1
Scabby mouth	45	38	13	4	74	1.8	0.1
Viral pneumonia	45	47	7	1	74	1.6	0.1
Facial eczema	70	24	4	2	74	1.4	0.1

3.7.2 Sources of Information for Animal Health Management

Veterinarians were contacted most often for animal health advice and/or information (Table 3.32). Farming publications and other farmers were regular sources of animal health information; other sources were used relatively infrequently. Operators of large farms (ssu > 4000) used farm management consultants and farm discussion groups more frequently ($P < 0.05$) than those with smaller properties Group 1 (ssu < 1500), Group 2 (ssu 1501 - 2500) and Group 3 (ssu 2501 - 4000).

Table 3.32 Sources of advice/information used by survey farmers to assist with animal health management. Figures under 'Frequency' are percentage of responses in each category. Mean score was calculated by summing the values of the codes (Never = 1, Sometimes = 2, Often = 3, Always = 4) and dividing this by the number of responses.

Source of advice/information	Frequency				Total n	Mean Score	±se
	Never	Sometimes	Often	Always			
Veterinarian	0	20	56	24	74	3.0	0.1
Farming publications	19	45	34	3	74	2.2	0.1
Other farmer	26	39	31	4	74	2.1	0.1
Discussion group	51	22	24	3	74	1.8	0.1
Animal health company representative	34	55	10	2	74	1.8	0.1
Farm Management consultant	63	22	12	3	74	1.6	0.1
Stock and Station agent	62	26	12	0	74	1.5	0.1

3.7.3 Discussion and Application of Results

Parker (1984) investigated the seriousness of various animal health problems (i.e. effects in terms of animal health costs, stock losses and lost production) during the weaning to tupping period on north-east Wairarapa farms. Like the Wairarapa/Tararua survey, he discovered that few farmers regarded sheep

health problems as being very serious, and that most took steps to prevent outbreaks occurring through extra care with management or chemical administration.

The most serious and frequent sheep health challenges identified by Parker (1984) were internal parasites, flystrike, salmonella, footrot and ryegrass staggers. While the Wairarapa/Tararua survey showed that internal parasites and flystrike had most impact on wool production, footrot was a minor problem and salmonella and ryegrass staggers were not mentioned at all. The significantly more serious ($P < 0.05$) internal parasite problem on NZMWBES Class 3 farms compared with NZMWBES Class 4 farms may be due to a higher proportion of stock units run as sheep and less subdivision on hard hill properties making the preparation of 'safe' pastures (Charleston, 1986) difficult.

The more frequent use of farm consultants and attendance of discussion groups for animal health assistance by those with large (ssu > 4000) farms parallels their tendency to use these sources for grazing management advice. Thus, once farmers become involved with consultants and discussion groups (particularly on an annual fee basis) these sources of information are used to address a wide range of farming problems.

3.7.4 Conclusions

Animal health problems did not affect sheep performance greatly on Wairarapa/Tararua survey farms, largely because of adequate prevention and control programmes were able to be implemented by farmers. While veterinarians are best qualified, and used most frequently, to provide assistance with sheep health problems as they arise, the NZWB should maintain general farmer awareness of widespread animal health challenges (e.g. drench

resistance, flystrike) because of thier possible negative impacts on sheep production. This could be achieved by media and industry funded publications.

3.8 WOOL HARVESTING

3.8.1 Shearing Policy

The lamb, two tooth and mixed age ewe shearing policies used on the survey farms are outlined in Table 3.33. Sheep were not classified as hoggets until hogget shearing, therefore all hoggets were shorn only once. Lambs were usually shorn once before sale or shearing as hoggets, while two tooths were generally shorn twice, in the late-summer/autumn and at 'main shear' (October - January) with mixed age ewes. Mixed age ewes were most commonly shorn once (46 percent of cases) or twice (35 percent of cases), with eight-month shearing policies (whole flock or split flock) used on 19 percent of the survey farms. Shearing policies were not significantly different ($P < 0.05$) between farm group categories.

Table 3.33 Lamb, two tooth and mixed age ewe shearing policies used on farms surveyed. Figures under 'Policy' are number of farms, and percentages (in brackets).

Sheep Class	Policy							
	Once		Second Shear		Eight Month		Split Flock Eight Month	
Lamb	72	(97)	2	(3)				
Two tooth	5	(7)	66	(93)				
MA ewe	34	(46)	26	(35)	4	(5)	10	(14)

The month(s) of lamb, hogget, two tooth and mixed age ewe shearing on farms surveyed are summarised in Tables 3.34 to 3.37.

Table 3.34 Month(s) of lamb shearing on farms with once-yearly (n = 72) or twice-yearly (n = 2) shearing policies.

Month(s)	Number of Farms	Percentage of Farms
Once-yearly		
December	28	37.8
January	40	54.1
February	2	2.7
July	1	1.4
November	1	1.4
Twice-yearly		
December and March	1	1.4
December and April	1	1.4

Table 3.35 Month of hogget shearing on farms surveyed (n = 70).

Month	Number of Farms	Percentage of Farms
August	5	7.1
September	29	41.4
October	31	44.3
November	4	5.7
January	1	1.4

Table 3.36 Month(s) of two tooth shearing on farms with once-yearly (n = 5) or twice-yearly (n = 66) shearing policies.

Month(s)	Number of Farms	Percentage of Farms
Once-yearly		
June	1	1.4
November	1	1.4
December	1	1.4
January	1	1.4
March	1	1.4
Twice-yearly		
January and December	1	1.4
February and October	1	1.4
February and November	11	15.5
February and December	1	1.4
March and November	26	36.6
March and December	15	21.1
March and January	2	2.8
April and November	2	2.8
April and December	3	4.2
April and February	1	1.4
May and November	1	1.4
May and December	2	2.8

Table 3.37 Month(s) of mixed age ewe shearing on farms with once-yearly (n = 34), twice-yearly (n = 25) or eight-monthly (n = 15) shearing policies.

Month(s)	Number of Farms	Percentage of Farms
Once-yearly		
June	2	2.7
August	1	1.4
October	1	1.4
November	18	24.3
December	11	14.9
March	1	1.4
Twice-yearly		
March and November	9	12.2
April and November	3	4.1
April and December	1	1.4
May and November	1	1.4
May and December	7	9.5
June and December	1	1.4
July and January	3	4.1
Eight-monthly		
October, May, January	1	1.4
October, May, February	1	1.4
November, April, January	2	2.7
November, May, January	1	1.4
November, June, February	1	1.4
November, July, February	3	4.1
November, July, March	1	1.4
November, September, March	1	1.4
December, June, February	1	1.4
December, August, April	1	1.4
December, August, March	2	2.7

The time of shearing varied widely between farms, although favoured months for shearing were evident. Once-shorn lambs were most often shorn in December (39 percent) or January (56 percent), and hoggets were most often shorn in September (41 percent) or October (44 percent). Second-shorn two tooths were most likely to be shorn in March and November (39 percent) or March and December (23 percent). Once-shorn mixed age ewes were most often shorn in November (53 percent) or December (32 percent), while second-shorn mixed age ewes were most likely to be shorn in March and November (36 percent) or May and December (28 percent). The most popular timings for eight month shearing of mixed aged ewes were November - April - January (13 percent), November - July - February (20 percent) and December - August - March (13 percent).

Sixteen farmers (22 percent) had changed their mixed age ewe shearing policy since 1990. These changes are summarised in Table 3.38. Forty-seven percent of changes had been from full wool (once-a-year) shearing to either a second shear or eight-month policy. Thirty-three percent of shearing policy changes had been from second-shear to full wool or eight-month shearing. The reasons for changing shearing policy varied (Table 3.39), with the most common being to reduce the cost of wool harvesting, make management of shearing easier (e.g. shear fewer ewes with lambs at foot) and improve wool quality.

Table 3.38 Type of mixed age ewe shearing policy changes made by farmers surveyed (Total n = 15 farms).

Change	Percentage of Farms	Number of Farms
Once-shear to second shear	20.0	3
Once-shear to split flock eight-month	20.0	3
Second shear to once-shear	20.0	3
Once-shear summer to once-shear pre-lamb	6.7	1
Once-shear to eight month	6.7	1
Split flock eight-month to once-shear	6.7	1
Second shear to eight-month	6.7	1
Second shear date change	6.7	1
Second shear to once-shear pre-lamb	6.7	1

Table 3.39 Reasons for changes in shearing policy (Total n = 15 farms).

Reason for change	Percentage of Farms	Number of Farms
Make shearing management easier	26.7	4
Reduce cost of wool harvesting	20.0	3
Improve wool quality	20.0	3
Match feed demand with feed supply	13.3	2
Sell wool when market volumes low	13.3	2
Improve cashflow	6.7	1

3.8.2 Crutching Policy

The types of crutch used on survey farm sheep are outlined in Table 3.40. For survey purposes, crutching was defined as preparation of two tooths and mixed age ewes for lambing, and hoggets for wintering and hogget shearing. It therefore did not include dagging of lambs, hoggets or ewes, or pre-tup crutching of ewes.

Table 3.40 Hogget, two tooth and mixed age ewe crutching policies used on farms surveyed. Figures under 'Policy' are number of farms, and percentages (in brackets).

	Policy							
Sheep Class	Full Belly		Half Belly		Full Crutch		Tail Crutch	
Hogget	17	(30)	1	(2)	20	(36)	18	(32)
Two tooth	10	(18)	22	(40)	9	(16)	14	(26)
MA ewe	32	(54)	17	(29)	3	(5)	7	(12)

Full belly crutching, full crutching and tail crutching of hoggets were used to a similar extent (Table 3.40). Two tooths were most often prepared for lambing with a half belly crutch (40 percent of cases), whereas a full belly crutch was adopted by 54 percent of the farmers for mixed age ewes. Cross tabulation of shearing and crutching policies showed that crutching costs could be reduced on some farms. Fourteen percent and 29 percent of farmers who second-shore mixed age ewes, used full belly and half belly mixed age ewe crutching policies respectively. Full belly crutching ($0.78 per sheep) and half belly crutching ($0.70) per sheep) are more costly than full crutching ($ 0.50 per sheep); (Tua pers. comm.) which is adequate for preparing mixed age ewes for lambing.

Most hoggets were crutched during May, June and July, and most ewes were crutched during July and August (Table 3.41).

The analysis did not identify any significant differences in crutching policies employed by different farm group categories.

Table 3.41 Month of hogget crutching (n = 56), two tooth crutching (n = 55) and mixed age ewe crutching (n = 59) on farms surveyed. Figures under 'Sheep Class' are number of farms, and percentages (in brackets).

Month	Sheep Class					
	Hogget		Two Tooth		MA Ewe	
March	1	(2)				
April	5	(9)	1	(2)	1	(2)
May	13	(23)	3	(5)	5	(8)
June	14	(25)	3	(5)	8	(14)
July	16	(29)	28	(51)	30	(51)
August	4	(7)	18	(33)	14	(24)
September	1	(2)	2	(4)	1	(2)
October	2	(4)				

3.8.3 Clip Preparation

The woolsheds on the farms surveyed fell into three design categories - closed (long) board (43 percent), open board (39 percent) and raised board (18 percent).

The mean woolhandler to shearer ratio employed for various classes of sheep on farms surveyed is specified in Table 3.42. An average of one woolhandler was employed for each shearer shearing hoggets, lambs and mixed age ewes. Farmers in summer moist areas employed more woolhandlers per shearer, on average, than summer dry farm operators for lamb (1.03 vs 0.93, $P < 0.05$) and ewe (1.06 vs 0.96, $P < 0.05$) clip preparation.

Table 3.42 Number of woolhandlers employed per shearer at shearing time on farms surveyed.

Class of sheep shorn	Mean	Standard Error	Minimum	Maximum	Total n
Hoggets	1.0	0.02	0.5	1.7	70
Lambs	1.0	0.02	0.5	1.7	74
Mixed age ewes	1.0	0.02	0.5	1.7	74

NZWB Certified woolhandlers were seldom employed to oversee clip preparation at shearing time. Only 15 percent of respondents noted that they often or always requested a certified woolhandler be present in the woolshed.

The sources of advice/information on wool clip preparation used by farmers are described in Table 3.43. Advice came most frequently from wool broker representatives. The local NZWB WPO was the least-used source of wool clip preparation advice, but was more likely ($P < 0.05$) to assist NZMWBES Class 3 farm operators with clip preparation than those on Class 4 and Class 5 properties.

Table 3.43 Sources of advice/information used by farmers to assist with wool clip preparation at shearing time. Figures under 'Frequency' are percentage of responses in each category. Mean score was calculated by summing the values of the codes (Never = 1, Sometimes = 2, Often = 3, Always = 4) and dividing this by the number of responses.

Source of advice/information	Frequency				Total n	Mean Score	±se
	Never	Sometimes	Often	Always			
Wool broker representative	28	32	24	15	74	2.3	0.1
NZ Wool Board publications	36	41	23	0	74	1.9	0.1
Farming publications	50	34	16	0	74	1.7	0.1
Private wool buyer	61	18	16	5	74	1.7	0.1
Certified wool handler	59	18	14	9	74	1.7	0.1
Other farmer	69	19	11	1	74	1.4	0.1
NZ Wool Board Officer	80	15	4	1	74	1.3	0.1

3.8.4 Discussion and Application of Results

The factors determining the choice of a suitable shearing policy were discussed by Sumner et al. (1982) and Livingston and Parker (1984). These included:

(1) The farmer's objectives and personal circumstances. Maximising income through the harvesting of wool which meets processors' requirements (at least 75 mm average staple length, sound, and free of cotting, vegetable matter and unscourable discolouration) must be weighed against practices which involve additional work and/or increased risk.
(2) The physical characteristics of the farm. The choice of shearing policy is influenced by farm size, shape, topography, state of development, climate, soil type and weeds and pests.
(3) The type of farm system. Because shearing interacts with other farm operations, it cannot be considered in isolation. Shearing policies must be assessed in relation to weaning, finishing and drafting of lambs, dipping, the sale of wool, culling and sale of surplus ewes, the availability of labour and the general plan of farm work.

