# HOW CAN NEW ZEALAND PRODUCERS INCREASE THE LEVEL OF FINE WOOL PRODUCTION?

Research using Linear Programming as a Modelling Tool with Case Studies in Marlborough and Canterbury

---

A dissertation submitted in partial fulfilment of the requirements for the Degree of Master of Applied Science

At

Lincoln University

Canterbury

New Zealand

By

R. J.T. Kidd

---

Lincoln University

2011

# Certification

I declare that the work presented in this dissertation, is to the best of my knowledge and belief, original and my own work, except as acknowledged in the text, and that the material has not been previously submitted either in part or whole for a degree at this or any other university.

Robert James Trevelyan Kidd

Lincoln University, 2011

Abstract of a dissertation submitted in partial fulfilment of the requirements for the Degree of M. Appl. Sci.

**How can New Zealand producers increase the level of fine wool production?**

*Research Using Linear Programming as a Modelling Tool with Case Studies in Marlborough and Canterbury*

By

R.J.T. Kidd

Fine wool is suitable for clothing, both designer suits and outdoor active wear. Around 6,817 tonnes of clean, fine wool was exported between July 2009 and June 2010 from New Zealand (Beef + Lamb New Zealand Economic Service, 2010c). The majority of this fine wool is produced by Merino sheep. New Zealand currently has approximately 2.1 million Merino sheep that produce fine wool (MAF, 2009). Merinos have predominantly occupied the South Island high country.

Since 1998, through the Tenure Review process [Crown Pastoral Lands Act (1998)], much of these high country areas have been returned to Crown control (High Country Accord, n.d.). This process has resulted in 229,909 hectares of high country land placed into the conservation estate from 2002 to 2008. Fine wool production is directly influenced by these changes; therefore, increasing New Zealand's fine wool production to off-set this reduction and to meet growing markets is currently an important topic. A potential shortfall between fine wool produced and the demand from increasing markets may create opportunity-loss, and be a disincentive for large buyers to purchase New Zealand fine wool products. One potential solution is to increase fine wool production.

This research was undertaken to investigate the feasibility of Merino sheep systems in non-traditional areas. Non-traditional Merino properties are identified as farms that comprise a majority of Class six land with current sheep breeds farmed being Corriedale, Halfbred and/or Merino sheep. This research selected seven properties from which data was collected through questionnaires and follow-up interviews with owners or managers.

A linear programme was constructed to compare the breeds. The model selected the Merino as the most optimal breed. Wool and meat prices, lambing percentages and fleece weights were adjusted to determine tipping points between the Merino or Corriedale/Halfbred option. Results showed that further investigations on a case-by-case basis would be worthwhile considering the robustness of the Merino breed within the model and the strong indication of the Merinos’ success in comparison to the alternative breed.

Farmers in these non-traditional areas should investigate farming Merinos in their relatively dry, stony areas or as a whole-flock breed change. Constraints to farming Merinos were identified by current and potential farmers as well as mitigation methods that current Merino farmers identified as successful techniques to enable farming of the Merino breed in these non-traditional areas.

**Keywords: Fine wool, Merino, Corriedale, Halfbred, Class Six Land, Future Production, Breed Change, Linear Programming**

# Acknowledgements

Most importantly to my 'support crew', Mum and Dad. Thank you for your support throughout my past four years at Lincoln University. You have been a great source of motivation, encouragement and advice, all of which has helped me enjoy a great university experience and aided me in making the most of the many opportunities I have been presented with.

To the seven farmers who willingly gave their time, shared information and valuable knowledge, enthusiasm and interest - thank you. It was a pleasure to meet all of you and spend some time with you on your fantastic properties. I look forward to seeing you all again one day.

Guy Trafford, this would not have been possible without you, thank you. Your effort, patience, quiet encouragement and the confidence you had in me, as well as the extensive knowledge you shared, have truly provided the foundation from which I have been able to complete this project. Nic Lees, your enthusiasm and assistance in supporting me has been significant in enabling this project to proceed.

To James and Georgie Murray, thank you for taking a risk and giving me the opportunity to experience the high country, and in doing so, igniting and supporting a passion for a world I once did not know. However, it is your friendship and the generosity of making me welcome in your family that is most important to me.

To Professor Keith Woodford, you offered me the opportunity to extend myself in the past year: it has been a very satisfying experience and one from which I believe I have benefitted immensely. This has given me a great sense of satisfaction.

To Mark Stevenson and Dave Maslen, from The New Zealand Merino Company. Your assistance, industry knowledge, information and the encouragement you have provided is truly valued. It has been a pleasure getting to know you and I look forward to seeing more of you in the future.

I am also very grateful to Hannah for your friendship, love and support throughout an often challenging process but one in which you have played an important part.

To my friends (especially Mike and Liam) all of you have shown patience, understanding and friendship which is valued and appreciated more than words can convey. To Dan Smith and Rob Gibson, thank you also for your entertainment and company. Many others have provided assistance, either directly or indirectly, and although not mentioned, I am grateful for your role in this chapter of my life.

Thank you.

# Table of Contents

# Terms and Abbreviations

---

| | |
|---|---|
| **MFD** | Mean Fibre Diameter |
| ***μ*** | Micron |
| **Micron** | 1 micron = 1 millionth of a metre |
| **TNZMC** | The New Zealand Merino Company Limited |
| **PGG** | Pine Gould Guinness |
| **MGIL** | Merino Grower Investments Limited |
| **PGP** | Primary Growth Partnership |
| **Ha** | Hectares |
| **Kg** | Kilogram |
| **/** | Per |
| **MAF** | Ministry of Agriculture and Forestry |
| **th** | Tooth |
| **M.A.** | Mixed Age |
| **Cull** | Removal of animals due to an age or other deficiency- usually implies animals are slaughtered |
| **s.u.** | Stock Unit |
| **DM** | Dry matter |
| **MJME** | Mega Joules of Metabolisable Energy |
| **ME** | Metabolisable Energy |
| **c.w.** | Carcass weight |
| **Dressing percentage** | Carcass weight as a percentage of liveweight |

# Figures, Diagrams & Tables

PAGE

# 1. Introduction

## 1.1 Background

The New Zealand wool industry is based upon sheep pastoral farming systems which currently involve 32.4 million sheep (Statistics New Zealand, 2010). Wool was New Zealand's first exported good and largest export product in the latter half of the 1800's, however in 2006 it was only 2.73% of exports (Nicol & Saunders, 2009).

Wool production systems are found throughout New Zealand and include many different sheep breeds, producing a range of different average wool fibre diameters. The wool produced in these systems can be divided into three distinct categories: fine wool (<24.5 µ), medium micron wool (24.5-31.4 µ) and crossbred wool (>31.4 µ) (MAF, 2003).

Between July 2009 and July 2010, New Zealand exported a total of 122,893 tonnes of clean wool (Beef + Lamb New Zealand Economic Service, 2010c). Of the total wool exported, 80.1% was coarse wool, 14.5% medium micron wool and 5.5% was fine wool (Beef + Lamb New Zealand Economic Service, 2010c).

Wool with a mean fibre diameter (MFD) greater than 24.5µ has been used in outer clothing garments with the stronger of these wools used in interior textiles and carpets. Wool-based products in these markets are currently in low demand due to the availability of cheaper substitute products made from synthetic fibres. Coarse wool is produced by dual purpose animals, descendents from British-based breeds with relatively high growth rates and liveweights. This type of sheep is also capable of serving the sheep meat industry, which has been the main source of income for these farmers as the wool price has declined. Wool has become a by-product of sheep meat production due to high shearing costs and low returns, with the exception of fine wool producers where it remains the primary product (Lynch, Gardiner, Wallace, Hamilton-Seymour, Harold, Cao & Forbes, 2006).

In 1999, McKinsey & Company was employed to advise New Zealand wool growers on the best strategic direction for the future of the New Zealand wool industry. Various recommendations followed, most notably the disestablishment of the New Zealand Wool Board. The fine wool industry also initiated changes after the McKinsey Report which led to the forming of the Merino New Zealand Incorporated, described by Stevenson (2004) as an 'industry good' body providing beneficial services to the industry in the mid-1990's. The roles of Merino New Zealand Inc. were then largely taken over by Merino New Zealand Ltd. in 1998 (Stevenson, 2004). Out of Merino New Zealand Ltd. and Wrightson (now PGG Wrightson) was formed The New Zealand Merino Company (TNZMC) (Greer, 2003). TNZMC is responsible for increasing demand through research and development from on-farm production to garment production while also brokering wool for growers (The New Zealand Merino Company, 2006a).

Fine wool is suitable for clothing, both designer suits and outdoor active wear. The majority of this fine wool is produced by Merino sheep[1]. Around 6,817 tonnes of clean, fine wool was exported between July 2009 and June 2010 from New Zealand (Beef + Lamb New Zealand Economic Service, 2010c).

New Zealand currently has around 2.1 million Merinos that produce fine wool (MAF, 2009). Originally from Spanish descent, Merinos excel in dry and arid climates such as the Mediterranean climate. Due to this strength Merinos became the founding breed of the Australian sheep industry and continue to be the major breed in the Australian national flock today. The first sheep to be established successfully in New Zealand were Merinos, imported from Australia in significant numbers in 1834 (Meadows, 2008).