Livingston and Parker (1984) described the features of four basic shearing policies; in-season once-a-year (full wool) shearing, second shearing, eight-monthly shearing and pre-lamb shearing. Shearing policies in the Wairarapa/Tararua survey appeared to be designed to fit each farm's set of unique circumstances/characteristics, and most survey farmers were found to be flexible in that shearing dates and intervals were readily altered in response to farm management factors. A number of previous surveys have detailed the shearing policies used on Wairarapa and Tararua farms (Livingston and Parker, 1984; Parker, 1984; Gray et al., 1989; Gavigan, 1992). Gray et al. (1989) noted that 43 percent, 33 percent and 23 percent of Pongaroa farmers

employed full wool, second shear and eight month ewe shearing policies respectively, compared with 46 percent, 35 percent and 19 percent in the present study. Livingston and Parker (1984) and Parker (1984) reported a much larger proportion of farmers (90 percent and 86 percent respectively) shearing ewes once-a-year (in season) in their north-east Wairarapa surveys. Like the Wairarapa/Tararua survey, Parker (1984) found that most farmers (83 percent) second shore two tooths, and that lambs were usually shorn only once before sale or shearing as hoggets.

There was close agreement between the Wairarapa/Tararua survey and Parker's (1984) survey in terms of lamb and hogget shearing dates, with most lambs shorn during December and January, and the majority of ewe hoggets shorn by late October. Both surveys also showed that a large proportion of farmers shore two tooths at a time likely to give a response in ovulation rate, although the Wairarapa-based research on two tooth shearing policies by Parker (1989) would indicate that fleece removal in late summer/early autumn is not an optimum practice in summer dry areas.

Livingston and Parker (1984) found that only one out of 30 Bideford farmers had adopted a new shearing policy in the three years preceeding the survey. Gray et al. (1989) and Gavigan (1992) noted greater proportions of farmers changing shearing policies, in line with the Wairarapa/Tararua survey. The types of changes varied from farm to farm, but seemed to indicate a trend toward eight-month shearing. Wool quality, shearing costs, cash flow and management factors were important in the decision of individual farmers to change their shearing policy.

Livingston and Parker (1984) considered that the timing of pre-lamb crutching was generally determined by weather, availability of labour, other farm duties and the need to coincide with innoculation and/or drenching. They found that

May, June and July were the most popular months for pre-lamb crutching, compared with June, July and August for the Wairarapa/Tararua survey. This difference is likely to reflect the difference in regional location of the two survey samples.

Similar results concerning shearing and woolhandling working conditions and the provision of clip preparation advice were obtained in the present study to those reported by Gavigan (1992). Gavigan (1992) reported that 46 percent, 37 percent and 17 percent of woolsheds in the Wairarapa/Tararua region were of closed board, open board and raised board design respectively, compared with respective values of 43, 39 and 18 percent in the current survey. Gavigan (1992) only surveyed shearing and woolhandling operators. Thus, it appears that these wool industry participants are an accurate source of information on wool harvesting, and could be used by the NZWB to assist with future studies on this aspect of wool production systems. The large proportion of closed board woolsheds in the region indicates that woolshed working conditions make high standards of clip preparation difficult to achieve on many farms. Woolshed modifications, to improve wool flow and enable the removal of wool processing faults, could be promoted by NZWB mass extension, particularly if wool prices and the discount for poorly prepared wools increase in the future.

The significiantly higher ratio of woolhandlers to shearers employed on summer moist farms compared with summer dry farms was likely due to the former wool clips requiring the removal of more unscourable yellow discolouration than summer dry farm clips. The average of one woolhandler per shearer is in agreement with the NZWB recommendation for preparing wool to a good standard.

The relatively few Wairarapa/Tararua survey respondents requesting a NZWB certified woolhandler at shearing time may indicate that NZWB wool handling

courses have a poor image among wool producers, or that many of the region's farmers are unaware that professionally trained woolhandlers are available for clip preparation. Awareness of the advantages of employing qualified woolhandlers could be raised through NZWB mass extension activites in order to improve the standard of wool clip preparation in the Wairarapa/Tararua region.

Both the present survey and Gavigan (1992) show that advice on wool clip preparation was most frequently provided by wool broker representatives. This was expected, as four wool broker representatives are active in the region. However, it should be noted that broker representatives offer advice/information to auction-sellers only. The NZWB could concentrate on providing clip preparation advice to farmers who sell wool privately. Although personal clip preparation advice was provided relatively infrequently by the local NZWB WPO, information was offered (and frequently used by survey farmers) through Wool Board publications (including local media articles).

3.8.5 Conclusions

The variety of wool harvesting policies on Wairarapa/Tararua survey farms reflects the range of farm circumstances/characteristics in the region. It is likely that not all shearing and crutching policies employed by farmers optimise wool production system returns, however any changes to shearing policies promoted by the NZWB should take farmer objectives and personal circumstances, and the impact on other farm production enterprises, into consideration.

The NZWB should continue to promote improved woolshed design to enhance working conditions, and raise the profile of NZWB certified woolhandlers, to ensure high standards of wool clip preparation in the Wairarapa/Tararua region.

3.9 WOOL SELLING

3.9.1 Method of Selling

Traditional wool selling avenues were well supported by farmers with 57 percent mainly selling through the auction system and 35 percent mainly selling their wool to private wool merchants. Alternative wool selling options, including a combination of auction and private sales, and contract selling, were used by the remaining survey farmers. Wool selling policies did not differ significantly between farm group categories.

A number of farmers (16 percent) stated that they had changed their method of selling wool since 1990 (Table 3.44). Movement away from auction selling constituted 60 percent of wool selling policy changes. Changes to selling wool by contract, through Associated Wool Exporters or Quality Wool Supplies Ltd., accounted for 40 percent of the changes. Selling policy changes were made for a variety of reasons (Table 3.45). Farmers moving away from the auction system to private or combination selling believed that they could reduce wool selling costs, gain more control over wool prices and receive quicker payment. Those changing to contract selling felt they could improve wool price by using a more direct selling route, and support wool marketing reform at the same time. The farmer who had changed from private sale to auction selling considered that wool brokers provided "better service" than private wool buyers.

Table 3.44 Types of, and reasons for, wool selling policy changes made by farmers surveyed. Figures under 'Type of Change' are number of farms (n = 10), and percentages (in brackets).

Reason for change	Type of Change									
	Auction to Private		Private to Auction		Auction to Combination		Private to Contract		Auction to Contract	
High wool broker costs	1	(10)			1	(10)				
More control over wool price	2	(20)								
Quicker payment	1	(10)								
Better service			1	(10)						
More direct selling route							3	(30)	1	(10)

Of those farmers selling privately (in-shed), 37 percent had wool tested prior to sale. While 33 percent of private sellers received only one quotation for their wool, others obtained quotations from a number of private wool merchants. Some farmers noted that they had established a good seller-buyer relationship with a single private merchant, some "didn't like holding a Dutch auction", and others stated that they "had never considered getting another buyer in". Twenty-seven percent received three quotes and 17 percent of private sellers contacted four or more private wool merchants to obtain prices for their wool.

3.9.2 Sources of Wool Selling Information

The sources of advice/information used by farmers to assist with wool selling are summarised in Table 3.45. NZMWBES Class 3 farm operators were more likely ($P < 0.05$) to use the NZWB quotation service than NZMWBES Class 4 and Class 5 farmers.

Wool broker representatives were most active in supplying wool selling advice, giving an estimate of expected auction price and assisting farmers to set price

reserves. The next most frequently used source of selling information was the local newspaper, with 82 percent of farmers stating that they consulted the wool type-price table, published weekly by the local NZWB WPO, at least sometimes prior to selling wool. Farming publications (e.g. NZ Farmer) and radio were considered reasonably accessible sources of general wool price information and were used relatively frequently. The NZWB quotation service, the NZWB WPO and the NZWB price answerphone were used least frequently to obtain wool price information.

Table 3.45 Sources of advice/information used by farmers to assist with wool selling. Figures under 'Frequency' are percentage of responses in each category. Mean score was calculated by summing the values of the codes (Never = 1, Sometimes = 2, Often = 3, Always =4) and dividing this by the number of responses.

Source of advice/information	Frequency				Total n	Mean Score	±se
	Never	Sometimes	Often	Always			
Wool broker representative	28	19	30	23	74	2.5	0.1
Newspaper	18	43	35	4	74	2.3	0.1
Farming publications	24	46	26	4	74	2.1	0.1
Radio	29	43	24	4	74	2.0	0.1
Private wool buyer	54	22	18	6	74	1.8	0.1
Other farmer	51	28	18	3	74	1.7	0.1
Wool Market Review	49	31	18	2	74	1.7	0.1
NZ Wool Board quotation service	70	18	9	3	74	1.4	0.1
NZ Wool Board Officer	78	14	8	0	74	1.3	0.1
NZ Wool Board price answerphone	78	14	7	1	74	1.3	0.1

3.9.3 Discussion and Application of Results

No previous studies of the wool selling behaviour of Wairarapa/Tararua farmers have been reported. Wairarapa/Tararua survey data therefore had to be compared with national wool selling information (NZWB, 1993c). Care was required when making these comparisons, as national wool selling data allocated wool to various selling systems on a volume basis, whereas the Wairarapa/Tararua survey identified support for various selling systems on an

individual wool producer basis. However, as no significant differences between farmers in terms of sheep flock size with respect to wool selling policies were identified, the comparison was considered valid.

Survey farmers were less supportive of auction selling than national wool volumes indicated. In 1992/93, 71 percent and 29 percent of shorn wool harvested nationwide was sold at auction and through private channels respectively (NZWB, 1993c). In contrast, the Wairarapa/Tararua data indicated that only 57 percent of farmers sold at auction, with the remaining 43 percent selling to private merchants or through direct contracts. This was not unexpected, as the Wairarapa/Tararua region has been recognised as a strong private selling area, and has recently been targeted by Associated Wool Exporters and Quality Wool Supplies Ltd. to establish contract wool selling.

The trend away from auction selling (60 percent of wool selling policy changes made during the last three years) by Wairarapa/Tararua farmers is in line with national trends. In this respect the NZWB (1993c) showed that since 1990/91, the percentage (by volume) of wool sold at auction had decreased from 68 percent to 61 percent.

The percentage of survey farmers testing wool prior to private sale (37 percent) was higher than prior informal study had suggested. However, in most cases wool is probably sampled in private merchants' stores, after wool has been assigned to a particular buyer, and therefore its usefulness for management decision-making is limited. In-shed sampling and subsequent testing, and the use of test results to market wool to a number of potential buyers, which would mximise farmers' returns, appeared to be used very infrequently. Wairarapa/Tararua private wool sellers should be encouraged and assisted by the NZWB to sample wool in-shed and use wool test results to market wool to a wide range of potential buyers. Encouragement could take the form of a series

of local media articles and woolshed field days, while assistance could be provided through the establishment of a local service which samples wool, arranges wool testing, types wool and assists in offering it to private wool merchants, wool-brokers and even first stage wool processors.

Similarily it was surprising that the majority of Wairarapa/Tararua farmers (60 percent) offered their wool to only one or two private wool merchants for price quotations. Prices paid by private merchants are dependent on individual blend requirements, forward orders to be filled and margins to be met, so it is unlikely that one or two private wool buyers can always offer the highest price for a line of wool. Many farmers have little basis for making wool price comparisons, and are considered to forgo potential extra wool income by not offering wool to a wider range of buyers. Obtaining multiple quotes requires additional time and organisation, but this can easily be compensated by even small price gains on large lines of wool.

The infrequent use of NZWB services was a feature of the analysis of sources of advice/information used by farmers to assist with wool selling. A number of farmers were critical of the Wool Board quotation and price answerphone services, saying that they were difficult to contact (quotation service) and difficult to interpret (price answerphone). Although the NZWB WPO was found to have relatively infrequent personal contact with survey farmers regarding wool prices, the WPO's weekly wool price/wool marketing newspaper publication was used frequently. In light of these findings the NZWB should review its quotation and price answerphone services, and attempt to make them more accessible to, and user-friendly for farmers.

3.9.4 Conclusions

The results of this study suggest that there is potential to improve the returns from wool selling on many Wairarapa/Tararua farms, by sampling wool in-shed and using the wool test results to market wool to a wide range of potential buyers. The NZWB should encourage this practise through mass extension, and could assist its adoption by providing a service for wool sampling, testing, and offer to potential buyers.

CHAPTER FOUR

INTEGRATION

4.0 INTRODUCTION

The large number of interrelationships between variables in a farming system, that may have either positive or negative feedback effects, mean that an attempt should be made to integrate different aspects of management to estimate their relative effects on farm performance (Parker, 1984). Ideally, methods are required to identify 'cause and effect' relationships (Townsley and Parker, 1987) but the inability to control the wide range of input variables to a farming system makes this impossible even where replicated farm systems trials are established. Cross-tabulations of survey data (e.g. Taylor and McRae 1977; Taylor, 1982) or multiple regression equations (e.g. Fitzharris and Wright, 1984; Parker and Townsley, 1986) have been most commonly used in New Zealand farm management research to estimate the strength and direction of relationships between variables in farming systems.

In regression analysis of farm survey data, an association between two variables may mean: (a) one is directly affecting the other; (b) both are being affected by a third factor; or (c) one is affecting the other, but the effect is being confounded by the effect of a third factor (Townsley and Parker, 1987). When (b) or (c) apply, regression analysis is likely to lead to misinterpretation of underlying cause and effect relationships. Thus, interpretation of the coefficients in multiple regression analysis of farm survey data as valid estimates of cause and effect relationships requires that all factors that could

affect the response (dependent) variables and could be correlated with any of the explanatory variables have been measured and included in the model.

Although farm management researchers may use their knowledge of farming systems to minimise the chance of ignoring such factors, regression coefficients estimated from farm survey data should be interpreted with caution. Fitzharris and Wright (1984) suggested that in an observational study, as opposed to an experiment where management factors would be controlled, factors should be considered as associated with each other and not linked in a cause and effect relationship. Kleinbaum and Kupper (1978) urged caution when interpreting the results obtained from a regression analysis. A strong relationship (i.e. an association) between variables does not necessarily prove or even imply that the independent variables are causes of the dependant variable. In order to make such causal inferences, greater control over variables is required, either through improved statistical model specification or experimentation, or both. A number of other difficulties with the application of statistical estimation techniques, such as multiple regression, to farm survey data were noted by Parker (1984). These included measurement problems, number of potential explanatory variables relative to number of survey farms (i.e. available degrees of freedom), and appropriate mathematical form of estimating equations.

One objective of this research was to investigate the interrelationship between management strategies and the performance of wool production systems on the farms surveyed. An attempt was therefore made to disaggregate overall farm system performance in an effort to gain a greater understanding of the effect of various state and management variables on the production and price components of wool performance.

4.1 MULTIPLE REGRESSION ANALYSIS.

4.1.1 Methodology

Multiple regression analysis has been discussed by a number of authors (Willemsen, 1974; Green, 1978; Kleinbaum and Kupper, 1978; Lerche, 1983; Wittink, 1988; Montgomery and Peck, 1992). The multiple regression model for problems involving any number of predictor variables can be generalised as :

$$Y_i = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots \beta_m X_{mi} + \mu_i$$

This model is often referred to as the general linear model. It is general because it allows for an arbitrary number, *m*, of predictor variables and for each of the *m* predictor variables specified, the effects are assumed to be linear. Wittink (1988) noted that apart from the linearity implicit in this model, no interaction effects are accommodated. Thus, the effect of a given predictor variable X_1 is assumed to always be β_1, regardless of the level of X_2 or any other predictor variable.

In the analysis of Wairarapa/Tararua survey data, the SPSSx backward elimination regression option was used to derive an estimating equation for each dependent variable (wool production and wool price). Montgomery and Peck (1992) described backward elimination as beginning with a model that includes all *m* candidate regressors. The partial F-statistic (test for significance of regression) is computed for each regressor as if it were the last variable to enter the model. The smallest of these partial F-statistics is compared with a pre-selection value (e.g. F_{out} or F-to-remove) and if the smallest partial F value is less than F_{out}, that regressor is removed from the model. Then a regression model with *m* - 1 regressors is fitted, the partial F-statistic for the new model calculated, and the procedure repeated. The backward elimination algorithm

terminates when the smallest partial F value is not less than the preselected cutoff value. Montgomery and Peck (1992) felt that backward elimination is often a very good procedure for variable selection. It is particularly favoured by analysts who like to see the effect of all the candidate regressors so that nothing obvious will be missed.

4.1.2 Dependent and Explanatory Variables

Two separate regression analyses were completed. The dependent variables used were measures of wool production and wool price. Wool production (AVKGSSU) was represented by calculating the average kilograms of clean wool produced per sheep stock unit on each survey farm over the last three seasons (1990/91, 1991/92, 1992/93). Wool price (AVPRIC) was represented by calculating the average cents per kilogram of clean wool (net of selling costs, insurance and the NZWB wool levy) received by survey farmers over the last three seasons.

The set of possible explanatory variables can be categorised as either 'State' or 'Management' variables (Townsley and Parker, 1987). State variables are those whose values are not under direct management control, while the values of management variables are subject to farmer decision (Tables 4.1 and 4.2). Dummy variables represent non-continuous state and or management variables (cannot be measured quantitatively) and take the value one for the situation or management strategy described, and zero otherwise.

Table 4.1 Description of state and management variables included in a multiple regression model to predict average wool production per sheep stock unit. Dummy variables take the value one for the situation or management strategy described, and zero otherwise.

State Variables		
Symbol		Description
EFAREA	-	Effective grazing area of farm (ha).
AVFARM	-	Number of years experience farmer has had as farm owner or manager.
RAIN	-	Dummy variable for farms which are summer moist rather than summer dry.
STEEP	-	Dummy variable for farms classified as hard hill country farms (NZMWBES Class 3).
HILL	-	Dummy variable for farms classified as hill country farms (NZMWBES Class 4).
FLAT	-	Dummy variable for farms classified as intensive finishing farms (NZMWBES Class 5).
Management Variables		
Symbol		Description
AVRAT	-	Average (1990/91-1992/93) percentage of total stock units wintered as sheep.
AVSR	-	Average (1990/91-1992/93) stock units wintered per effective hectare.
AVPDK	-	Average paddock size (ha).
EWE	-	Dummy variable for farms running Romney ewes.
MASPRI	-	Dummy variable for farms where mixed age ewes are given high feeding priority during times of summer feed shortage.
FERT	-	Dummy variable for farms where fertiliser has been applied at maintenance or above maintenance level over the last three years.
BDGOB	-	Dummy variable for farms where sheep breeding objectives are quantified.
FLCWHG	-	Dummy variable for farms where ewe hogget fleeces are weighed for selection purposes.
HGTMFW	-	Dummy variable for farms where great importance is placed on measured ewe hogget fleece weight for selection purposes.
RAMMFW	-	Dummy variable for farms where great importance is placed on measured ram fleece weight as a predictor trait for selection purposes.
RAMSI	-	Dummy variable for farms where great importance is placed on ram selection index for selection purposes.
ATDG	-	Dummy variable for farms where operators often or always attend farm discussion group meetings.

Table 4.2 Description of state and management variable included in a multiple regression model to predict average net wool price. Dummy variables take the value one for the situation or management strategy described, and zero otherwise.

State Variables		
Symbol		Description
AVTOTKG	-	Average (1990/91 - 1992/93) size of wool clip (kg)
RAIN	-	Dummy variable for farms which are summer moist rather than summer dry.

Management Variables		
Symbol		Description
MARAT	-	Number of woolhandlers employed per shearer for harvesting of ewe wool.
FW	-	Dummy variable for farms where mixed age ewes are shorn once a year.
SS	-	Dummy variable for farms where mixed age ewes are shorn twice a year.
EM	-	Dummy variable for farms where all mixed age ewes are shorn every eight months.
SFEM	-	Dummy variable for farms where half the flock is shorn every four months.
EWE	-	Dummy variable for farms running Romney ewes.
MAWPRI	-	Dummy variable for farms where mixed age ewes are given high feeding priority during times of winter feed shortage.
HGTVWW	-	Dummy variable for farms where great importance is placed on visual ewe hogget wool whiteness for selection purposes.
HGTWC	-	Dummy variable for farms where great importance is placed on ewe hogget wool character for selection purposes.
RAMVWW	-	Dummy variable for farms where great importance is placed on ram wool character for selection purposes.
CLOSED	-	Dummy variable for farms with closed board design woolsheds.
OPEN	-	Dummy variable for farms with open board design woolsheds.
RAISED	-	Dummy variable for farms with raised board design woolsheds.
AUCTION	-	Dummy variable for farms where wool is sold through the auction system.
PRIVATE	-	Dummy variable for farms where wool is sold to private wool merchants.
CONTR	-	Dummy variable for farms where wool is sold by direct contract.

4.1.3 Results

The correlation coefficient values (r) between the dependant variables and candidate explanatory variables are presented in Table 4.3. These indicate the strength of linear association for each independent variable with the dependant variables (AVKGSSU and AVPRIC). Average percentage of total stock units wintered as sheep (AVRAT) had the strongest relationship with average clean wool production per sheep stock units (AVKGSSU). Average wool clip size (AVTOTKG) had the strongest relationship with average clean wool price per kilogram (AVPRIC).

Table 4.3 Simple correlation coefficients between wool production and wool price and explanatory variables.

Explanatory Variable	Dependent Variable Av. kg clean wool per ssu (AVKGSSU)
EFAREA	-0.055
AVFARM	0.047
AVRAT	-0.274
AVSR	-0.010
AVPDK	-0.018
Explanatory Variable	**Dependent Variable** **Av. cents per kg clean wool per ssu (AVPRIC)**
AVTOTKG	0.128
MARAT	-0.019

Estimated regression coefficient values for the equations that maximised R^2 values for each dependent variable are presented in Tables 4.4 and 4.5. Beta coefficients (standardised partial regression coefficients) allow the relative

contribution of the independent variables to changes in the dependent variable to be determined.

Table 4.4 Variables remaining in the wool production estimating equation after backward elimination. Figures in brackets are beta coefficients.

Explanatory Variable	Dependent Variable (AVKGSSU)	
Constant	5.699	
MASPRI (High MA ewe summer feeding priority)	0.770	(0.347)
AVRAT (% total su wintered as sheep)	-0.024	(-0.246)
BDGOB (quantified sheep breeding objectives)	0.846	(0.342)
R^2 Value	0.319	
Residual Mean Square (df)	0.754	(65)

Table 4.5 Variables remaining in the wool price estimating equation after backward elimination. Figures in brackets are beta coefficients.

Explanatory Variable	Dependent Variable (AVPRIC)	
Constant	357.801	
HGTVWW (visual wool whiteness hogget selection criteria)	20.545	(0.393)
CONTR (contract wool selling)	-15.804	(-0.194)
SS (twice yearly shearing)	-8.954	(-0.188)
R^2 Value	0.217	
Residual Mean Square (df)	428.119	(67)

4.2 DISCUSSION AND APPLICATION OF RESULTS

4.2.1 Wool Production

Although the regression model for wool production accounted for only 32 percent of the variation, the variables remaining in the equation are consistent with sheep production research results. Thus, farms with a high feeding priority for mixed age ewes during periods of summer feed shortage produced more wool per sheep stock unit than those placing a lower priority on ewe feeding at this time. This result is in agreement with the absolute effect of plane of nutrition on summer wool growth (Wickham and Bigham, 1973; Wickham, 1985; Sumner, 1985) and the large contribution (70%) of mixed age ewe wool to the total wool clip. Although summer feed conditions were good in the three seasons investigated by the survey, it is thought that feeding priorities during a feed shortage would also be indicative of general summer feeding priorities. To determine the potential for improved ewe nutrition over summer a whole farm analysis of the feed requirements of other classes of livestock and their relative gross margins is required.

The regression model indicated that farmers who quantified their sheep breeding objectives (e.g. 6.5 kg wool/ssu, 125% lambing, lambs finished at 18 kg carcass weight) produced more wool per sheep stock unit, ceteris paribus. This provides tangible evidence to the statement made in Section 3.5.4 that the process of quantifying breeding objectives, and working towards these through a monitoring programme, is positively associated with high sheep performance. Simply quantifying breeding objectives, without associated monitoring and subsequent adjustment of the wool production system, however, is unlikely to result in higher wool production. Quantified breeding objectives may also be indicative of a more production-oriented goal setting approach to farming, and

this may be manifested by improved overall farm production compared to farms where no objectives are specified.

A negative relationship between an increasing proportion of stock units wintered as sheep and wool production per sheep stock unit was apparent in the regression model. This is in agreement with Fitzharris and Wright (1984) whose regression analysis of Gisborne hill country properties showed that higher wool production consistently occurred on farms with a greater proportion of cattle. Madden (1962) and Boswell and Cranshaw (1977) also showed that increasing cattle : sheep ratios improved pasture composition and sheep performance.

4.2.2 Wool Price

The regression model for clean wool price explained only 22 percent of the variation in average price. However, the important explanatory variable of wool selling date (discussed in Section 3.4.5), was not accounted for in the model. There was no straight forward method of obtaining and representing this information, because farmers have a wide range of wool selling dates (as exemplified by the months of shearing (Tables 3.34 to 3.37)). Despite this limitation, variables remaining in the model were consistent with other research, as for the wool production model. Farmers who placed great importance on visual wool whiteness when selecting replacement ewe hoggets received a higher price for their wool than those who did not. This may support other evidence that progress can be made in breeding for white wool, with subsequent price premiums. Wickham (1985), for example, reported that eye-assessed greasy colour has a heritability of approximately 0.1 - 0.3 in Romney sheep. In Romneys there is a high estimate for the genetic correlation between clean and greasy colour, although the phenotypic relationship is generally low.

Wickham (1985) suggested that if the estimated genetic correlation was correct, wool colour could be improved most effectively by selecting flock replacements and rams on greasy colour.

The negative relationship between selling wool by contract and wool price should be interpreted with caution. Contracts for the sale of wool have only been available to Wairarapa/Tararua wool producers since early 1993. Prices received through contract selling thus comprise only a small proportion of the average (1990/91 - 1992/93) wool price used in the regression analysis. The CONTR explanatory variable may therefore represent survey farmers who have had relatively little success selling wool through traditional systems and have changed to contract selling as a result.

The wool price model suggests that farmers who shear their mixed age ewes twice yearly receive lower wool prices. This is consistent with the price discounts applied to the shorter fleece wools (particularly wool under 75 mm staple length) that can be generated by a second shearing policy.

4.3 CONCLUSIONS

In this chapter an attempt was made to understand the interactions between component variables in a wool production system. The models developed for predicting wool production per sheep and average clean wool price were relatively unsuccessful in explaining the variation in these indicators of system performance. However, the variables remaining in the prediction models and the direction of impact of the independent variables was consistent with existing knowledge, providing further evidence that a multiple regression approach to understanding farm system performance has considerable value in farm management research.