## 1.2 Research Problem

Merinos have predominantly occupied the South Island high country, a high altitude sub-alpine environment, with a similar summer climate to that of the Mediterranean and Australian regions while also including a severely cold winter, often with large amounts of snow. "Most other sheep breeds could not be profitably farmed in this environment" (Gow, Stevenson, Westgren & Sonka, 2005, p.5).

The high country environment contains vast areas which have been eligible for conversion into the conservation estate for many decades. The rate of conversion in the last decade has been significant, with inevitable repercussions. Since 1998, through the Tenure Review process (Crown Pastoral Lands Act (1998)), much of these high country areas have been returned to Crown control (High Country Accord, n.d.). This process has resulted in a

[1] Merino sheep will from here on be referred to as Merino or Merinos

significant reduction in grazable land area for Merinos. The result of this policy change has seen many run-holders (lessees of high-country land) retire vast quantities of land to the Crown for the intended purpose of landscape conservation, and as part of this legally preventing farmers from grazing domesticated stock in these areas.

In return, the run-holders receive freehold title on the more productive land. The process has resulted in 229,909 hectares of high country land placed into the conservation estate between 2002-2008, an area substantially greater in size than Stewart Island (which is 185,000ha) (High Country Accord, n.d.).

The reduction in available land for Merino grazing inevitably leads to further reductions in the size of the Merino flock (Greer, 2004). Fine wool production is directly influenced by these changes; therefore, increasing New Zealand's fine wool production to off-set this reduction and to meet growing markets is currently an important topic. Chairman of TNZMC John Nichol identified that "…demand from current partners has increased to a level where growers will be unable to supply enough, particularly to active outdoors wear" (Harrigan, 2010).

Simply, an inevitable shortfall between fine wool produced and demand from increasing markets will create a loss of opportunity, and possibly a disincentive for large buyers to purchase New Zealand products. The solution is to increase fine wool production. Three options exist for this: increase fine wool production in current traditional fine wool systems; import fine wool from other producing nations (e.g. Australia); and/or increase the New Zealand Merino flock by establishing Merino systems in non-traditional areas.

Non-traditional Merino properties are identified as farms that comprise a majority of Class six land (as defined by the *Land Use Capability Survey Handbook* by Landcare Research and AgResearch). This research selected seven properties containing a majority of Class six land. The research was undertaken to investigate the feasibility of Merino sheep systems in non-traditional areas. The properties were also further selected based upon the current sheep breed farmed, which was required to be either Corriedale or Halfbred sheep. The Corriedale was pioneered in New Zealand by mating the Merino with the English Leicester or Lincoln ram, it is a dual purpose breed with an average wool micron of 28-33µ for ewes and 24-30µ for hoggets (Meadows, 2008). The Halfbred is also a dual purpose breed but unlike the Corriedale which Meadows (2008) deems to have an equal emphasis on both wool and meat, the Halfbred breed is more focused towards wool production with an average fibre diameter of 25-31µ (Meadows, 2008).

Anecdotal evidence also indicated some Merino properties existed in these non-traditional areas and a selection of these properties as well as properties with a mix of Merino, Corriedale and Halfbred systems were included. A total of seven properties were used in a mixed methods approach involving interviews, questionnaires and linear programming.

## 1.3 Research Rationale

To understand how best to increase Merino-based farm systems in non-traditional areas, a quantification of the constraints to this farm system is necessary. This study seeks to identify potential or current constraints. The identification will enable work to be undertaken that may alleviate or reduce the influence of the constraining factors and in doing so increase Merino production.

## 1.4 Research Objectives

- To ascertain a comprehensive list and explanation of constraints and the impact they have on potential and current Merino systems in non-traditional land.
- To determine if Merino systems have potential in non-traditional areas currently farmed with the Corriedale and/or Halfbred sheep.
- If the Merino is shown to be optimal then this project would be used to encourage increases in the national Merino flock.
- Provide a document that is easily understood and practically useful.
- Provide appropriate data to aid persons looking to develop these types of systems.

# 2. Literature Review

## 2.1 Introduction

As New Zealand sheep numbers decline to a relative low of 32.4 million in 2010 from the 70 million high of the 1980s (Ashley-Jones, 2010) demand is increasing for fine wool products. This research aims to look at how New Zealand producers can increase the level of fine wool production.

### 2.1.1 Background

Merinos originate from Spain where they were the prized property of the Spanish Kings and nobles. The Mediterranean climate of Spain was initially believed to be the sole reason for their superior fleeces (Massey, 2007). This theory was later proved largely incorrect as smuggling and legitimate operations enabled the Merino breed to spread worldwide, establishing and performing with continuing success. Following this activity the total demise of the Spanish flock occurred as part of social turmoil in the 17$^{th}$ century and the previously extricated Merino sheep enabled the breed to continue (Massey, 2007). The Spanish Merinos founded the Australian flock with the breed currently dominating 75% of the total flock (Australian Bureau of Statistics, 2010a). The Merino was first introduced into New Zealand in significant numbers in 1834 from Australia (Wolfe, 2006). These sheep were pushed deep into the uncharted territory of New Zealand's backcountry, especially in the South Island, where they produced New Zealand's first export, wool. Following this, British-based sheep breeds gradually increased in number to become the dominant sheep in the sector.

## 2.2 The Merino Sheep

Dalton (2006) describes the Merino as the first sheep to be farmed in New Zealand but suggests that they were unsuited to the warm, humid North Island. Currently 97% of Merinos are farmed in the South Island (Merino Inc., n.d.).

Merinos survive well in harsh climates and grow a fleece that provides protection from cold winter climates and allows for cooling in hot, arid summers.

Further to this, Merinos are able to travel large distances in flocks and possess a renowned foraging ability (Stringleman & Peden, 2009) meaning they can find feed in sparse and trying conditions.

Merinos effectively graze available feed while retaining a tight flock structure with overall grazing resembling rotational grazing. Merinos graze sub-alpine pastures in the summer months and are mustered at the end of autumn to be put onto safer, lower, semi-improved pastures for relief from the often heavy snow that covers their summer habitats, to which they are returned in mid-spring.

Merino hoggets are generally fed on forage crops in their first winter to assist their relatively low growth rate. This low growth rate and an inherent low fertility when compared to other sheep breeds has meant they have not been generally favoured in climatic and environmental conditions where other sheep breeds can survive.

### 2.3 Traditional Merino Grazing Land

The Merino is currently farmed in the high country of New Zealand (Buchanan, 1954). This is supported by more recent work that explains Merinos are well suited to the high altitudes and mountainous landscapes of New Zealand's South Island high country (Merino Inc, 2010). This traditional grazing land is mostly classified as Classes 7 and 8 lands. Lynn *et al.* (2009) describe these classes as follows; 8 is very severe to extreme gradient and conditions – conservation or protection uses; 7 is severe gradient and conditions, requires active soil conservation measures. Class 7 and 8 are the classes that are predominantly included into the conservation estate through the Tenure Review process.

Tenure Review is founded upon the Crown Pastoral Lands Act (1998) which enables large areas of high country changing from 'Pastoral Lease' status and into 'Conservation Status' (High Country Accord, n.d.), which does not permit grazing by domestic animals. The process involves title changes by which the leaseholder gains freehold ownership of specific areas allowing freedom from rules that confine a Pastoral lease title. It also allows the land that is deemed as 'fragile' to be retired from grazing and controlled by the Government through the Department of Conservation [DOC] (Land Information New Zealand [LINZ], n.d.).

The loss of some class 7 and 8 land to conservation status reduces the area capable of supporting livestock. The High Country Accord (n.d.) explains that, between the years 2002 and 2008, 229,909 hectares were placed into the conservation estate. Simultaneously the MAF (2009b) report states that the Merino flock has declined from 3.3 million sheep in 1996 to approximately 2.1 million in 2007.

### 2.4 Competition From Dual Purpose Sheep

Sheep of many different breeds from many different parts of the world have been introduced into New Zealand; many have not survived (Dalton, 2006). "The ones that have really thrived are the British breeds, noted for their meat and wool" (Dalton, 2006, pp.5).

Wolfe (2006) mentions that the introduction of the refrigerated meat trade represented a valuable new export opportunity for New Zealand. The sailing of the ship *Dunedin*, a refrigeration capable vessel, from Port Chalmers in 1882 was the beginning of the frozen meat trade. The opportunity to provide the large British market with sheep meat occupied the attention of many sheep farmers who as a result turned from the single purpose Merinos to dual purpose British breed sheep which was further encouraged by the wool price decline of the 1880's.

The British breeds' dual purpose ability refers to the ability to provide larger carcasses and large quantities of lower quality wool. These animals quickly replaced the Merino on more productive land as they provided additional opportunities, and thus more income for the graziers, while also performing in the higher rainfall areas which were unsuitable for Merinos. Therefore, the Merino was destined for the High Country, a rugged dry climate and landscape closely aligned with their origins. It was here that the Merino began to reign supreme (Dalton, 2006). Most other sheep breeds and livestock classes cannot be profitably farmed in this environment (Stevenson, 2004).

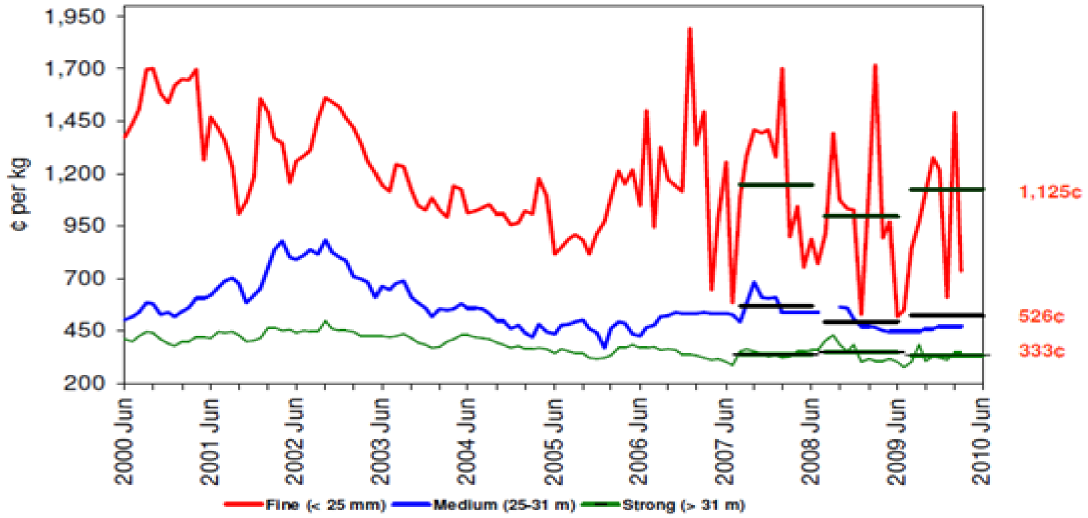
### 2.5 New Zealand Fine Wool

New Zealand fine wool is an internationally demanded product, due to its natural inherent properties. “New Zealand Merino is whiter, stronger and longer than Merino from anywhere else on the planet - resulting in superior natural attributes for use in luxury suiting, active outdoor, sports and fashion clothing, as well as many other home furnishing and apparel products” (The New Zealand Merino Company, 2006b). New Zealand Merino wool is, “unequivocally the best in the world in terms of purity, colour, strength and vegetable matter content” (Brakenridge, 1995). These attributes enable a niche-market positioning in the world wool market and warrant a premium price.

### 2.6 Indicators Of Fine Wool Demand

Merino wool prices have improved in recent years (MAF, 2003). The premiums for fine wool are apparent and indicate demand for the raw product. The International Wool Textile Industry annual report, 2007-2008, demonstrates that strong wool sold for less than 400 cents/kg greasy while in the same year fine wool sold for 1400 cents/kg greasy. The premiums achieved by fine wool fluctuated slightly over the past ten years but were never lower in the 10 year period, than the comparison in the 2005-2006 year where strong wool sold for just under 400 cents/kg while fine wool sold for just above 900 cents/kg (International Wool Textile Organisation [IWTO], 2008).

**Figure 2.1: New Zealand Wool Prices 2000-2010**




**Source: Beef + Lamb Economic Service (2010a)**

“Demand for Merino is close to outstripping supply in New Zealand (Primary Growth Partnership [PGP], 2010). A substantial indicator of the increasing level of demand and confirmation of ‘considerable growth prospects’ has emerged recently; this has come in the form of an already important American customer. The customer, *SmartWool* is the largest global supplier of wool socks in the active outdoor market and is increasing its demand substantially of New Zealand Merino wool (Cronshaw, 2010).

Long term supply contracts have been established by TNZMC since its beginning in 2001 (New Zealand Trade & Enterprise, 2010); these contracts extend to companies such as *Smartwool* and *Loro Piana.* These relationships further demonstrate a long-term demand for fine wool.

Jeremy Moon, the CEO and Founder of *Icebreaker* clothing, states that there is room for increasing supply to the market, “I know that we can get bigger” (Saporito, 2010). There are also opportunities for expansion with other clothing and textile companies and which include both international and domestic brand partners.

### 2.7 Market Diversification

In the early 1990’s world wool stock piles were significant and New Zealand and Australian Merino growers were eager to move towards a non-commodity type market in an attempt to increase future profits (Stevenson, 2004).
The fine wool sector has broken away from the whole wool sector and differentiated its brand while marketing the unique products and sustainable practices that the systems promote (Marsh, 2005). A recent article adds support to this comparison between wool types.
"The Merino growers are struggling, but with what we're doing with NZ Merino, we're doing a lot better than strong-wool growers," stated Bob Brown the Chairman of Merino Grower Investments Ltd. (Wood, 2010).

The marketing initiative by TNZMC, *Icebreaker* and other companies moved Merino wool into a premium position. *Icebreaker*, a small company of marketing experts were able to put the Merino fibre on the world map and develop a new market for outdoor Merino clothing (Macfie, 2005). Comments from Jeremy Moon, the CEO and Founder of *Icebreaker* clothing line, which produces 100% Merino garments stated that, “…the growing weight of scientific evidence about the performance benefits of Merino fibre explains why so many sports people are making the transition from man-made fabric to the more eco-friendly apparel (Merino wool products)" (Icebreaker, 2009).

"New Zealand has positioned its Merino wool in the high value end of the fashion and related markets including high-end suits for men and women, active outdoor wear, fashion knitwear, accessories and designer blankets" (MAF, 2003).

### 2.8 Competitive Advantage

New Zealand Merino wool has gained publicity and increased demand through the marketing of its natural product attributes and the picturesque environment in which it is currently grown. More recently, the farming practices applied to these growing systems have contributed to the appeal and competitive advantage of the product. A farming practice that has been employed in past decades, but since discontinued, is mulesing.

Mulesing was developed to manage the negative results of the characteristic skin folds of the Merino sheep, which unfortunately provide an ideal breeding ground for maggots, which can effectively eat the sheep alive. Mulesing has been used in the past in New Zealand but came at a physical cost to the animal. Mulesing involves removal of the outer layers of skin on the breech area of the lamb; the skin that subsequently grows back is free of wool follicles effectively reducing the wool grown in this area and thus reducing the potential area for fly-strike. Fly-strike is a major cost and production hindrance to farmers.

Mulesing is able to reduce animal health issues and costs while increasing the condition of the animal and subsequent quality of wool.

The negative animal welfare issues associated with these practices, which include pain and infection, have resulted in what the consumer perceives as an inhumane and an unnatural practice. This method has largely ceased in the New Zealand fine wool industry. However, mulesing is still very much a part of the Australian sheep industry causing large customers/brands to boycott Australian wool encouraged by campaigns from the group, People for the Ethical Treatment of Animals (PETA) and their supporters. This indicates the value which consumers are placing upon production integrity. Other methods exist that are deemed less severe for the sheep, such as injections of chemicals which halt wool growth in certain areas, but the majority of properties still mules as a cheaper alternative.

Australia's reluctance to change has lead to an opportunity for New Zealand producers to build up a competitive advantage. To do this, TNZMC has developed the '*Zque*' brand that provides accreditation for wool produced on properties that exclude mulesing from their system. In addition to this, these properties must also comply with the Resource Management Act (1992), Employment Relations Act (2000), Health and Safety Act (1992) and Animal Welfare Act (1999) (The New Zealand Merino Company, 2011b) in their farming practices.
*'Zque'* fibre combines natural performance wool with an accreditation program that ensures environmental, social and economic sustainability, animal welfare (non-mulesed), and traceability back to the source (The New Zealand Merino Company, 2011a).

This type of initiative has helped to build a competitive advantage over competitors, especially Australia. Australia dominates the world market for fine wools (MAF, 2003). In July, Australia's wool industry leaders announced they would be unable to meet the previously made commitment to cease mulesing by the end of 2010 (Animals Australia, n.d.). Negative press and attention from animal rights' groups has resulted from this retracted commitment. The Australian's inability to meet this target positions New Zealand fine wool for greater demand.

An example of this increasing demand is the company *SmartWool* (mentioned earlier) which has subsequently embraced the *'Zque'* program yielding larger contracts and commitments from them. Benefits to the grower include financial reward for this type of product. "Major contract buyers of New Zealand fine wool, such as *Icebreaker*, *SmartWool* and Designer Textiles International, have agreed to pay a premium price for an assurance by farmers they no longer practised mulesing" stated John Brakenridge the CEO of TNZMC (Wallace, 2008)

With significant consumer groups poised to increase demand, it could be expected that the production levels would be increasing to meet this opportunity. However, this is not the case. Essentially, the main factor affecting Merino wool production is the lack of suitable and available land for these systems to survive in. The traditional grazing environments are reducing in availability due largely to Tenure review. This is resulting in a decrease in the Merino flock size, with a decrease in available Merino wool.

### 2.9 Impact On Production

Changing land uses, other than to dairy systems, has caused 2.6 million hectares of grazing land to be lost to other land uses, which includes extensive marginal pasture lands (high country land) closed for conservation since 1990 (Meat and Wool New Zealand [M&WNZ], 2009).

Along with breeding ewes, wether flocks have traditionally been run in Classes 7 and 8. Wethers are castrated rams and produce wool as their only product; they are the hardiest stock class within the Merino flock and are more suited to this terrain and climate than breeding stock. With wool production as the wethers sole purpose they have lower nutritional requirements than breeding stock throughout the yearly cycle. This low requirement matches the class 7 and 8 land, which produces very little feed and requires a large amount of effort to obtain what is available.

It could be argued on some Merino properties the major reason for a Merino ewe flock's existence is to supply replacements to the wether flock. With this in mind the reduction of grazing rights to the land suitable for wethers reduces the capability of the farmer to continue with this grazing regime and the requirement for Merino ewes. Therefore, Merino ewe flocks may be changed to other breeds.