CHAPTER FIVE

SUMMARY AND CONCLUSIONS

5.0 INTRODUCTION

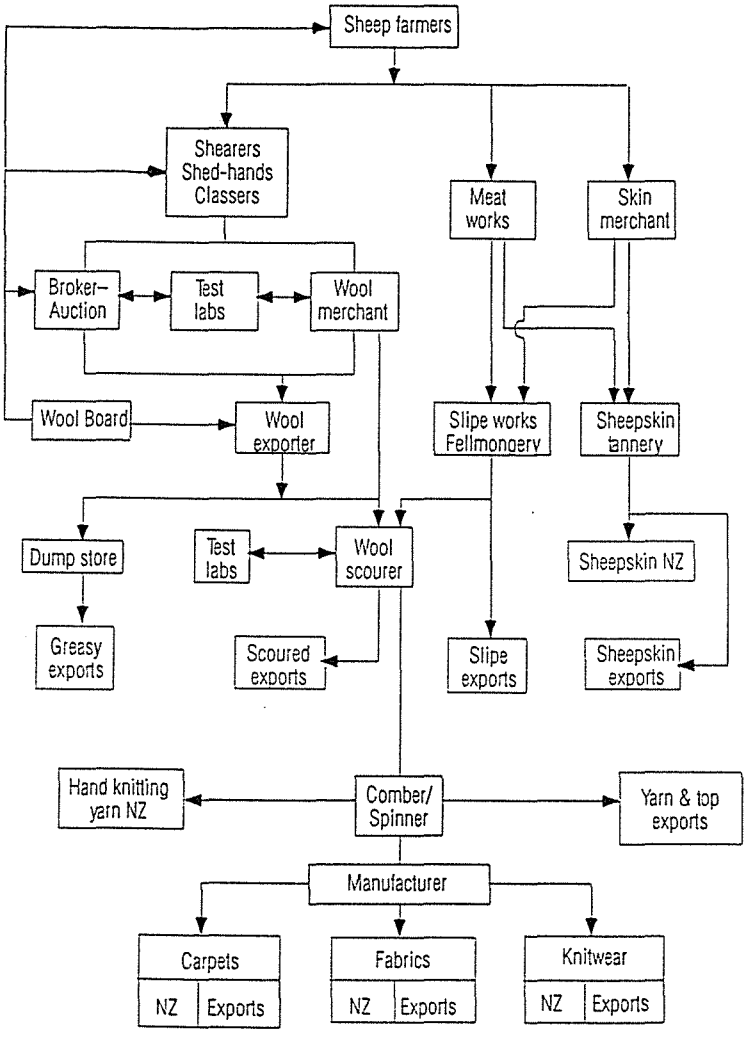
The New Zealand wool industry comprises a network of wool producers, harvesters, brokers, exporters and processors (Figure 5.1). The NZWB is an integral part of this network. It provides other wool industry participants with information and assistance, and coordinates the promotion of New Zealand wool, and wool industry research and development.

The author is employed by the NZWB to assist Wairarapa/Tararua wool growers in all aspects of wool production, wool preparation and wool selling/marketing. The objectives of this study were therefore set within the context of improving the performance of Wairarapa/Tararua wool production systems through more pertinent extension.

The main focus of this study was the compilation of a detailed database of wool production systems from a representative sample of wool producers. This database was compared with existing annual databases, to test their suitability for describing wool production systems in the region (Chapter Three). An attempt was made to understand the interactions between component and management variables in a wool production system that are important in achieving high levels of wool production and returns (Chapter Four). This information was used to identify methods and opportunities which could improve the effectiveness of NZWB mass extension.

In this chapter the methodology used in this study is appraised, and possible improvements are suggested. Recommendations are made in relation to the objectives of this study and suggestions for further research are made.

Figure 5.1 Flowchart of the New Zealand wool industry.
Source : New Zealand Wool Board (1992a).



5.1 EVALUATION OF RESEARCH METHODOLOGY

The procedure used to draw the sample for the Wairarapa/Tararua wool production system survey, plus a high response rate due to the use of the personal interview method, meant that this study provided the most representative analysis of the recent sheep and beef cattle farm surveys carried out in the region. Although the 'population' list used to generate the sample excluded some wool producers, it provided the most appropriate alternative to a Department of Statistics New Zealand population list for stratifying farms by sheep flock size.

The mail questionnaire-personal interview combination allowed the successful collection of a large amount of information from each farmer. As a consequence a detailed database of physical and financial wool production system performance indices was able to be compiled and information on all aspects of wool production, harvesting and selling, as well as farmer information-seeking behaviour and attitudes towards farming and the wool industry was collected. In particular, the combined survey approach reduced the time required to complete the questionnaire during the farm visit, and this left more time for general discussion on the wool industry. The time required to complete the personal interview was also reduced, and this in turn allowed a large number of wool producers to be surveyed within a six week period. The mail-interview survey method also provided the respondents with the opportunity to consider questions at their own leisure. The survey enabled the author (NZWB WPO) to meet farmers who had had no previous personal contact with the NZWB or any other information/technology transfer personnel. This initial contact is likely to be ongoing in many cases.

The study highlighted the problem of collecting sufficient information to describe farm management and production system performance. Despite data

being collected for a large number of variables for each farm (and a number of additional variables which could be created from these) a considerable amount of detail necessary to explain wool production systems performance was not obtained, as shown by the multiple regression analysis in Chapter Four. In some instances, more questions have been raised than answers provided, as exemplified by the large amount of variation in wool production and wool price that remained unexplained in the multiple regression models. This arose partly because of the largely exploratory nature of the study. If more complete models of the wool production system are required a questionnaire could be designed so that more specific explanatory information was collected.

5.2 RECOMMENDATIONS IN RELATION TO STUDY OBJECTIVES

5.2.1 Wool Production System Database

The wool production system database compiled in this study can be used by the local NZWB WPO and other farm consultants for making wool production system performance comparisons as the first step in helping farmers improve returns from wool production.

Few significant differences in wool production were found within farm class, summer rainfall, sheep flock size or summer rainfall/farm class groupings, and of the differences that were significant, none were consistent across all years. Very large ranges for most performance parameters were found within individual group categories. This suggested that the performance of wool production systems is more dependent on management variables than state variables. It also indicates that there is considerable potential to improve both physical and financial wool performance on many Wairarapa/Tararua farms.

The Wairarapa/Tararua region was found to have been relatively homogeneous in terms of wool production over the past three seasons, although uncharacteristically moist summers during this time may have affected the summer rainfall category comparison in the study. Also the small number of farms in some group categories restricted the ability to identify significant differences in wool performance attributes. However, the results suggest that the NZMWBES farm classification system may be unnecessary for differentiating between wool production systems.

5.2.2 Database Comparisons

One of the main objectives of the study was to test the suitability of the NZMWBES and WFIC databases for describing Wairarapa/Tararua wool production systems. Both these databases had been used in the past to identify production trends and yield gap opportunities. Comparison with the more representative Wairarapa/Tararua survey results showed that the NZMWBES and WFIC databases were satisfactory for describing some, but not all, of the characteristics of wool production systems in the region. The NZMWBES Sheep and Beef Farm survey was found to be suitable only for monitoring Wairarapa/Tararua region average sheep and beef cattle farm size. The WFIC database provided a good indication of Wairarapa/Tararua region winter stocking rates, sheep : cattle ratios, average net wool prices and wool harvesting costs. Neither database appeared to be suitable for monitoring regional lambing percentages, wool production performance, wool income and wool return (as defined in Chapter 3). The WFIC results are expected to be less satisfactory in summer dry years due to the high percentage of summer dry farms in this database. It was therefore concluded that if time and financial resources and wool producer support allow, the Wairarapa/Tararua survey should be updated regularly to identify aspects of wool production systems that require improvement through NZWB mass extension.

5.2.3 Important Management Variables

The variation in wool production system performance between farms was shown to be mainly due to variation in farm management practises. It was discovered that sheep breeding could be improved on many survey farms by: the quantification of sheep breeding objectives; the use of objective selection criteria for replacement ewe hogget selection; the use of objective selection criteria for ram selection; and the use of greater objectivity when deciding where to buy rams.

There appeared to be potential to improve wool production through better feeding (priority feeding) of mixed age ewes during the summer. While better feeding of ewes at the expense of other classes of stock can not be justified at 1993 prices on the basis of improved wool production alone, if associated benefits such as heavier ewe mating weights and subsequent higher lambing percentages are included, the change in grazing management may be profitable. Farms running a greater proportion of cattle were also found to achieve higher wool production per sheep stock unit, but conversion to more cattle may be neither financially feasible (due to capital constraints) nor physically possible (due to on-farm constraints).

A significant proportion (35 percent) of Wairarapa/Tararua farmers sell their wool privately. However few of these farmers used in-shed sampling and objective measurement of wool to assist wool marketing, and a large percentage of farmers (56 percent) offered wool to a very limited range of buyers. A more objective approach to marketing wool and a greater number of price quotations from private wool merchants could improve net wool prices for Wairarapa/Tararua farmers.

5.2.4 Improving New Zealand Wool Board Extension

The NZWB mission statement implies that WPO's have the responsibility to improve not only monetary returns to wool producers, but also non-monetary outcomes such as farmer satisfaction/enjoyment in producing wool, and the long-term sustainability of wool production. A large proportion (57 percent) of the farmers surveyed placed as much or greater emphasis on enjoying the farming lifestyle as on maximising profit. Recognising and addressing the different goals/objectives of farmers through extension activities is therefore an important step in improving the WPO service to Wairarapa/Tararua wool growers. While improvements in the management variables noted previously are likely to increase monetary returns to the regions' wool producers, they should also be promoted in the context of assisting individual wool producers achieve their personal goals and objectives.

Publications were identified as being a more appropriate method for the widespread transfer of new and existing farming technologies than field days, discussion groups and other agriculture-related events. However, it was not possible to determine the impact of these extension approaches for enhancing farming practices. Until an impact assessment can be completed it would appear prudent for the NZWB Grower Services Group to allocate most time and financial resources to mass extension through newspapers and free publications.

5.3 SUGGESTIONS FOR FURTHER RESEARCH

This study centred on the physical and financial characteristics of Wairarapa/Tararua wool production. The effect that these components had on other parts of the farming system was only briefly considered. A more

complete approach would be to consider alternative wool production systems, particularly in the context of mixed age ewe feeding priorities in relation to whole farm system performance and financial returns.

A large proportion of the variance in wool production and wool price was not explained by the estimating equations developed in this study. Subsequent research could attempt to explain more of this variation to identify management variables that are important in achieving high levels of wool production and returns, thus providing a more defined focus for NZWB mass extension activities.

There is a need to further investigate the goals/objectives and attitudes of Wairarapa/Tararua farmers. An investigation of the relationship between farmers' self concepts (the way in which they view themselves and desire to be viewed by their peers), their farming aims, and their information-seeking and technology adoption behaviour may provide information that could be used to make mass extension more effective.

REFERENCES

Armstrong, D. and Brown, D. M. (1986)

"How to improve hill country profits". Proceedings of the Ruakura Farmers' Conference : 121-127.

Baker, D. O. (1994)

Pers. comm. Wairarapa Farm Improvement Club, Masterton.

Baker, D. O. and Todd, D. B. (1981)

"General farming and management topics". Wairarapa Farm Improvement Club (Inc) Report : 2 (1) : 5.

Baker, R. L., Clarke J. N., Meyer, H. H., Harvey, T. G., Bigham, M. L. (1987)

"Genetic variation among six strains of Romneys and Border Leicester and Coopworth crosses". Proceedings of the New Zealand Society of Animal Production 47 : 101-105.

Baker, D. O., Todd, D., Garland, C. and Guscott, P. (1991)

"Consultants annual report". Wairarapa Farm Improvement Club (Inc), Masterton.

Baker, D. O. (1993)

"Background to the successful operation of the Wairarapa Farm Improvement Club. The system and benefits from the physical and financial database". Proceedings of the New Zealand Grassland Association 55 (in press).

Baker, D. O., Todd, D., Garland, C. and Guscott, P. (1993)

"Consultants annual report". Wairarapa Farm Improvement Club (Inc), Masterton.

Bell, F. M. D. (1980)

"Getting maximum production from hill country". Proceedings of the 29th Lincoln College Farmers' Conference : 358 - 364.

Bendall, B. C. and Bendall, G. D. (1993)

"How do farmers interpret breeding objectives?" Proceedings of the A. L. Rae Symposium on Animal Breeding and Genetics : 27-29.

Benjamin, A. (1987)

"The helping interview with case illustrations". Houghton Mifflin Company, Boston.

Bigham, M. L. (1986)

"Principles of wool growth". In sheep Production : Vol 2. Feeding, Growth and Health. Eds. S. N. McCutcheon, M. F. McDonald and G. A. Wickham. New Zealand Institute of Agricultural Science : 57-74.

Booth, A. K. and Gibbs, H. S. (1969)

"Soils and farming patterns in the Wairarapa". Proceedings of the New Zealand Grassland Association 31 : 9-18.

Boswell, C. C. and Cranshaw, L. J. (1977)

"Mixed grazing of sheep and cattle". Proceedings of the New Zealand Society of Animal Production 37 : 116-120.

Britland, S. (1994)

"Exchange rate affects the price of New Zealand wool". Wool Report, March 1994 : 15.

Burgess, S. M. (1980)

"The climate and weather of Manawatu". New Zealand Meterological Service Miscellaneous Publication, 115 (18) : 21.

Carter, W. E. (1993)

"Changing products and markets - the implications". Unpublished Address, New Zealand Wool Board Seminar, Palmerston North.

Charleston, W. A. G. (1986)

"Parasites". In Sheep Production : Vol 2. Feeding Growth and Health. Eds. S. N. McCutcheon, M. F. McDonald and G. A. Wickham. New Zealand Institute of Agricultural Science : 204-243.

Cochran, W. G. (1953)

"Sampling techniques". John Willey and Sons, Inc., New York.

Collins, M. (1972)

"Sampling". In Consumer Market Research Handbook. Ed. : R. M. Worcester. McGraw - Hill Book Company, London : 52-68.

Conway, P. A. (1993)

Pers. comm. Grower Services Division, New Zealand Wool Board, Wellington.

Coop, I. E. (1986)

"Matching feed supply and demand". Sheep Production : Vol 2. Feeding, Growth and Health. Eds. S. N. McCutcheon, M. F. McDonald and G. A. Wickham. New Zealand Institute of Agricultural Science : 137-162.

Davison, R. M. (1994)

Pers. comm. NZMWBES, Wellington.

De Lamater, J. (1982)

"Response effects of question content". In Response Behaviour in the Survey Interview. Eds. : W. Dijkstra and J. Vander Zouwen. Academic Press : 13-48.

Department of Statistics (1986)

"Handbook on survey procedures". Department of Statistics, Wellington.

Department of Statistics New Zealand (1992)

"1991 agriculture data prepared for the New Zealand Wool Board". Department of Statistics, Auckland.

Dobbie, J. L. (1988)

"Breeding strategies to increase wool profits". Proceedings of the 40th Ruakura Farmers' Conference 40 : 70-74.

Elliot, K. H., Rae, A. L. and Wickham, G. A. (1979)

"Analysis of records of a Perendale flock. II. Genetic and phenotypic parameters for immature body weights and yearling fleece characteristics". New Zealand Journal of Agricultural Research 22 : 259-265.

Erdos, P. L. (1970)

"Professional mail surveys". Robert E. Krieger Publishing Company, Florida.

Ferguson, K. A. (1981)

"Nutrition and wool production - quantity and quality of feed and quantity and quality of wool". In Sheep Nutrition. Eds. G J. Tomes and I. J. Fairnie. Western Australian Institute of Technology, Perth : 99.

Fitzharris, M. J. and Wright, D. F. (1981)

"The important mix of fencing and fertiliser - major management factors in Gisborne hill country farms". Proceedings of the 31st Lincoln College Farmers' Conference : 52-56.

Fitzharris, M. J. and Wright, D. F. (1984)

"Critical inputs into Gisborne hill country". Proceedings of the New Zealand Grassland Association 45 : 27-37.

Freeman, R. B. (1992)

"Wool harvesting. an analysis of factors influencing wool returns". Agricultural Engineering Miscellaneous Report No. 6/92, Department of Civil and Agricultural Engineering, University of Melbourne.

Freund, J. E. (1988)

"Modern elementary statistics". Prentice - Hall International, Inc., London.

Gavigan, R. G. (1992)

"A survey of Wairarapa shearing and woolhandling operators". Unpublished research report, Department of Agricultural and Horticultural Systems Management, Massey University.

Gorden, R. L. (1975)

"Interviewing : strategy, techniques and tactics". Dorsey Press, Illinois.

Gray, D. I., Nicholls, J. R., Fraser, P.A.G. and Wright, A. (1989)

"Farming in the Pongaroa region. A report on a 1989 survey of farm adjustment strategies". Occasional Publication, Department of Agricultural and Horticultural Systems Management, Massey University.

Green, P. E. (1978)

"Analysing multivariate data". The Dryden Press, Hinsdale, Illinois.

Gretton, S. (1991)

"What leads to top performance? - Key factors which make 20 King Country Farmers of the Year so successful". Proceedings of the Ruakura Farmers' Conference : 74-76.

Hawker, H. (1985)

"Nutrition and wool growth". Proceedings of a New Zealand Wool Board Wool Production Seminar : (4) 1-16.

Hawker, H. and Crosbie, S. F. (1985)

"Effects of level of nutrition in winter and summer on the wool growth of Romney and Perendale ewes with a history of high or low winter wool growth". Proceedings of the New Zealand Society of Animal Production 45 : 225 - 228.

Journeaux, P. R. (1987)

"Bull beef systems for Wairarapa hill country". M.Agr.Sc. Thesis, Massey University.

King, M. (1982)

"The place of soil conservation in hill country". Proceedings of the New Zealand Society of Farm Management National Conference : 85-90.

Kleinbaum, D. G. and Kupper, L. L. (1978)

"Applied regression analysis and other multivariable methods". Duxbury Press, North Scituate, Massachusetts.

Lansing, J. B. and Morgan, J. N. (1971)

"Economic survey methods". Institute for Social Research, The University of Michigan.

Lerche, C. O. (1983)

"Social and economic statistics". Longman, London and Lagos.

Little, A. D. International Inc. (1992)

"A study of the raw wool marketing system for New Zealand wool". New Zealand Wool Board, Wellington.

Livingston, P. J. and Parker, W. J. (1984)

"Comparing shearing policies". Riverside Farm publication No. 10, Massey University.

MacKay, A. D., Tillman, R. W., Parker, W. J. and Barker, D.J. (1990)

"Impact of superphosphate, lime and cocksfoot on summer dry hill country pasture production". Proceedings of the New Zealand Grassland Association 51 : 131-134.

Madden, E. A. (1962)

"The influence of cattle on pasture composition and second growth control". Proceedings of the New Zealand Grassland Association 24 : 90-93.

McLaren, N. (1990)

"Wairarapa consultancy sheep and beef discussion groups". Proceedings of the New Zealand Society of Farm Management National Seminar.

McLaren, N. (1993)

"Meat Research and Development Council Alfredton monitor farm annual report". Agriculture New Zealand, Masterton.

McPherson, A. W. (1982)

"An appraisal of selection objectives and criteria for New Zealand Romney sheep with particular reference to wool traits". M.Agr.Sc. Thesis, Massey University.

McRae, A. F. (1993)

"As applied agricultural scientists we serve ...?"

Proceedings of the New Zealand Society of Animal Production 53 (in press).

McRae, A. F., Brazendale, R. and Reid, J. I. (1993a)

"Extension technology transfer : a view from the 'farmer first' research programme". Proceedings of the 1993 Central Districts Sheep and Beef Farmers' Conference : 37-45.

McRae, A. F., Brazendale, R. and Reid, J. I. (1993b)

"Farmer goals, farming cycles, profitability and technology".

Internal Discussion Manuscript, Department of Agricultural and Horticultural systems Management, Massey University.

Montgomery, D. C. and Peck, E. A. (1992)

"Introduction to linear regression analysis". John Wiley and Sons, Inc., New York.

Morris, C. A., Clarke, J. N. and Elliot, K. H. (1982)

"Objectives for sheep improvement". In Sheep Production : Vol 1. Breeding and Reproduction. Eds. G. A. Wickham and M. F. McDonald. New Zealand Institute of Agricultural Science : 143-167.

Morrison, P. G. (1993)

"Address to Federated Farmers Meat and Wool conference, 24 June 1993". Unpublished address, New Zealand Wool Board, Wellington.

Morton-Williams, J. (1972)

"Questionnaire design". In Consumer Market Research Handbook. Ed.: R. M. Worcester. McGraw - Hill Book Company, London : 69-102.

Mullaney, P. E. and Sanderson, I. D. (1970)

"Relative economic importance of some wool quality traits for Merino and crossbred wool types". Australian Journal of Experimental Agriculture and Animal Husbandry 10 : 544-548.

Nachmias, D. and Nachmias, C. (1976)

"Research methods in the social sciences". Edward Arnold Publishing, London.

New Zealand Rural Support Trust (1992)

"An analysis of the economic position of East Coast North Island sheep and beef cattle farmers". Unpublished discussion paper, East Coast Rural Support Trust, Masterton.

New Zealand Wool Board (1987)

"Statistical handbook 1986-87 season". New Zealand Wool Board, Wellington.

New Zealand Wool Board (1988)

"Statistical handbook 1987-88 season". New Zealand Wool Board, Wellington.

New Zealand Wool Board (1989)

"Statistical handbook 1988-89 season". New Zealand Wool Board, Wellington.

New Zealand Wool Board (1990)

"Statistical handbook 1989-90 season". New Zealand Wool Board, Wellington.

New Zealand Wool Board (1991a)

"Statistical handbook 1990-91 season". New Zealand Wool Board, Wellington.

New Zealand Wool Board (1991b)

"Draft operational plan for Grower Services 1991/92". New Zealand Wool Board, Wellington.

New Zealand Wool Board (1992a)

"Strategic directions for the New Zealand wool industry 1992-2000". New Zealand Wool Board, Wellington.

New Zealand Wool Board (1992b)

"Statistical handbook 1991-92 season". New Zealand Wool Board, Wellington.

New Zealand Wool Board (1993a)

"The New Zealand wool industry manual". New Zealand Wool Board, Wellington.

New Zealand Wool Board (1993b)

"1992/93 annual report". New Zealand Wool Board, Wellington.

New Zealand Wool Board (1993c)

"Statistical handbook, 1992-93 season". New Zealand Wool Board, Wellington.

New Zealand Wool Board (1993d)

"New Zealand Wool Board, backgrounder". New Zealand Wool Board, Wellington.

New Zealand Wool Board (1993e)

"Wool market review". No. 6.25, New Zealand Wool Board, Wellington.

Noble, K. E. (1985)

"Land use capability classification of the southern Hawkes Bay - Wairarapa region. A bulletin to accompany New Zealand land resource inventory worksheets". Water and Soil Miscellaneous Publication No. 74, Water and Soil Directorate, Ministry of Works and Development for the National Water and soil Conservation Authority, Wellington.

Norusis, M. J. (1988)

"SPSSx introductory statistics guide". SPSS Inc., Chicago, Illinois.

NZMWBES (1992)

"The New Zealand sheep and beef farm survey 1990-91". Publication No. 2052, Wellington

NZMWBES (1993a)

"The New Zealand sheep and beef farm survey 1991-92". Publication No. 2064, Wellington.

NZMWBES (1993b)

"Annual review of the New Zealand sheep and beef industry 1992-93". Publication No. 2060, Wellington.

Parker, B. (1983)

"Similarity breeds success for King country farmers". New Zealand Journal of Agriculture 147 (4) : 8-11.

Parker, W. J. (1984)

"A study of management practices and productive performance on a sample of hill country sheep farms in North-East Wairarapa". M.Agr.Sc. Thesis, Massey University.

Parker, W. J. and Townsley, R. J. (1986)

"Management practices and productive performance on hill country sheep farms". Proceedings of the New Zealand Society of Animal Production 46 : 133-137.

Parker, W. J. (1989)

"An alternative hogget - two tooth shearing policy for summer-dry regions in New Zealand". Proceedings of the New Zealand Society of Animal Production 49 : 291 - 295.

Parker, W. J. (1992)

"Dairy farmer survey on drying off management, use of computers, information collected for decision making, general management". Questionnaire, Department of Agricultural and Horticultural Systems Management, Massey University.

Parker, W. J. (1993)

"Strategies to enhance the role and impact of Riverside Farm in the Wairarapa region". A report on, and recommendations arising from, a Workshop held at Rathkeale College, 12 May 1993, Department of Agricultural and Horticultural Systems Management, Massey University.

Parker, W. J., MacDonald, A., Blanchard, V. and Townsley, R.J. (1993a)

"Riverside farm - a Wairarapa teaching, research and extension resource". Proceedings of the New Zealand Grassland Association 55 (in press).

Parker, W. J., Blanchard, V. and Townsley, R. J. (1993b)

"An interim report on a telephone survey of Wairarapa sheep and beef cattle farmer awareness of Riverside farm and associated activities". Department of Agricultural and Horticultural Systems Management, Massey University.

Pattinson, R. D. (1981)

"What characters determine the clean price of wool at auction". Wool Technology and Sheep Breeding 29 (3) : 93.

Payne, S. (1951)

"The art of asking questions". Princetown University Press, Princetown, New Jersey.

Phillpott, B. P. (1966)

"Analysis of trends and fluctuations in wool prices". Background paper submitted to the Wool Marketing Study Group, Wellington.

Radcliffe, J. E. (1975)

"Seasonal distribution of pasture production in New Zealand". New Zealand Journal of Experimental Agriculture 3 : 259-65.

Rae, A. L. (1958)

"Genetic variation and covariation in productive characters of New Zealand Romney Marsh sheep". New Zealand Journal of Agricultural Research 1 : 104-123.

Rae, A. L. (1964)

"Genetic problems in increasing sheep production". Proceedings of the New Zealand Society of Animal Production 24 : 111-128.

Rattray, P. V. (1986)

"Feed requirements for maintenance, gain and production". Sheep Production : Vol 2. Feeding, Growth and Health. Eds. S. N. McCutcheon, M. F. McDonald and G. A. Wickham. New Zealand Institute of Agricultural Science : 75-109.

Rayner, T., Hawke, G., Tapper, M. and O'Dea, D. (1989)

"The economy in transition : restructuring to 1989". New Zealand Planning Council, Wellington.

Regnault, W. R. and Chynoweth, R. I. (1985)

"Preparing the farm clip". Proceedings of a New Zealand Wool Board Wool Production Seminar : (6) 1-12.

Reserve Bank of New Zealand (1982)

"Demand and supply for wool".

Reserve Bank Bulletin 45 (6), Wellington.

Smith, H. W. (1975)

"Strategies of social research. The methodological imagination". Prentice - Hall, Inc., Englewood Cliffs, New Jersey.

Spall, J. G. (1987)

"Diversification of Wairarapa hill country : the potential for agroforestry". M.Agr.Sc. Thesis, Massey University.

SPSS Inc. (1988)

"SPSSx user's guide". SPSS Inc., Chicago, Illinois.

Stanley-Boden, I. P. (1985)

"Analysis of the price and availability of New Zealand wools according to their textile properties". M.Appl.Sc. Thesis, University of Canterbury.

Sumner, R. M. W. and Rattray, P. V. (1980)

"Effects of short-term differential feeding in the autumn on liveweight gains and wool growth of ewes". Proceedings of the New Zealand Society of Animal Production, 40 : 209 - 214.

Sumner, R. M. W. and Smeaton, D. C. (1981)

"Wool growth of ewes druing autumn on hill country". Proceedings of the New Zealand Society of animal Production 41: 283 - 287.

Sumner, R. M. W., Bigham, M. L., Knight, T. W., McMillan, W. H. and Wiggins, L. K. (1982)

"Shearing - its effects on production". Proceedings of the 34th Ruakura Farmers' Conference : 31-34.

Sumner, R. M. W. (1985)

"Flock management and wool growth". Proceedings of a New Zealand Wool Board Wool Production Seminar : (5) 1-15.

Sumner, R. M. W., Dobbie, J. L. and Squire, J. D. (1986)

"Management options for improving wool income". Proceedings of the Ruakura Farmers' Conference : 114-120.