Tenure Review participants whose rights increase by gaining freehold title on their remaining land and varying levels of payment from the Crown in the process are able to increase development of their freehold land. This therefore increases the incentive to maximise the income per hectare with many properties moving to dairy grazing or lamb fattening operations due to the increased quality and quantity of available feed. Greer's (2004) report also notes that, due to changes in income resulting from land retirement, a change of breed on these farms may occur, adding to a reduction in fine wool produced.

A cost of the reduction in Merino grazing country is the subsequent reduction in the national Merino flock size. Absent grazing land and the exclusion of wether flocks in some systems leading to whole system breed changes, further reduces the national Merino flock. Tenure Review's impact on Merino sheep numbers has been estimated as up to a 750,000 stock unit (s.u.) reduction (Greer, 2004).

With these facts fuelling these predictions, comments have arisen, such as in an interview by *Time Magazine* of founder and current CEO of *Icebreaker* Jeremy Moon. In this interview

Mr Moon was discussing *Icebreaker* and its options for expanding, the concluding comments of the interview with regards to company expansion yielded the following conclusion, ‘any bigger (*Icebreaker*), and he may run out of sheep” (Saporito, 2010).

### 2.10 The Main Issue

With increasing demand and decreasing production of New Zealand fine wool there is an inevitable lack of supply capability confronting the growers of New Zealand Merino wool. It is important to find ways in which to increase fine wool production for various reasons. This includes the need to maintain existing customers and provide for their demands and in doing so retain their business.

Large customers value consistency and availability so that they are able to meet their own contractual obligations and maintain adequate supply levels to meet their customer’s requirements. If sufficient quantities of New Zealand fine wool were unavailable then customers’ processing facilities could potentially lose processing efficiencies and end consumers rendered unsatisfied at a lack of available product, price increases or a combination of the two. This situation would force the New Zealand fine wool customers to explore other means of obtaining product.

This increases the risk of competition through which New Zealand fine wool could lose some of its price premiums, as customers change supplier. Australia poses the largest threat in this area with a large per annum clip to meet supplier demand. This could also lead to the mixing of New Zealand produced wool with international, lower quality, wools leading to further value reduction in New Zealand fine wool. This has the potential to erode New Zealand’s competitive advantage and market.

The research focuses on increasing New Zealand Merino wool production so that this competition is not given the opportunity to erode existing and potential customers, assist in maintaining the competitive advantage that New Zealand fine wool has and to increase the fine wool industry’s ability to supply new markets. The following section discusses the general farming conditions and explores ways to increase fine wool production.

## 2.11 Important Factors Of New Zealand Farm Systems

The focus of this research is to study and analyse the potential of the Merino flock to expand outside what is considered to be its traditional New Zealand range of the South Island high country. The factors which are believed to have the greatest impact upon this expansion are considered to be climate, class of land, breed suitability and economic efficiencies.

### 2.11.1 New Zealand Climate

The climate of the country must be explained and accounted for when considering changes as considerable as a breed change. The climate is often the largest controlling factor of any farm system. 'New Zealand has a broad latitudinal range and complex topography, it has a wide range of climatic zones that are mainly dominated by the relationship to the mountains', (Fleming, 2003, p. K-18). The National Institute for Water & Atmospheric Research (NIWA) reinforces the diversity of New Zealand's climate, conveying it as complex and varied with warm subtropical conditions in the far north to cool temperate climates in the far south while also containing severe alpine conditions in the mountainous areas (Mackintosh, 2001).

This is what allows many different types of land use to occur and brings about varied and often localised issues that confront each use. It is in essence what allows this research to look at different sheep breeds under different conditions with a particular focus on Merinos versus their closest relatives, the Corriedale and Halfbred sheep. Both the Corriedale and Halfbred breeds are based upon Merinos crossed with strong wool breeds of English Leicesters, Lincoln, or Romney sheep. These two alternative breeds may also be suitable for grazing in some areas that Merinos are found and thus are the basis of this research.

### 2.11.2 Land Classification Framework

The Ministry of Agriculture and Forestry [MAF] have produced a guideline for eight different types of land classes, plus variations and sub-classes within these for exceptions. The system allows for a grouping of types of land by varied factors, mainly the farming activities that are suitable on these classes of land and characteristic features of these land types.

*Landcare Research* has published the most comprehensive guide in its, 'Land Use Capability Survey Handbook' (Lynn et al., 2009) on which the MAF guidelines are based. The book is compiled as an assessment of physical factors considered to be critical for long-term land use and management. The inventory is also used for classification; the eight classes of land are established according to the long-term capability to sustain one or more productive uses (Lynn et al., 2009).

The availability of this type of data is highly advantageous for categorising and simplifying the land type in New Zealand. It helps to identify key issues that contribute to the systems available in these areas.

## 2.12 Options For Increasing Production

There are four possible options to increase supply of New Zealand fine wool to be explored. These are:

1. Import fine wool to meet New Zealand producers contracts
2. Increase wool production in current systems through increased stocking rates or increased wool growth.
3. Graze Merinos on non-traditional areas.
4. Develop other existing breeds to generate more fine wool.

### 2.12.1 Import Fine Wool

The continuous importing of fine wool to New Zealand would indeed increase the amount of fine wool available for supply to customers but by doing this the competitive advantage of New Zealand fine wool is lost. The most likely place to import wool from would be Australia, due to its close proximity. Australia is also a viable source as it has a large flock with approximately 72.7 million sheep in 2006 (Australian Bureau of Statistics, 2010a), of which 75% are Merinos (Australian Bureau of Statistics, 2010b). The problem with this is that New Zealand's fine wool competitive advantage and the value that is attributed to the wool would be lost in whole or part.

This is because New Zealand's farming practices and dramatic landscapes both provide marketability. This marketability has been and continues to be instrumental in increasing demand and value to products above other fine wools such as Australia's. If fine wool was imported to fill TNZMC's supply deficit then it would be mixed with New Zealand fine wool production and bring the value of the New Zealand wool down.

TNZMC has considered this as an option in past years. John Brackenridge explained “that if land continued to be retired while demand increased, the company could be seeking ‘millions of kilos’ of wool from Australia” (“Tenure Review cuts Merino numbers”, 2008). Imports of fine wool have not followed these comments and more recently this option was reviewed by the TNZMC board. Chairman of TNZMC, John Nichol, explained that New Zealand fine wool is TNZMC’s preference for supply source, with efforts to increase New Zealand based production being pursued (Harrigan, 2010).

### 2.12.2 Increase Wool Production In Current Systems

The high country environment (traditional Merino land) favours an extensive farming system, meaning that the area supplied to individual animals is considerably more than what would be in an intensive system, also, the available feed per hectare would be far less than an intensive system. Some winter feeding systems do resemble more intensive systems but the area available for crops is usually very limited and often only hoggets and rams enjoy this abundance of easily harvestable and readily accessible feed in the winter.

The rest of the Merino flock on a high country property graze on developed pasture over the winter and winter ‘shoulder’ months. Wethers and ewes (when not preparing for or involved in tupping, lambing and lamb rearing) spend the remainder of the year in these very extensive, vast landscapes foraging for food and burning the majority of consumed energy surviving. These areas can often comprise severe terrain, which requires large amounts of energy from the sheep to survive. Wool is mainly protein and the animals therefore need protein to generate wool growth. If protein is limited then wool growth will suffer. Due to the severity of the conditions in these areas high quality feed is limited. The low energy feed common in these areas can at times limit maintenance requirements which can limit wool growth. The ability to increase wool growth on the 2.1 million Merinos currently grazing the high country is limited by this lack of energy

Additionally, the ability of this land type to carry more stock is further limited by the amount of land available in the winter to support livestock. Land is often buried in snow and subject to extremely cold conditions. The land is also very fragile and thus large numbers of stock grazing repetitively can degrade the vegetation and soil structure. Therefore, it is not in high country run-holders’ long term interests to stock the land above current levels as long term damage to the landscape would occur, hampering future grazing and land quality.

Due to the sparse food reserves and fragile nature of the high country environment, the current stocking rates are presently considered to be at their maximum, resulting in an inability to increase Merino numbers per hectare in their current environment.

### 2.12.3 Graze Merinos On Current Non-traditional Merino Country

The final option available to increase fine wool production is to graze Merinos on non-traditional Merino country. Merinos were the original sheep breed in many areas of the North Island as they arrived with the first European settlers, but later reduced in prevalence as more profitable crossbreds increased from the late 1880's. An example of a recent, large scale flock is that of Waihi Pukawa. Attempts at farming Merinos in non-traditional land have been made and there has been some success at Waihi Pukawa Station in the North Island's Central plateau (Hutchinson, 1994). Merino sheep were farmed successfully as part of the large and mainly crossbred sheep system from 1988 until recently in 2005 when they were replaced with a combination of increased crossbred stock and red deer ("Station confident about adding red deer to the mix", 2005).

#### 2.12.3.1 Land options

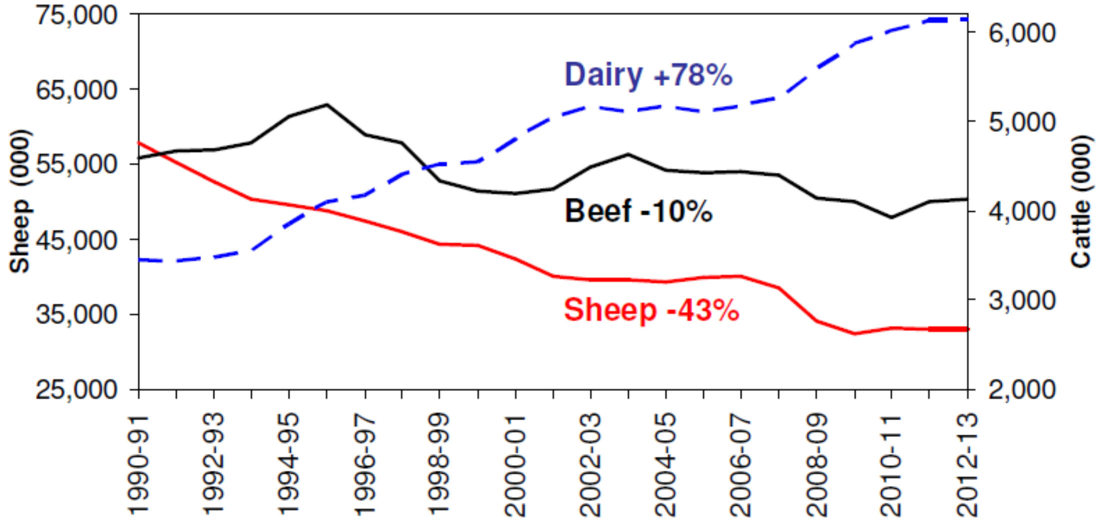
Non-traditional Merino country by definition, ranges from east coast South Island hill country farms through to coastal properties. These properties generally include operations ranging from mid-micron and dual purpose sheep systems through to intensive dairy operations.

'Dairy output has expanded rapidly over the past decade owing to improvements in productivity, and the conversion of other types of farms to dairy farms, particularly in the South Island in recent years' (MAF, n.d.).

Where irrigation, contour, climate and soils prove worthy dairy has been established. The trend is for larger dairy farm operations in both the South and North Islands (MAF, 2009b). DairyNZ (2009) describes dairy farming as the most significant economic activity in New Zealand and expects it to remain so for the foreseeable future. This is re-enforced by the Ministry of Agriculture and Forestry.

Statistics New Zealand figures shows the national milking herd contains one milking cow for every New Zealander as part of a total dairy cattle herd of 5.8 million head in 2009 (Bascand, 2010).

**Figure 2.2: Dairy, Beef and Sheep stock number trends in New Zealand 1990-est. 2013**




**Source: Beef + Lamb Economic Service (2010)**

Conversions from sheep and beef to dairy or dairy-support predominantly involve the relatively intensively farmed flat land. Dairy herd size increases in 2010 matched that of land changed from Sheep and Beef farm systems to Dairy systems (Beef + Lamb Economic Service, 2010b).

High prices for dairy products are the driving force behind conversions and land suitable is preferentially used for dairy farming. Expansion (of dairy operations) is predicted to increase again as the recession conditions subside (MAF, 2009b). Many of these systems face their own pressures as urban expansion, viticulture, forestry and scrub reversion have reduced the amount of available land for dairy and prime sheep and beef operations by 2.6 million hectares (Beef + Lamb New Zealand, 2010).

The prime sheep and beef properties, which occupy the zone between the dairy capable and the steep hill country land are intensive systems and are not pursued as areas for Merino wool production as they are focused on lamb production and thus fleeces do not reach their full potential. This is due to slaughter/sale before a fleece is shorn.

Additionally, the sheep grazed in these areas are breeds focused on high growth rates and lambing percentages. Merinos are considered unsuitable for meat production in a large scale (intensive) environment when compared to the dual purpose breeds due to their lower fertility and growth rates.

However, there is already evidence of a diversity of land types being used for grazing Merinos, with vineyards being used for wintering hoggets.. ‘There is an excellent match between demand for winter grazing for Merinos and the post harvest (grapes) period’, (Stuart Ford, 2009 as cited in Merino Inc Newsletter, 2009, p.3).

### 2.12.4 Non-traditional Merino Country As A Land Class

The land class found between the finishing systems and high country systems is largely Class 6 land. Class 6, outlined by Lynn et al. (2009), is described as stable, unsuitable for arable use with slight to moderate physical limitations and hazards under perennial vegetative cover.

This land allows for a more intensive system than the high country. This is possible due to more fertile soils, warmer average temperatures and the ability to over-sow (aerial application of seed) and top-dress (aerial application of fertiliser) the majority of the land, allowing for development of pastures. This land has the potential to carry a greater number of Merinos in a smaller area therefore potentially offsetting part of the losses created by Tenure Review. Class 6 land is seen in many forms throughout New Zealand; however, this study focuses on the Marlborough and Canterbury regions of the South Island.

These are traditionally dry areas with improved native pasture and moderate to steep hills on the eastern side of the main divide. Other Class 6 areas in the North Island for example have been excluded from this research to align with costs and time restrictions and inappropriate climate.

#### 2.12.4.1 Breeds of sheep currently in these systems

On analysis of the literature (Wolfe 2006, Meadows 2008) it was found that the Perendale, Corriedale and Halfbred would be the most suitable sheep breeds to assess in regards to non-Merino grazed land and an additional indicator of where potential Merino grazing land could be. The Perendale breed was discounted due to the average micron of wool being significantly in excess of the Corriedale and Halfbred micron ranges (Meadows, 2008). The Corriedale and Halfbred are capable of producing fine wool whereas Perendales are not.

These mid-micron sheep are currently located on Class 6 land farms as they produce strong, fine wool through to mid-micron wool and capable of providing the farmer with revenue from both meat and wool. These sheep are relatively hardy breeds among the crossbred sheep in New Zealand. Another important reason for their dominance in these areas is thought to stem from the limitations of the Merinos that were experienced in the pre-refrigeration era where early pioneers found these English based breeds to perform and survive most successfully.

#### 2.12.5 Footrot

These issues include footrot, which is described as a significant, severely debilitating disease particularly in Merino sheep and indirectly in man, as an economic, emotional and social burden (Patterson & Patterson, 1991). The condition results from soft, damp inter-digital skin that is the result of moist conditions. As the skins' resilience is partially compromised in these conditions it is more easily pierced. A breaching of the skin allows bacteria (if present) to access the inside of the soft tissue causing festering to occur which is further encouraged by humid conditions. The Merino originates from dry climates rendering them the most susceptible of all sheep breeds to this debilitating and production-reducing infection (Matthews, 1996). Patterson & Patterson (1991) also indicates the Merino is the most susceptible. Mitigating options available, breeding with footrot resistant rams, selection for resistant stock, strict culling of susceptible stock and disciplined treating minor cases.

An article by Country–Wide (2005) magazine brought to light an observation from the Waihi Pukawa station manager, Ian Huddlestone. Mr Huddlestone's experiences while farming Merinos in non-traditional land on the Central Plateau of the North Island identified that the pumice-based soil allowed for free draining land and abrasions to the hooves (keeping them short and able to dry out), allowing the flock to avoid the feet infections commonly associated with the Merino.

Due to this well-known susceptibility and the severity of the disease, it is concluded that footrot is a major reason for the alternative breeds current occupancy of this land.

Past experiences of footrot infections and a perceived risk of infection of stock in this relatively improved (over sowing and top-dressing contribute to higher than natural grass growth) land class are likely reasons for few Merino flocks in this type of country. However, authors Patterson & Patterson (1991) and Matthews (1996) provide some evidence that illuminates management-based practices available to reduce footrot in Merinos in areas where susceptibility is higher than the high country climates.

#### 2.12.6 Low Lambing Rates

Low lambing rates of the Merino are also another issue that may contribute to a higher concentration of other breeds in this environment. An average lambing percentage of 82.5% was recorded in the traditional regions (*Merino 100% Club study*, Merino Inc, 2003). As crossbred sheep have higher lambing percentages they can be more profitable for the farmer as more products accrue from each ewe in the system. However, for many farmers the cost of improving Merino lambing performance can be relatively low, while the benefits are great (Merino Inc, 2003).

#### 2.12.7 Wool Colour

Sumner, Young & Upsdell (2003) indicated that that the regions of New Zealand where sheep are grazed is related to fleece yellowing. The presence of unscourable yellow discolourations can be induced through warmth and moisture (Sumner, 2005).

### 2.13 A Possible Opportunity For The Merino

The areas identified for this research, into the success and challenges present in farming Merinos in non traditional country, required investigation. These systems may be open to a change of breed that would allow the Merino flock to increase on economic grounds. The increase in demand for fine wool products combined with the low supply, the superior quality of New Zealand fine wool and the impending gap between supply and demand requires an analysis of the feasibility of changing breeds in these Class six areas where Corriedale and Halfbred sheep are currently farmed.

### 2.14 Research

There is limited literature produced about the constraints facing Merinos on the hill country where Corriedales and Halfbreds are currently grazed. This limitation provides the opportunity to explore the feasibility of grazing Merinos on this non-traditional land. Through sources in the industry (Jon Hickford & Dave Maslen, personal communication, 2010) there is anecdotal evidence of several farmers with Merino systems in the Class 6 land. The existence of these farmers' systems indicates there may be potential for Merino numbers to increase in these systems which would also provide a source of knowledge and subject cases to research.