Sumner, R. M. W. and Scott, M. L. (1990)

"Effect of shearing once-yearly in January, once-yearly in July or twice-yearly in January and July on ewe performance. Proceedings of the New Zealand Society of Animal Production 50 : 329 - 334.

Taylor, N. W. and McRae, A. F. (1977)

"The effect of increased farm production on profitability and workload". Proceedings of the Ruakura Farmers' Conference 29 : 75-79.

Taylor, N. W. (1982)

"Some economic aspects of hill country development". Proceedings of the New Zealand Society of Farm Management : 61-76.

The Wool Industry Act (1977)

New Zealand Government, Wellington.

Thompson, C. S. (1982)

"The weather and climate of the Wairarapa region". Ministry of Transport New Zealand Meteorological Service, Wellington.

Townsley, R. J. and Parker, W. J. (1987)

"Regression analysis of farm management survey data". New Zealand Journal of Experimental Agriculture 15 : 155-162.

Tua, M. (1994)

Pers. comm. Shearing Contractor, Alfredton.

Van Brussel, M. (1993)

"Fibre requirements of the carpet industry - a European perspective". Unpublished Address, New Zealand Wool Board Seminar, Palmerston North.

Wairarapa Business Development Centre (1991)

"Wairarapa ; resources of a region". Wairarapa Business Development Centre, Masterton.

Warwick, D. P. and Lininger, C. A. (1975)

"The sample survey : theory and practice". McGraw - Hill, New York.

Wickham, G. A. and Bigham, M. L. (1973)

"The effects of sheep management on wool characteristics". Discussion paper, New Zealand Society of Animal Production Wool Study Group.

Wickham, G. A. (1985)

"Breeding sheep for wool production". Proceedings of a New Zealand Wool Board Wool Production Seminar : (3) 1-11.

Wickham, G. A. and McPherson, A. W. (1985)

"A review of the importance of wool traits as genetic improvement objectives and selection criteria for New Zealand Romney Sheep". Proceedings of the New Zealand Society of animal Production 45 : 203-208.

Wickham, G. A. (1993a)

"A sheep breeder's options in meeting wool industry preferences". Unpublished Address, New Zealand Wool Board Seminar, Palmerston North.

Wickham, G. A. (1993b)

"Application of breeding objectives". Proceedings of the A. L. Rae Symposium on Animal Breeding and Genetics : 19-26.

Wiggins, L. K. (1993)

Pers. comm. Grower Services Divsion, New Zealand Wool Board, Wellington.

Wiggins, L. K. and Beggs, D. M. (1980)

"Wool characteristics and price". Wool 7 (1) : 39 - 40.

Willemsen, E. W. (1974)

"Understanding statistical reasoning". W. H. Freeman and Company, San Francisco.

Wittink, D. R. (1988)

"The application of regression analysis". Allyn and Bacon, Inc., Boston.

Zikmund, W. G. (1991)

"Business research methods". The Dryden Press, Chicago.

APPENDIX A

NEW ZEALAND MEAT AND WOOL BOARDS' ECONOMIC SERVICE FARM CLASS DEFINITIONS

Class 1. South Island High Country. Extensive run country located at high altitude carrying fine wool sheep, with wool as the main source of revenue. Located mainly in Marlborough, Canterbury and Otago.

Class 2. South Island Hill Country. Mainly fine wool sheep with a carrying capacity of around three stock units per hectare. Wool and sales of cast-for-age ewes are a major source of revenue. Mainly in Canterbury.

Class 3. North Island Hard Hill Country. Carrying around eight stock units per hectare with 12 sheep per cattle beast. Sheep provide around 60% of the revenue, the balance being derived from the sale of cattle. Mainly located on east and west coasts and the central plateau of the North Island.

Class 4. North Island Hill Country. Easier hill country and smaller holdings than Class 3. Mainly Romney sheep and carrying around 11 stock units per hectare with ten sheep per cattle beast. A high proportion of sale stock is in forward store or prime condition. These farms are located throughout the North Island.

Class 5. North Island Intensive Finishing Farms. High producing grassland farms carrying 12 stock units per hectare with nine sheep per cattle beast. Replacement ewes are often bought in. Mainly located in south Auckland, West Coast North Island and Hawkes Bay.

Class 6. South Island Finishing - Breeding Farms. A more extensive type of finishing farm generally breeding its own replacements and frequently with some cash cropping. Mainly in Canterbury and Otago.

Class 7. South Island Intensive Finishing Farms. High producing grassland farms carrying about 13 stock units per hectare and with some cash crop. Mainly in Southland, South and West Otago.

Class 8 South Island Mixed Finishing Farms. Mainly in Canterbury with a high proportion of the revenue being derived from grain and small seeds as well as finishing stock.

APPENDIX B

WAIRARAPA/TARARUA SURVEY QUESTIONNAIRE

WAIRARAPA WOOL PRODUCTION SYSTEM SURVEY 1993

Please tick the appropriate box, or where actual numbers or statements are required fill in the spaces provided. If there is more than one option applicable to your situation tick the appropriate boxes. **All answers to this questionnaire will remain confidential.**

OFFICE USE ONLY

Record 1

Name : _____ 3

Address : _____ 4

_____ 5

_____

Phone No. : _____

SECTION A

WOOL DETAILS

1. Please attach the complete set of 1992/93 wool account sales documents and/or wool receipts for your farm to this questionnaire.

2. What was the total weight of wool produced on your farm? **Please specify clean or greasy weight (circle one).**

1992/93 _____ kg clean/greasy 1

1991/92 _____ kg clean/greasy 1

1990/91 _____ kg clean/greasy 2

3. What was the average price (net of selling costs insurance and wool levy) for wool sold from your farm? **Please specify clean or greasy price (circle one).**

1992/93 _____ c/kg clean/greasy 2

1991/92 _____ c/kg clean/greasy 3

1990/91 _____ c/kg clean/greasy 3

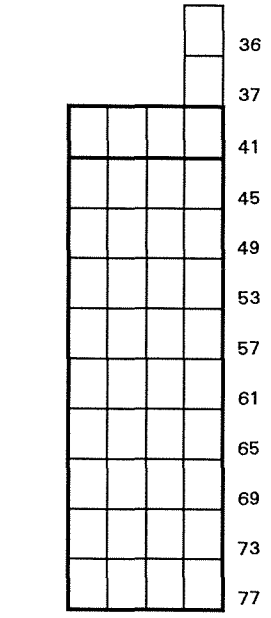
SECTION B

STOCK DETAILS

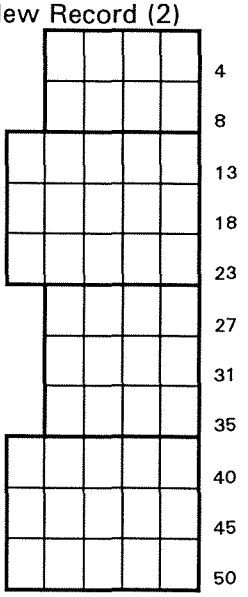
1. What is the main breed of ewe on your farm?

Romney ☐
Perendale ☐
Coopworth ☐
Other (please specify) ☐

_____



New Record (2)



2. What is the main breed of ram on your farm?

Romney ☐
Perendale ☐
Coopworth ☐
Other (please specify) ☐

_____

3. How many sheep did you winter (on hand 1st July)?

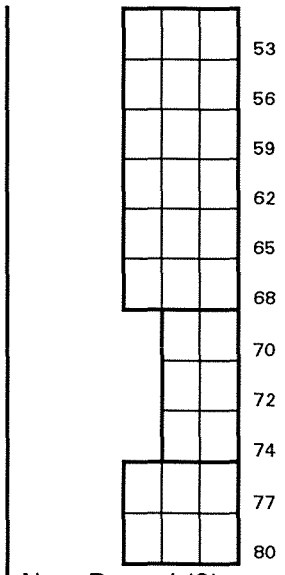
	1992/93	1991/92	1990/91
Ewe hoggets	_____	_____	_____
Wether hoggets	_____	_____	_____
Ram hoggets	_____	_____	_____
Two tooths	_____	_____	_____
Mixed Age ewes	_____	_____	_____
Rams	_____	_____	_____
Other sheep (please specify)	_____	_____	_____

_____

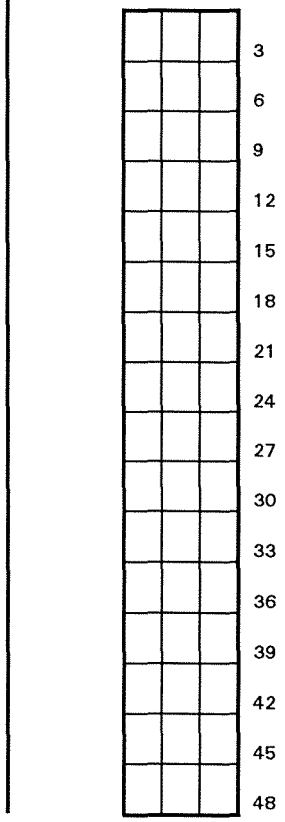
1. How many cattle did you winter (on hand 1st July)?

	1992/93	1991/92	1990/91
Rising 1yr bulls			
Rising 2yr bulls			
Breeding bulls			
Breeding cows			
Rising 1yr heifers			
Rising 2yr heifers			
Rising 1yr steers			
Rising 2yr steers			
Other cattle (please specify)			

_____



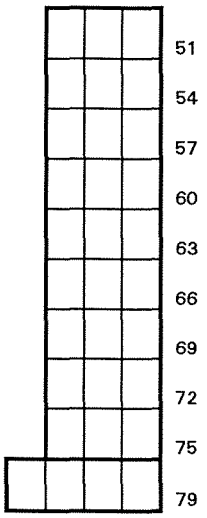
New Record (3)



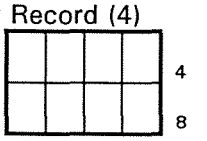
5. How many other stock did you winter (on hand 1st July)?

	1992/93	1991/92	1990/91
Yearlings/hinds	_____	_____	_____
Stags	_____	_____	_____
Yearling stags	_____	_____	_____
Goats	_____	_____	_____
Other stock (please specify)	_____	_____	_____

_____

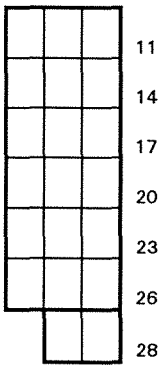


New Record (4)



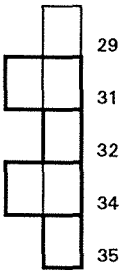
5. What was the lambing percentage (lambs docked/ewes mated) on your farm?

1992/93 _____ %
1991/92 _____ %
1990/91 _____ %



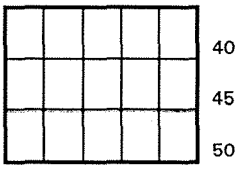
7. What was the average liveweight at mating of the mixed aged ewes on your farm? **Please specify whether the liveweight is estimated or weighed (circle one).**

1992/93 _____ kg estimated/weighed
1991/92 _____ kg estimated/weighed
1990/91 _____ kg estimated/weighed



. How many lambs were sold from your farm without being shorn?

1992/93 _____
1991/92 _____
1990/91 _____



SECTION C

WOOL COSTS

1. What was the total cost of shearing, woolhandling and crutching on your farm?

   1992/93 $ _____ 55

2. What was the total cost of woolshed supplies (e.g. woolpacks, clips) on your farm?

   1992/93 $ _____ 59

3. What was the total cost of cartage for wool sold from your farm?

   1992/93 $ _____ 63

4. What was the total cost of wool insurance, if not organised by a wool broker, for wool sold from your farm?

   1992/93 $ _____ 67

5. What was the total cost of wool testing, if not organised by a wool broker, for wool sold from your farm?

   1992/93 $ _____ 71

SECTION D

SHEEP BREEDING

New Record (5)

1. What are your sheep breeding objectives (e.g. produce more wool, breed a particular type of sheep)?

_____

_____

_____

_____

_____

☐☐ 2

2. Please indicate the importance you place on the following factors when selecting replacement ewe hoggets.

	Importance				
	No	Little	Average	Great	
Visual body size	☐	☐	☐	☐	☐ 3
Measured fleece weight	☐	☐	☐	☐	☐ 4
Visual wool whiteness	☐	☐	☐	☐	☐ 5
Face cover	☐	☐	☐	☐	☐ 6
Structural soundness	☐	☐	☐	☐	☐ 7
Black fibres	☐	☐	☐	☐	☐ 8
Visual fleece weight	☐	☐	☐	☐	☐ 9
Wool character/fleece structure	☐	☐	☐	☐	☐ 10
Measured body weight	☐	☐	☐	☐	☐ 11
Visual wool fineness	☐	☐	☐	☐	☐ 12
Other (please specify)	☐	☐	☐	☐	☐ 13

_____

3. Do you use the following objective measures of performance for selecting replacement ewe hoggets?

	Yes	No	
Hogget fleece weighing	☐	☐	☐ 14
Weighing hoggets	☐	☐	☐ 15
Other (please specify)	☐	☐	☐ 16

_____

4. Where do you get advice/information to help you select replacement ewe hoggets?

	Never	Sometimes	Often	Always	
Stock agent	☐	☐	☐	☐	17
Wool broker representative	☐	☐	☐	☐	18
NZ Wool Board Officer	☐	☐	☐	☐	19
Farm Management consultant	☐	☐	☐	☐	20
Ram breeder	☐	☐	☐	☐	21
Other farmer	☐	☐	☐	☐	22
NZ Wool Board publications	☐	☐	☐	☐	23
Farming publications	☐	☐	☐	☐	24
Other (please specify)	☐	☐	☐	☐	25

_____

5. Please indicate the importance you place on the following factors when picking rams.

	Importance				
	No	Little	Average	Great	
Visual body size	☐	☐	☐	☐	26
Conformation	☐	☐	☐	☐	27
Measured fleece weight	☐	☐	☐	☐	28
Structural soundness	☐	☐	☐	☐	29
Selection index	☐	☐	☐	☐	30
Visual wool fineness	☐	☐	☐	☐	31
Wool character/fleece structure	☐	☐	☐	☐	32
Measured body weight	☐	☐	☐	☐	33
Visual wool whiteness	☐	☐	☐	☐	34
Face cover	☐	☐	☐	☐	35
Black fibres	☐	☐	☐	☐	36
Visual fleece weight	☐	☐	☐	☐	37
Other (please specify)	☐	☐	☐	☐	38

_____

6. Where do you get advice/information to help you pick rams?

	Never	Sometimes	Often	Always	
Stock agent	☐	☐	☐	☐	39
Wool broker representative	☐	☐	☐	☐	40
NZ Wool Board Officer	☐	☐	☐	☐	41
Farm Management consultant	☐	☐	☐	☐	42
Ram breeder	☐	☐	☐	☐	43
Other farmer	☐	☐	☐	☐	44
NZ Wool Board publications	☐	☐	☐	☐	45
Farming publications	☐	☐	☐	☐	46
Other (please specify)	☐	☐	☐	☐	47

_____

7. How do you decide where to buy your rams? 49

_____

_____

_____

_____

_____

_____

SECTION E

FEEDING/GRAZING MANAGEMENT

1. In which month do you normally experience the most severe shortage of pasture on your farm?

J	F	M	A	M	J	J	A	S	O	N	D
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

☐☐ 51

2. What is the reason for the shortage of pasture on your farm at this time?

_____

_____

_____

☐☐ 53

3. During a feed shortage on your farm, which classes of stock take feeding priority.

(Please rank from 1 = most important to 7 = least important).

	Feed shortage Summer	Winter
Mixed age ewes	_____	_____
Breeding Cows	_____	_____
Yearling cattle	_____	_____
2yr and older cattle (non breeding)	_____	_____
Replacement ewe lambs/hoggets	_____	_____
Other lambs	_____	_____
Other (please specify)	_____	_____

_____

☐ 54
☐ 55
☐ 56
☐ 57
☐ 58
☐ 59
☐ 60
☐ 61
☐ 62
☐ 63
☐ 64
☐ 65
☐ 66
☐ 67

4. What class of stock do you use to "clean up" long (rank) feed on your farm in the summer/autumn?

_____ 69

5. Do you use the following techniques to help you manage livestock feeding on your farm?

	Yes	No	
Feed budget (written calculations)	☐	☐	70
Pasture cover monitoring	☐	☐	71
Rotational grazing	☐	☐	72
Break feeding	☐	☐	73
Weighing stock	☐	☐	74

6. At what level have you applied fertiliser to your farm over the last three years? 75

Maintenance	☐
Below maintenance	☐
Above maintenance	☐
No fertiliser	☐

7. Where do you get advice/information to help you with feeding/grazing management?

	Never	Sometimes	Often	Always	
Farm Management Consultant	☐	☐	☐	☐	76
Discussion groups	☐	☐	☐	☐	77
Other farmer	☐	☐	☐	☐	78
Farming publications	☐	☐	☐	☐	79
Other (please specify)	☐	☐	☐	☐	80

_____

SECTION F

ANIMAL HEALTH

New Record (6)

1. Please indicate the impact the following animal health problems have on wool production on your farm.

	Impact				
	No	Little	Average	Serious	
Flystrike	☐	☐	☐	☐	1
Scabby mouth	☐	☐	☐	☐	2
Facial eczema	☐	☐	☐	☐	3
Viral pneumonia	☐	☐	☐	☐	4
Foot rot	☐	☐	☐	☐	5
Internal parasites	☐	☐	☐	☐	6
Other (please specify)	☐	☐	☐	☐	7

_____

2. Where do you get advice/information to help you with animal health management on your farm?

	Never	Sometimes	Often	Always	
Veterinarian	☐	☐	☐	☐	8
Stock and station agent	☐	☐	☐	☐	9
Farm Management consultant	☐	☐	☐	☐	10
Animal health product company representative	☐	☐	☐	☐	11
Discussion group	☐	☐	☐	☐	12
Other farmer	☐	☐	☐	☐	13
Farming publications	☐	☐	☐	☐	14
Other (please specify)	☐	☐	☐	☐	15

_____

SECTION G

WOOL HARVESTING

1. What is the annual shearing policy for sheep on your farm?

	Policy (e.g. once a year, 8 month)	Month(s) shorn
Lambs	_____	_____
Hoggets	_____	_____
Two tooths	_____	_____
Mixed age ewes	_____	_____
Other (please specify) _____	_____	_____

2. Has your shearing policy changed during the last three years?

Yes ☐ No ☐ 31

3. If yes to (2), how has it changed? 32

_____

_____

_____

_____

_____

4. If yes to (2), why did you change it? 33

_____

_____

_____

_____

_____

16 18 19 21 22 24 25 27 28 30

5. How many shearers and woolhandlers (including yourself and family) do you employ at shearing time?

	Shearers		*Woolhandlers*	
	Family	Outside	Family	Outside
Hogget shearing	☐	☐	☐	☐
Lamb shearing	☐	☐	☐	☐
Ewe shearing	☐	☐	☐	☐

☐☐ 35 37 39 41 43 45 47 49 51 53 55 57

6. Do you request that a NZ Wool Board Certified woolhandler be present in your woolshed at shearing time?

Never ☐ Sometimes ☐ Often ☐ Always ☐

☐ 58

7. What is the annual crutching policy (not including dagging) for sheep on your farm?

	Type of crutch (e.g. full belly)	Month(s)crutched
Hoggets	_____	_____
Two tooths	_____	_____
Mixed age ewes	_____	_____
Other (please specify) _____	_____	_____

☐☐ 60 62 64 66 68 70 72 74

3. What design is the woolshed on your farm?

☐ 75

Closed (long) board ☐
Open board ☐
Raised board ☐
Other (please specify) ☐

_____

9. Where do you get advice/information to help you with wool clip preparation at shearing time?

New Record (7)

	Never	Sometimes	Often	Always	
NZ Wool Board Officer	☐	☐	☐	☐	☐ 1
Wool broker representative	☐	☐	☐	☐	☐ 2
Private wool buyer	☐	☐	☐	☐	☐ 3
Certified wool handler	☐	☐	☐	☐	☐ 4
Other farmer	☐	☐	☐	☐	☐ 5
Farming publications	☐	☐	☐	☐	☐ 6
NZ Wool Board publications	☐	☐	☐	☐	☐ 7
Other (please specify)	☐	☐	☐	☐	☐ 8

_____

SECTION H

WOOL SELLING

1. What is the main method for selling wool produced on your farm?

Auction ☐
Private (in-shed) sale ☐
Other (please specify) ☐

_____ ☐ 9

2. Has the method of selling wool produced on your farm changed during the last three years?

Yes ☐ No ☐ ☐ 10

3. If yes to (2), how has it changed?

_____ ☐ 11
_____
_____
_____
_____

4. If yes to (2), why has it changed?

_____ ☐ 12
_____
_____
_____
_____

5. If you sell wool privately (in-shed) do you have the wool tested prior to sale?

Yes ☐ No ☐ ☐ 13

6. If you sell wool privately (in-shed) how many private wool buyers do you ask to offer prices on your wool?

_____ private wool buyer(s) ☐ 14

7. Where do you get advice/information to help you with wool selling?

	Never	Sometimes	Often	Always	
Wool broker representative	☐	☐	☐	☐	15
Private wool buyer	☐	☐	☐	☐	16
NZ Wool Board Officer	☐	☐	☐	☐	17
Other farmer	☐	☐	☐	☐	18
NZ Wool Board quotation service	☐	☐	☐	☐	19
NZ Wool Board price answerphone	☐	☐	☐	☐	20
Wool market Review	☐	☐	☐	☐	21
Newspaper	☐	☐	☐	☐	22
Farming publications	☐	☐	☐	☐	23
Radio	☐	☐	☐	☐	24
Other (please specify)	☐	☐	☐	☐	25

_____

SECTION I

NFORMATION SEEKING

1. Do you read the following agriculture-related publications?

	Never	Sometimes	Often	Always	
Wool Report	☐	☐	☐	☐	26
Wool Market Review	☐	☐	☐	☐	27
Woolclips (in Wairarapa Times Age "Midweek")	☐	☐	☐	☐	28
NZ Farmer	☐	☐	☐	☐	29
Rural News	☐	☐	☐	☐	30
Countrywide	☐	☐	☐	☐	31
Straight Furrow	☐	☐	☐	☐	32
Other (please specify) _____	☐	☐	☐	☐	33

2. Do you attend the following agriculture-related events?

	Never	Sometimes	Often	Always	
Farm discussion group meetings	☐	☐	☐	☐	34
National Agricultural Field days (Mystery Creek)	☐	☐	☐	☐	35
Wairarapa Farm Improvement Club events	☐	☐	☐	☐	36
A and P shows	☐	☐	☐	☐	37
Federated Farmers meetings	☐	☐	☐	☐	38
Wairarapa Hill Country Farmer of the Year field days	☐	☐	☐	☐	39
NZ Wool Board events	☐	☐	☐	☐	40
MRDC Focus Farm field days	☐	☐	☐	☐	41
Other (please specify) _____	☐	☐	☐	☐	42

SECTION J

FARM AND FARMER DETAILS

1. What is the total area of your farm?

_____ ha

47

2. What is the effective (grassed) area of your farm?

_____ ha

52

3. How many paddocks is your farm fenced into?

_____ paddocks

55

4. If you own the farm, in what year did you take possession?

_____

57

5. If you are the farm manager, how many years have you managed this property?

_____ years

59

6. In what year were you born?

_____

61

7. How many years have you been engaged in full time farming?

_____ Years

63

3. What is your main aim as a farmer (e.g. lifestyle, financial reward)? 65

9. How do you view the future of the wool industry? 67

0. How would an improvement in wool prices influence the number of sheep you farm? 68

1. Please rate the performance of your NZ Wool Board over the past five years. 69

- Very Good ☐
- Good ☐
- Average ☐
- Below Average ☐
- Poor ☐

omments :

THANK YOU VERY MUCH FOR YOUR HELP

APPENDIX C

INDIVIDUAL SUMMER RAINFALL/NZMWBES FARM CLASS CATEGORY WOOL PRODUCTION SYSTEM INFORMATION

Table 1 Land, subdivision and livestock characteristics of Type 1 (summer moist/Class 3) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Total farm area (ha)	493	323	132	131	920	6
Effective farm area (ha)	405	324	132	131	880	6
Number of paddocks	52	42	17	15	120	6
Average paddock size (ha)	8	2	1	5	11	6
su wintered per ha						
1992/93	8.8	1.8	0.7	6.0	10.1	6
1991/92	9.2	2.2	0.9	5.7	11.7	6
1990/91	9.0	2.2	0.9	5.8	11.3	6
Sheep su as % of total su						
1992/93	79	12	5	62	95	6
1991/92	81	10	4	68	95	6
1990/91	83	8	3	75	96	6

Table 2 Land, subdivision and livestock characteristics of Type 2 (summer moist/Class 4) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Total farm area (ha)	318	145	30	80	604	24
Effective farm area (ha)	304	138	28	78	573	24
Number of paddocks	37	14	3	14	80	24
Average paddock size (ha)	8	3	1	3	16	24
su wintered per ha						
1992/93	9.6	1.6	0.3	6.6	12.6	24
1991/92	10.2	1.9	0.4	6.4	14.8	23
1990/91	10.2	1.6	0.3	8.3	13.4	22
Sheep su as % of total su						
1992/93	78	11	2	44	100	24
1991/92	79	7	1	67	94	23
1990/91	81	7	1	71	93	22

Table 3 Land, subdivision and livestock characteristics of Type 3 (summer moist/Class 5) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Total farm area (ha)	318	198	81	191	720	6
Effective farm area (ha)	282	133	54	188	550	6
Number of paddocks	45	15	6	22	63	6
Average paddock size (ha)	7	2	1	4	9	6
su wintered per ha						
1992/93	9.9	2.6	1.0	6.1	12.5	6
1991/92	10.0	2.5	1.0	5.9	12.8	6
1990/91	10.4	2.6	1.1	6.2	13.6	6
Sheep su as % of total su						
1992/93	69	20	8	53	94	6
1991/92	74	16	6	58	94	6
1990/91	78	12	5	66	95	6

Table 4 Land, subdivision and livestock characteristics of Type 4 (summer dry/Class 3) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Total farm area (ha)	818	391	130	337	1720	9
Effective farm area (ha)	651	273	91	309	1178	9
Number of paddocks	55	27	9	22	90	9
Average paddock size (ha)	14	7	2	8	30	9
su wintered per ha						
1992/93	8.9	0.8	0.3	7.1	9.9	9
1991/92	9.0	1.1	0.4	6.8	10.8	9
1990/91	8.7	1.0	0.3	6.9	10.3	9
Sheep su as % of total su						
1992/93	77	8	3	65	90	9
1991/92	79	8	3	70	93	9
1990/91	82	10	3	69	100	9

Table 5 Land, subdivision and livestock characteristics of Type 5 (summer dry/Class 4) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Total farm area (ha)	679	530	125	210	2340	18
Effective farm area (ha)	618	477	112	178	2220	18
Number of paddocks	52	31	7	9	120	17
Average paddock size (ha)	12	5	1	5	25	17
su wintered per ha						
1992/93	10.0	1.6	0.4	7.1	13.8	18
1991/92	10.1	1.6	0.4	7.2	13.4	16
1990/91	9.8	2.2	0.6	3.8	13.1	15
Sheep su as % of total su						
1992/93	71	13	3	41	81	18
1991/92	74	13	3	46	91	16
1990/91	78	10	3	55	90	15

Table 6 Land, subdivision and livestock characteristics of Type 6 (summer dry/Class 5) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Total farm area (ha)	365	290	88	100	1040	11
Effective farm area (ha)	294	176	53	87	550	11
Number of paddocks	44	20	6	21	80	11
Average paddock size (ha)	7	5	1	3	17	11
su wintered per ha						
1992/93	9.8	1.4	0.4	7.7	12.2	10
1991/92	10.1	0.9	0.3	8.5	11.5	8
1990/91	11.2	2.6	0.9	8.4	17.1	8
Sheep su as % of total su						
1992/93	63	11	3	41	77	10
1991/92	70	11	4	54	83	8
1990/91	75	12	4	58	90	8