These farmers may provide counter actions/options to meet challenges that are perceived or otherwise and allow the increase of Merino wool production on properties that are currently carrying Corriedales and/or Halfbreds in Class 6 areas of Marlborough and Canterbury hill country. Data concerning the amount of sheep in these areas is unavailable.

### 2.15 Literature Review Conclusion

The demand and production levels of New Zealand fine wool are heading for a large disparity. This could cause damage to existing relationships and future business opportunities. Therefore, actions need to be taken to avoid this potentially negative situation by increasing wool production in the supply chain. The options for increasing the production of fine wool in New Zealand are limited and this research looks at increasing Merino numbers in non-traditional Merino sheep country. This non-traditional Merino country in Canterbury and Marlborough is further defined for this study as land where systems that currently include Corriedales and Halfbreds and some Merinos are farmed. The research (toward which this literature review contributes) aims through the process of case study investigation and quantitative analysis, to investigate the feasibility of farming Merinos on this non-traditional country.

# 3. Research Method

---

### 3.1 Mixed Methods Approach

A mixture of qualitative and quantitative data was sought to gain a multi-aspect view of the case study farm systems and farmers so that constraint identification would be as comprehensive as possible.

### 3.2 Property Selection

The data required for this research topic was required to be realistic and applicable. The South Island is identified as comprising 97% of the Merino flock in New Zealand (Merino Inc, n.d.). A selection of current farmers was sought to provide this data from two South Island regions. Marlborough and Canterbury were identified as suitable sample areas due to costs and time restrictions limiting the ability to travel outside of these two regions.

Three key contacts were established to assist with suitable properties. One in North Canterbury, one in Marlborough and another in Christchurch. These three contacts were able to assist in compiling a list of properties that they believed to fit within the parameters of the designated sample.

Case Study Farmer parameters:

- South Island location
- Canterbury and Marlborough regional location
- Farm has a majority of Class 6 land
- Merinos, Corriedales and or Halfbred sheep are currently farmed
- Willing to participate

Nine potential properties were then contacted. Two were found to be unsuitable for the study while seven were deemed suitable and agreed to participate.

### 3.2.1 Quantitative Data

Quantitative data was sought to aid the development of a linear programme (LP). This included figures on livestock production, performance and livestock numbers. This numerical data allowed for comparisons, averages and assumptions to be made allowing for a representative farm system to be constructed. This system was then manipulated to determine constraints.

### 3.2.2 Qualitative Data

Qualitative data was collected to understand the history of the property, method of product sale, view of the farmer with regard to sheep breed changes and the relevant implications of all of these. The farmers' experiences and background were also explored, with summarised views on the future of the meat and wool markets. Thoughts on sheep breed changes were also investigated.

Qualitative data is important to enable an appreciation of the farmers' perspectives. This information also assists in identifying whether the farmer is a constraint or not. Challenges the farmer faces from their system and factors used to reduce these challenges were discussed. Data from the interviews was compiled into a basic 'Property Report' (see Appendix D) for each case study (C.S.) property. By analysing the situation with a mixed methods approach the opinions of the farmers can be understood with far greater breadth and accuracy.

## 3.3 Data Collection

Data was gathered from the seven participants by questionnaire and interview. The questionnaire focused on farm data while the interview was used to gain an insight into the farmer's viewpoint and opinions.

### 3.3.1 Questionnaires

The questionnaire (Appendix A) was sent five weeks prior to the interview period. This was to enable minimal pressure to be placed upon participants at the interview and allowed for stored data to be retrieved and included in the questionnaire at participants' convenience.

This also allowed a greater chance of more accurate data to be gathered as well as reducing interview time.

### 3.3.2 Interviews

Once the seven participants agreed to participate the questionnaire was sent and an interview was arranged for a particular day in November 2010. The exact time and location of the interviews were arranged three days prior to the meeting to suit the participant. All interviews occurred at the homes of the interviewees and took approximately one and a half hours each. An interview guideline was used to accompany the questionnaire to assure all important topics were covered (Appendix B).

## 3.4 Data Analysis

### 3.4.1 Linear Program Model

Linear programming (LP) was developed in the 1940's for military operations planning, but is also now used in business and commercial planning as well as agricultural planning (Dent, Harrison, Woodford, 1986).

Linear programming requires multiple assumptions to be made throughout model construction. This allows for parameters (reflective of the real situation) to be established. Parameters allow for the model to produce results that are applicable to the real world situation and increase the relevance of the output results which can then be applied.

The linear programming technique can be applied to a wide range of problems with the following characteristics (Dent et al., 1986):

- A range of activities possible with the manager the determining factor of which one is implemented.
- Various constraints prevent free selection from the range of activities.
- A rational choice of a combination of activity levels is related to managers utility capability (e.g. profit), an objective which can be quantified.

Effectively the LP model constructed will lead to a breed comparison on the properties.

### 3.4.2 Basic Explanation of Linear Programming

LP's allow separate calculations to be avoided that would otherwise have occurred through multiple budgets or gross margins. Linear programming includes assumptions. "It assumes that, for a defined activity, relationships linking resource use, resource costs, activity levels and activity returns are all linear" (Dent, Harrison & Woodford, 1986, p.33).

The usefulness of LP's in farm management is their ability to simulate multiple changes to a system to reflect reality or trial ideas. Due to changes in the environment, policy, market pressures and product demand levels, the plans of farmers need to be flexible. A large amount of information is processed and can be used efficiently and effectively with an LP. The ability to make decisions with greater confidence is aided by an LP. A linear programme will display optimal activity sizes and will provide data on the predicted result if the conditions remain the same for the duration. An LP therefore enables relatively reliable and rapid comparisons between potential and/or current farm management practices. This allows the most successful option to be examined and to determine if it meets the operator(s) objectives.

Linear planning models do not take into account personal preferences and beliefs. Due to this, the actions of a farmer may differ from the LP's optimal result. An example of this misalignment is when an LP is created to compare breeds of stock. An LP may distinguish one breed to be superior for the farm system based upon sound biological and financial performance. However, the choice of sheep breed on the farm is not altered by the farmer upon being informed of the LP's 'superior' breed, due to the farmer's personal reasons. These reasons can include (but are not limited to) a lack of knowledge and experience with this particular sheep breed or an aversion to farming these animals due to a perceived reputation or past experience.

## 3.5 LP Model Input Data

### 3.5.1 Land Use Data

Farmers interviewed described the different land types within their systems, usually as a reference to where stock were kept at different times of the year. These descriptions were later summarised into four generic categories. The categories included Flats, Cultivatable Hill, Steep Hill and Very Steep Hill. The size of these areas (in hectares) was compared and averaged to result in an average size. This average was then used as the area for the model farm (Table 3.1).

**Table 3.1: Model Farm Land Use**

| | |
|---|---|
| Flats | 240 ha |
| Cultivatable Hill | 167 ha |
| Steep Hill | 872 ha |
| Very Steep Hill | 346 ha |
| Total Farm Size | 2318 ha |
| **Effective Farm Size** | **1626 ha** |

**Source: Appendix C 11**

### 3.5.2 Irrigation

Three of the C.S. properties have ‘K-line’ irrigation systems. These systems supply moisture to 0.6% - 6.2% of effective farm area and are supplied with water ranging from a community scheme to natural springs. Due to the low usage, irrigation has been excluded from the model farm.

### 3.5.3 Feed Supply

3.5.3.1 Pasture

Pasture growth rates have been extracted from the commercial farm management programme, 'Farmax Pro' which, amongst other data has a library of pasture growth rates. This source also contains data on Mega Joules of Metabolisable Energy per kilogram of dry matter (MJME/kg DM) data throughout many New Zealand farming locations. Two locations were chosen entitled 'Marlborough (Dry)' and 'Canterbury (Hill)'. These two locations are almost identical in MJME quality but differ in growth rates and growth timing (Table 3.2). Both have been included in the LP and can be utilised or excluded as the user chooses.

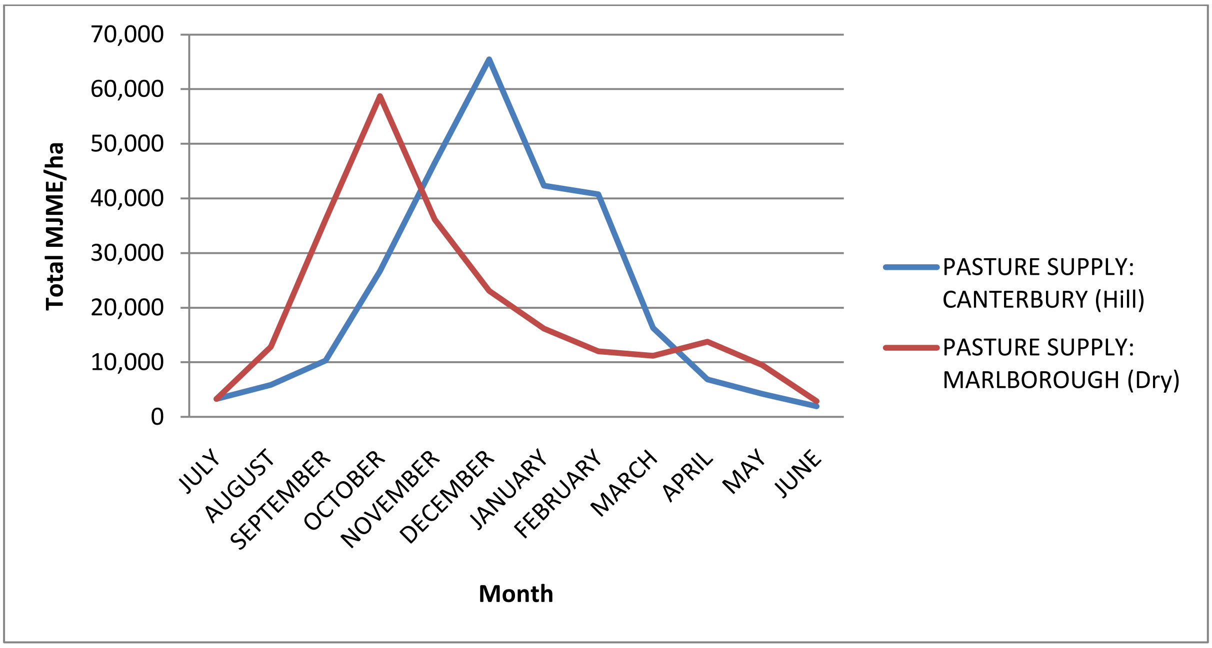
The application of these can be seen in Appendix C10 while the simplified table is shown below.