Table 7 Physical performance characteristics of Type 1 (summer moist/Class 3) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Lambing %						
1992/93	82	15	6	64	104	6
1991/92	94	12	5	76	106	6
1990/91	95	10	4	80	105	6
Clean wool production per ssu (kg/ssu)						
1992/93	3.6	0.9	0.4	2.8	4.7	6
1991/92	3.9	0.9	0.4	2.6	5.2	6
1990/91	4.0	2.0	0.8	1.6	7.3	6
Clean wool production per ha (kg/ha)						
1992/93	24.7	6.9	2.9	17.2	37.3	6
1991/92	28.3	8.1	3.3	19.1	40.4	6
1990/91	28.1	13.4	5.5	13.0	52.8	6

Table 8 Physical performance characteristics of Type 2 (summer moist/Class 4) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Lambing %						
1992/93	95	13	6	64	104	24
1991/92	107	17	4	69	133	23
1990/91	109	18	4	74	140	23
Clean wool production per ssu (kg/ssu)						
1992/93	4.5	1.1	0.2	3.1	8.2	21
1991/92	4.6	1.1	0.2	3.2	8.6	21
1990/91	4.7	1.0	0.2	3.3	7.7	21
Clean wool production per ha (kg/ha)						
1992/93	33.1	7.6	1.7	21.7	48.9	21
1991/92	36.5	10.2	2.2	21.4	55.3	21
1990/91	38.5	8.7	1.9	25.6	51.9	21

Table 9 Physical performance characteristics of Type 3 (summer moist/Class 5) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Lambing %						
1992/93	98	20	8	65	116	6
1991/92	105	13	5	84	120	6
1990/91	99	18	7	71	115	6
Clean wool production per ssu (kg/ssu)						
1992/93	4.0	0.8	0.4	3.3	5.4	5
1991/92	4.5	0.7	0.3	3.5	5.2	5
1990/91	4.5	0.9	0.4	3.3	5.4	5
Clean wool production per ha (kg/ha)						
1992/93	31.0	12.1	5.4	20.3	45.3	5
1991/92	38.7	13.5	6.0	21.9	52.2	5
1990/91	40.6	14.0	6.3	24.1	61.5	5

Table 10 Physical performance characteristics of Type 4 (summer dry/Class 3) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Lambing %						
1992/93	98	21	7	53	126	8
1991/92	104	21	7	68	133	9
1990/91	99	17	6	72	126	9
Clean wool production per ssu (kg/ssu)						
1992/93	4.3	0.7	0.2	2.9	5.2	8
1991/92	4.3	0.9	0.3	2.2	5.5	8
1990/91	4.1	0.6	0.2	3.2	4.9	8
Clean wool production per ha (kg/ha)						
1992/93	29.9	5.0	1.8	24.0	39.7	8
1991/92	30.6	5.8	2.1	22.4	41.8	8
1990/91	29.1	2.9	1.0	26.8	35.4	8

Table 11 Physical performance characteristics of Type 5 (summer dry/Class 4) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Lambing %						
1992/93	96	11	3	77	110	18
1991/92	102	14	3	79	127	16
1990/91	96	14	4	77	125	15
Clean wool production per ssu (kg/ssu)						
1992/93	4.2	0.6	0.1	3.2	5.1	14
1991/92	4.3	0.7	0.2	3.1	5.4	14
1990/91	4.5	1.2	0.3	3.5	6.5	14
Clean wool production per ha (kg/ha)						
1992/93	31.0	7.1	1.9	20.9	43.2	14
1991/92	32.8	8.7	2.3	18.7	47.9	14
1990/91	32.9	7.7	2.1	16.8	46.2	14

Table 12 Physical performance characteristics of Type 6 (summer dry/Class 5) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Lambing %						
1992/93	105	15	5	82	127	11
1991/92	108	16	5	89	135	10
1990/91	106	20	7	80	136	9
Clean wool production per ssu (kg/ssu)						
1992/93	5.1	2.7	0.9	2.9	6.9	8
1991/92	4.4	0.5	0.2	3.7	5.1	8
1990/91	4.2	0.9	0.3	3.0	5.6	8
Clean wool production per ha (kg/ha)						
1992/93	28.4	6.1	2.1	20.1	43.2	8
1991/92	30.8	3.3	1.2	26.7	36.1	8
1990/91	34.5	9.8	3.5	27.3	56.5	8

Table 13 Financial performance characteristics of Type 1 (summer moist/Class 3) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Average clean wool price (c/kg)[1]						
1992/93	322	35	14	254	350	6
1991/92	346	33	13	308	395	6
1990/91	387	70	29	326	410	6
Wool income per ssu ($/ssu)						
1992/93	11.79	3.80	1.55	7.03	16.12	6
1991/92	13.61	3.98	1.63	9.02	20.37	6
1990/91	15.99	11.12	4.54	6.78	37.01	6
Wool income per ha ($/ha)						
1992/93	79.64	26.57	10.85	58.22	130.55	6
1991/92	98.75	35.40	14.45	69.09	159.77	6
1990/91	113.08	78.08	31.88	55.72	269.30	6
Wool harvesting cost 1992/93[2]						
$/ssu	2.52	1.34	0.55	0.42	4.50	6
$/clean kg	0.78	0.52	0.21	0.09	1.62	6
Wool cartage cost 1992/93						
$/ssu	0.26	0.05	0.03	0.23	0.29	2
$/clean kg	0.08	0.04	0.03	0.05	0.11	2
Wool return 1992/93[3]						
$/clean kg	2.41	0.86	0.35	0.81	3.36	6
$/ssu	9.18	4.84	1.98	2.24	15.47	6
$/ha	61.00	35.57	14.52	21.14	125.29	6

1 Average clean wool price net of selling costs, insurance and wool levy.
2 Wool harvesting cost includes shearing, woolhandling and woolshed supply costs.
3 Wool return = wool income - (wool harvesting cost + wool cartage cost).

Table 14 Financial performance characteristics of Type 2 (summer moist/Class 4) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Average clean wool price (c/kg)[1]						
1992/93	352	29	6	304	410	22
1991/92	330	24	5	288	389	23
1990/91	373	41	9	315	421	21
Wool income per ssu ($/ssu)						
1992/93	15.76	3.67	0.80	11.18	29.02	21
1991/92	14.93	3.61	0.79	9.11	27.12	21
1990/91	17.56	3.37	0.75	12.46	29.15	20
Wool income per ha ($/ha)						
1992/93	114.79	23.15	5.05	76.02	161.57	21
1991/92	119.38	32.26	7.04	61.59	174.60	21
1990/91	143.38	31.90	7.13	95.79	197.38	20
Wool harvesting cost 1992/93[2]						
$/ssu	3.60	1.36	0.28	0.48	6.77	23
$/clean kg	0.85	0.30	0.06	0.06	1.15	22
Wool cartage cost 1992/93						
$/ssu	0.20	0.14	0.04	0.04	0.57	14
$/clean kg	0.04	0.02	0.006	0.01	0.07	14
Wool return 1992/93[3]						
$/clean kg	2.65	0.45	0.10	1.94	3.82	22
$/ssu	11.90	4.10	0.88	7.98	27.96	22
$/ha	86.35	23.05	4.91	48.51	155.67	22

1 Average clean wool price net of selling costs, insurance and wool levy.
2 Wool harvesting cost includes shearing, woolhandling and woolshed supply costs.
3 Wool return = wool income - (wool harvesting cost + wool cartage cost).

Table 15 Financial performance characteristics of Type 3 (summer moist/Class 5) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Average clean wool price (c/kg)[1]						
1992/93	363	34	14	335	420	6
1991/92	359	50	22	305	438	5
1990/91	379	22	10	351	410	5
Wool income per ssu ($/ssu)						
1992/93	14.37	2.50	1.12	11.92	18.24	5
1991/92	16.00	0.79	0.35	15.42	17.37	5
1990/91	16.76	3.07	1.37	13.72	20.94	5
Wool income per ha ($/ha)						
1992/93	112.90	51.04	22.83	68.08	180.96	5
1991/92	137.24	47.87	21.41	89.02	190.89	5
1990/91	151.88	45.66	20.42	98.73	215.72	5
Wool harvesting cost 1992/93[2]						
$/ssu	3.29	0.90	0.37	2.12	4.71	6
$/clean kg	0.81	0.14	0.06	0.63	0.97	6
Wool cartage cost 1992/93						
$/ssu	0.20	0.14	0.10	0.10	0.30	2
$/clean kg	0.05	0.03	0.02	0.03	0.08	2
Wool return 1992/93[3]						
$/clean kg	2.81	0.29	0.12	2.52	3.20	6
$/ssu	11.24	1.53	0.63	9.74	13.53	6
$/ha	78.60	38.65	15.78	39.60	138.08	6

1 Average clean wool price net of selling costs, insurance and wool levy.
2 Wool harvesting cost includes shearing, woolhandling and woolshed supply costs.
3 Wool return = wool income - (wool harvesting cost + wool cartage cost).

Table 16 Financial performance characteristics of Type 4 (summer dry/Class 3) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Average clean wool price (c/kg)[1]						
1992/93	362	26	9	327	399	8
1991/92	361	40	13	318	438	9
1990/91	374	17	6	347	403	9
Wool income per ssu ($/ssu)						
1992/93	15.52	2.33	0.82	11.03	18.62	8
1991/92	14.97	2.34	0.83	9.83	18.02	8
1990/91	15.37	2.84	1.01	11.13	19.23	8
Wool income per ha ($/ha)						
1992/93	107.49	13.21	4.67	91.03	131.40	8
1991/92	107.72	16.44	5.81	91.65	137.05	8
1990/91	109.01	10.16	3.59	97.40	129.82	8
Wool harvesting cost 1992/93[2]						
$/ssu	3.43	1.56	0.55	0.21	4.77	8
$/clean kg	0.81	0.34	0.12	0.04	1.10	8
Wool cartage cost 1992/93						
$/ssu	0.31	0.25	0.12	0.14	0.67	4
$/clean kg	0.07	0.06	0.03	0.03	0.15	4
Wool return 1992/93[3]						
$/clean kg	2.77	0.36	0.13	2.27	3.27	8
$/ssu	11.93	2.69	0.95	9.06	17.13	8
$/ha	83.04	19.90	7.04	69.95	129.78	8

1 Average clean wool price net of selling costs, insurance and wool levy.
2 Wool harvesting cost includes shearing, woolhandling and woolshed supply costs.
3 Wool return = wool income - (wool harvesting cost + wool cartage cost).

Table 17 Financial performance characteristics of Type 5 (summer dry/Class 4) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Average clean wool price (c/kg)[1]						
1992/93	353	28	7	316	422	18
1991/92	354	18	5	329	406	16
1990/91	385	22	6	338	425	14
Wool income per ssu ($/ssu)						
1992/93	14.73	2.20	0.59	12.22	18.14	14
1991/92	15.20	2.69	0.72	11.28	19.37	14
1990/91	17.48	4.57	1.22	13.75	31.60	14
Wool income per ha ($/ha)						
1992/93	109.84	28.10	7.51	69.74	158.15	14
1991/92	116.43	30.63	8.19	62.69	165.17	14
1990/91	126.50	29.29	7.83	65.87	164.45	14
Wool harvesting cost 1992/93[2]						
$/ssu	3.72	1.01	0.24	1.64	5.67	18
$/clean kg	0.91	0.25	0.06	0.37	1.47	18
Wool cartage cost 1992/93						
$/ssu	0.20	0.06	0.02	0.11	0.32	10
$/clean kg	0.05	0.02	0.006	0.03	0.10	10
Wool return 1992/93[3]						
$/clean kg	2.59	0.47	0.11	1.63	3.64	18
$/ssu	10.66	2.48	0.59	6.30	16.06	18
$/ha	75.82	25.99	6.13	46.53	126.12	18

1 Average clean wool price net of selling costs, insurance and wool levy.
2 Wool harvesting cost includes shearing, woolhandling and woolshed supply costs.
3 Wool return = wool income - (wool harvesting cost + wool cartage cost).

Table 18 Financial performance characteristics of Type 6 (summer dry/Class 5) farms surveyed.

Parameter	Mean	Standard Deviation	Standard Error	Minimum	Maximum	Total n
Average clean wool price (c/kg)[1]						
1992/93	350	27	9	324	404	10
1991/92	339	24	8	309	372	8
1990/91	382	33	12	334	421	8
Wool income per ssu ($/ssu)						
1992/93	18.08	10.28	3.89	9.45	39.35	7
1991/92	15.04	2.79	1.05	11.46	18.89	7
1990/91	16.10	4.21	1.59	10.08	21.05	7
Wool income per ha ($/ha)						
1992/93	98.48	24.88	9.40	51.84	124.11	7
1991/92	104.92	10.52	3.98	91.11	117.83	7
1990/91	118.44	12.69	4.80	99.66	135.80	7
Wool harvesting cost 1992/93[2]						
$/ssu	3.95	1.23	0.39	1.90	6.16	10
$/clean kg	0.81	0.19	0.06	0.54	1.22	10
Wool cartage cost 1992/93						
$/ssu	0.33	0.21	0.12	0.11	0.54	3
$/clean kg	0.05	0.03	0.02	0.03	0.09	3
Wool return 1992/93[3]						
$/clean kg	2.68	0.33	0.11	2.14	3.10	9
$/ssu	14.50	8.09	2.70	7.44	32.86	9
$/ha	83.07	28.25	9.42	40.79	138.82	9

1 Average clean wool price net of selling costs, insurance and wool levy.
2 Wool harvesting cost includes shearing, woolhandling and woolshed supply costs.
3 Wool return = wool income - (wool harvesting cost + wool cartage cost).