**Table 3.2: MJME/kg DM for Marlborough (Dry) and Canterbury (Hill) locations**

| **Month** | **Jul** | **Aug** | **Sept** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | ***Av.*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Marlborough (Dry) MJME/kg DM** | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | ***9.24*** |
| **Canterbury (Hill) MJME/kg DM** | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.6 | 8 | 8 | 8.3 | 7.9 | ***9.25*** |

**Source: Ogle, 2007**

**Diagram 3.1: Pasture Growth Rates kgDM/ha/day for Marlborough (Dry) and Canterbury (Hill) locations**




**Source: Appendix C 10**

### 3.5.4 Supplementary Feed

All C.S. properties have supplementary feed in their systems. Several of the C.S. farmers explained that purchased baleage, barley and sheep nuts have not been consistently necessary but have become increasingly so in recent years. Four of the farms purchase barley, one of which also purchases sheep nuts, one farmer buys baleage and one buys hay. Baleage is made on four of the farms while two properties make hay.

The model farm therefore reflects this trend. The model is given the option of making baleage on the flat areas, which comprise 15% of the total effective farm size; additionally the option of purchasing barley is included to supplement the feed reserves. C.S. farms' winter feed crops were calculated as a percentage of the effective flat areas on each C.S. property. These crops are mainly fed in a break feeding regime in the winter months and provide relief from grazing for hill pastures, while also reducing animal exposure to the extensive and exposed blocks.

The percentage of winter feed crop area in the flat paddocks ranged from 0% - 29%. The average is 11% therefore the assumption for the model is 26.6 ha (rounded down to 26ha). A kale crop is assumed to be the winter feed crop. Energy assumptions and cost calculations for supplementary feed are displayed in Appendix 9.

### 3.5.5 Stock Data

#### 3.5.5.1 Sheep & Cattle

Sheep data including liveweight, fleece weight, reproduction levels, key event dates and death rates were compiled from the C.S. properties. These were compared and averaged or assumed from the available range and applied based upon the relevance of the figures. This enabled common animals for the Merino flock and the Corriedale/Halfbred flock as well as cattle to be generated and utilised in the LP. The specific details for sheep and cattle are presented in a summarised table in Appendix C 8.

Cattle inclusion in the LP was vital to allow for feed quality management as well as risk and assists in creating a more representative farm model. The LP is constrained to enable a self sustaining herd which consumes 30% of the feed consumed, so as to provide an even comparison between sheep operations.

#### 3.5.5.2 Ram Liveweight

Due to a lack of C.S. data on ram liveweights, rams were assumed to be 30% larger than M.A. ewes in June for both breeds. This is based on the differences between Corriedale ewes and rams and Merino ewes and rams seen in Meadows (2008).

### 3.5.6 Feed Demand: Sheep

Energy requirements for stock were calculated from Nicol and Brookes (2007) work. This is the most up-to-date data available (Ludemann, 2009). The background sheets 'Sheep Demand' (Appendix C 7) and 'Cattle Demand' (Appendix C 6) were constructed to display the calculations and assumptions for sheep and cattle ME requirements, culminating in monthly requirements of MJME for each stock class as well as a weight profile throughout the year.

Nicol and Brookes (2007) advised that more energy is required for diets under 10.5 MJME/kg DM and terrain also influences the ME required. 'Hard hill' country was selected as the terrain from a selection of, flat land, easy hill and hard hill. As the average hill country pasture energy levels from the 'Feed Supply' (Appendix C10) were 9.3 MJME/kg DM in Canterbury and 9.2 MJME/kg DM in Marlborough extra energy was required. M.A. and 2th ewes received 7% more ME above maintenance, while 15% extra was added for young sheep (hoggets). Rams were also provided with 15% above maintenance of a mature ewe to allow for their superior energy requirements incurred from their body size.

Maintenance figures are further added to by the increased energy requirements of shearing, pregnancy, lactation and environmental challenges. With regard to shearing, once shorn, a sheep has less insulation from cold weather and as such must maintain its core body temperature by other means. If the environmental temperature causes the body temperature to reduce past the 'lower critical temperature' then the body uses more energy than the maintenance ME provided. This increase in energy requirement can remain for up to two weeks post shearing, over which time the skin of the sheep thickens and some wool growth occurs, providing necessary insulation at the conclusion of two weeks. The energy requirement for the two weeks can be up to 40% of the animal's maintenance requirement. In M.A. ewes and 2th ewes this was calculated to be 5 MJME/ewe/day while hoggets and rams were calculated at 40%.

In the model this was done by multiplying the month post shearing maintenance by 1.2 (effectively 20%) [1.4 (40%) was not used as expected because the maintenance factor that was being multiplied applied to the whole month whereas only half the month was required so 1.2 was used as the multiplying factor]. The majority of the C.S. properties shear around mid-year, while the minority shear in summer. Shearing in the L.P was assumed to be in July.

Weight loss and gain are factors of environmental pressure, pregnancy, lactation, flushing and mating. When sheep lose weight, energy is made available and substitutes for dietary ME (Nicol & Brookes, 2007), however in a sustainable system this weight needs to be recovered at some stage. The assumption based on a paper by Nicol and Brookes (2007) provides the recommendation that for mature ewes 1 kg of liveweight lost provides for 30 MJME and to replace 1 kg of liveweight 55 MJ ME is required; this was applied to M.A. Ewes and 2th ewes of both breeds.

Pregnancy also requires ME above maintenance for eight weeks prior to parturition. Following parturition, lactation requires ME above maintenance for 12 weeks. The amount is reflective of the weaning weight of the lamb(s).

C.S. farmers provided some estimates on lamb birth and weaning weights. Birth and weaning weights were lower for the Merino than the Corriedale and Halfbred sheep. Assumptions have been made with these as a guideline. The following sub-sections display the assumptions used to calculate the extra ME demands on the sheep.

The Merino sheep carcass is often described as late maturing, little developed and possesses a slow growth rate (Stevens, 1967). The C.S. data supported this with the Merino ewe having a 57.5 kg liveweight compared to the 65 kg liveweight of the Corriedale/Halfbred, therefore the Merino maintenance requirements are comparatively lower.

#### 3.5.7 Lamb Weights

To determine lamb birth weight, the percentage difference between ewe liveweights was used. Between Merino and Corriedale/Halfbred M.A. ewes the difference in liveweight was 12%, between 2th ewes a 13% difference exists. Therefore, this was applied to their respective lamb birth weights.

These weights were then adjusted to reflect the reproductive performance of the breeds. The Merino ewe has a 108% lambing rate while the Corriedale/Halfbred has 124%.

Twin lambs are individually lighter than single lambs across all breeds. The example used to demonstrate this comes from Morris, Kenyon and West (2005) who provide data on birth rank and lamb weights as part of their article. The sheep breeds analysed in the article included Coopworth and Romney and demonstrate the following.

**Table 3.3: Birth Rank and subsequent birth weight (Romney and Coopworth)**

| Birth Rank | Average weight for Romney and Coopworth |
|---|---|
| Single | 4.35 kg |
| Twin | 3.39 kg |

**Source: Morris, Kenyon and West (2005)**

Table 3.3 demonstrates that a twin lamb birth weight is equivalent to 78% of the single lamb. The LP assumptions included; begin with an assumed birth weight of 3 kg for a single Merino lamb. A 12% increase in weight (as is the difference between M.A. ewe weights between breeds) resulted in 3.36kg birth weight of the Corriedale/Halfbred sheep.

A single Merino lamb weighing 3 kg is multiplied by 78% to determine the weight of a twin (2.34 kg). This weight is then multiplied by two, resulting in a twin-bearing Merino ewe to carry a total of 4.68kg of lamb weight. From this a weighted average lamb weight for ME calculations was required (Table 3.4). The Merino M.A. and 2th ewes have reproduction levels of at 108% and 106% respectively while the Corriedale/Halfbred M.A. and 2th ewes have a reproduction level of 124%.

Merino M.A. ewe reproductive percentage above 100% = 8% x 4.68kg twins = 0.37 kg + 2.34 single weight. Merino 2th ewe reproductive percentage above 100% = 6% x 4.68kg twins = 0.28 kg + 2.34 single weight.

The Corriedale/Halfbred single lamb of 3.36 kg was multiplied by 78% to determine the weight of a twin, resulting in 2.62 kg multiplied by two to result in a twin-bearing Corriedale/Halfbred ewe to have a total of 5.24 kg of lamb weight. Corriedale/Halfbred M.A. and 2th ewe reproductive percentage above 100% = 24% x 5.24 kg twin lamb birth weight = 1.26 kg + 2.62 single weight.

**Table 3.4: Lamb weight assumptions for LP ME requirements**

| | Merino | Corriedale/Halfbred |
|---|---|---|
| **Ewe single lamb weight (kg LW)** | 3 | 3.36 |
| **Ewe twin lamb weight (kg LW)** | 2.34 | 2.62 |
| **2th Ewe weighted average lamb birth weight (kg LW)** | 2.62 | 3.88 |
| **M.A. Ewe weighted average lamb birth weight (kg LW)** | 2.71 | 3.88 |

**Data Source: Appendix C**

Merino 2ths are 91% of M.A. Merino ewes in liveweight, while Corriedale/Halfbred 2ths are 92% of M.A. ewes. As such 2th lamb birth weights have been adjusted for this. Growth rates and liveweights were used to determine feed demand and are displayed in Appendix C 7.

#### 3.5.8 Feed Demand: Cattle

Young stock receive 10% in addition to their ME requirements for hard hill conditions. Maintenance figures are further added for the M.A. cows to compensate for the extra energy above maintenance expended in pregnancy and lactation. The M.A. cows in lactation require 8% in addition to ME for a diet below 11 MJME. Growth rates and liveweights used to determine demand and weight profiles are displayed in Appendix C 6. The same assumptions are used over both the Merino and Corriedale/Halfbred models.

#### 3.5.9 Stock Costs

Stock costs (Appendix C 5) determine the total cost per head of each animal in the LP. The capital value was determined from the 'National Average Market Values of Specified Livestock' (Inland Revenue Department [IRD], 2010). The interest cost of 6.5% is assumed based upon a 1 year fixed interest rate for a mortgage, from the National Bank (Tarawera Publishing Ltd., 2011).

The costs and rates are based upon an annual amount; therefore the inclusion of a 'Months-on-Farm' section allows the costs to be adjusted for those animals that are not present in the systems for part of 12 months of the year. Death rates are included and derived from the Stock data pages (Appendix 8) and multiplied by the capital cost to determine a cost of death. Stock unit assumptions are derived in the Sheep Demand (Appendix C 7). Breeding costs are calculated from the Canterbury/Marlborough Hill Country Sheep and Beef MAF monitor farm report (MAF, 2010a) in which they are presented per s.u. and calculated from there in Appendix 5.

Freight costs are assumed at 50 km and figures were extracted from the Lincoln Farm budget Manual 2008 (Chaston, 2008). These figures were then increased to account for an increase in fuel costs of 30% between December 2008 (Automobile Association [AA], 2008) and December 2010 (Automobile Association [AA], 2010), 5% was also added to account for additional miscellaneous costs over this period thus a 35% increase was applied. Shearing costs for lambs were assumed at $2.46/lamb based on the Lincoln Financial Budget manual as there was a lack of data provided on this by C.S. farmers.

### 3.5.10 Fixed costs

Fixed costs were derived from the Ministry of Agriculture Pastoral Monitoring report on Canterbury/Marlborough Hill Country, 2010 (Appendix C 4). The fixed costs included labour expenses, working expenses and overhead expenses. Cash crop expenses and water charges for irrigation were irrelevant to the LP model farm and removed. Supplementary feed costs and grazing costs were removed as these are included separately (Appendix 9) and grazing off farm is not part of the model farm. Breeding costs are also excluded from fixed costs as they are accounted for in 'Stock Costs' (Appendix 5). Fixed costs are accounted for per hectare and feature on the main page. Wages were increased as it was assumed that two labour units would be required with a property the size of the model farm.

These two people would be paid as follows, $70,000 for the manager/owner and $40,000 for the more junior position. This labour cost divided over the effective farm area of 1626 ha results in $67.65per hectare.

### 3.5.11 Meat Income

Meat prices were sourced from rural newspapers for each week in 2010 (Straight Furrow, 2010-2011). Averages were determined per month for Prime Lambs with a 15.5 kg carcass weight (c.w.) YX grading, 17.5kg c.w YX, 19.0 kg c.w. YX and 21.0 YX lamb prices were all averaged per month for 2010. Mutton prices for 21.0 MX1 were obtained and averaged for use as cull ewe prices.

The cull cows received prices based upon monthly averages for M (manufacturing) cows (170kg-195kg carcass weight) and applied to a 235kg c.w. cow. Weaner prices were retrieved for the month of April (New Zealand Farmers Weekly, 2010) seen in Appendix 3.

### 3.5.12 Wool Prices

Wool prices were supplied for the LP from the New Zealand Merino Company's, Research and Development Manager of Production Science, Mark Stevenson. The five year median price per micron was used in the LP (Appendix C 2). The initial lambs sold from the systems were the progeny of terminal sires, they are unshorn when they reach the processing works. The other lambs however are shorn, in line with the majority of C.S. farmers' shearing their lambs in December or January. Stock class micron ranges were compiled and assumptions on micron were made with additional direction from Mark Stevenson (TNNZMC).

### 3.5.13 Main Sheet

The main sheet ties all the assumptions and calculations together for analysis. Red coloured negative numbers (-1.00) denote the removal of an item from the system e.g. wool is removed from the animal in the system. Negative numbers other than (-1.00) are negative figures indicating their value less than zero. The tie cells that link the inputs and outputs of the system are presented as, '1.00' linking the different activities with their Cost/Profit. The 'Activity Levels' cells provide the results, displaying stock numbers for sheep, cattle and supplementary feed required. Additional to all these the quantity of each product sold and a cash cost/profit is provided (EBIT).

#### 3.5.13.1 Feed Supply

Pasture supply in the Main Page can be altered between Marlborough (Dry) or Canterbury (Hill) locations. The feed supply is presented in MJME available per month. This can be added to by supplementary feed, if the model chooses to.

#### 3.5.13.2 Supplementary Feed

The option for the LP to make and/or purchase supplementary feed is available. Baleage can be made and/or purchased while barley can be purchased and kale can be grown in an area up to 26ha on the flats.

#### 3.5.13.3 Cattle

All weaner steers are sold in April while weaner heifers can be sold in April or retained as replacements. The cattle system has a herd with M.A. cows all culled at 10 years of age in April while a bull is replaced every two years in June.

Cull cows are sold for processing in April and are assumed to weigh 480kg (slightly below average of M.A. liveweights which are 493.5 (Appendix C 6) due to age and condition) with a dressing percentage of 50% resulting in a 240kg carcass weight. The prices for cull cows are derived from the Meat Income data in Appendix C 3 and were extrapolated out to be applied to the cull cow carcass weight.

#### 3.5.13.4 Sheep

##### 3.5.13.4.1 Merino Sheep

Mating is assumed at the 1st of April with lambing following on the 28th August and weaning on the 6th of November, based on C.S. data ranges as seen in Appendix C 8. It is assumed that 15% of M.A. ewes and 2th ewes are mated to a terminal sire. Poll Dorset, Dorset Down and Suffolk are the choice of the farmers in the C.S. who utilise terminal sires in their system. Meadows (2008) describes these breeds similarly, with all three meat purpose breeds, used for terminal crossing and are early maturing with medium to large sized frames. To account for the increase in growth rates introduced by the terminal sires' genetics a 10% increase on birth weight was included and a 20% increase in per day growth rates these are assumptions made from the (Fleming, 2003) Lincoln Farm Technical Manual which displays the following details in relation to Hybrid vigour.

**Table 3.5: Hybrid Vigour (percentages) for difference traits**

| Traits | Percentages (%) |
|---|---|
| Growth and Composition | 0-15 |
| Lamb Production | 10-40 |
| Wool Production | 0-15 |
| Overall Productivity | 5-25 |

**Source: Lincoln Farm Technical Manual (2003)**

The progeny of these terminal crossed sheep are fattened and sent away prime as they reach an average of 17.5kg carcass weight. This is based upon a 45% dressing percentage across all sheep in the system. The ram lamb terminal progeny are sent at the end of the first week of January while ewe lambs are sent at the end of January, both are unshorn. The non-terminal ram lambs are shorn in January (as are the ewe lambs which are retained for the winter) and are sold to the works before the winter commences. These Merino ram lambs are suitable for the works at the end of the third week of April. The price for these lambs is determined from a 17.5 kg c.w. YX dollar per kilogram rate and applied to the sheep at slaughter time. Their costs are removed from them also and feed requirements adjusted to account for their time on the property and subsequent demand on the system. Cull ewes are sent to the works in September while ewe hoggets, that have been wintered and shorn in July, are divided between replacements or sent to the works as 'lambs'. Terminal lambs make up 24% of total lambs produced, they involve all ram lambs and the terminal ewes.

#### 3.5.13.5 Corriedale/Halfbred Sheep

Mating is assumed at the 31$^{st}$ of March with lambing following on the 27$^{th}$ August and weaning on the 5$^{th}$ of November. Five of the seven C.S. properties sold their lambs in November and December. Some sell in February, March and April (in which some are dispersed while some sell all in one month). From the data provided showing the majority of lamb sales in November and December it has been assumed that Corriedale/Halfbred crossed with terminal lambs will be sold from December at 17.5kg c.w. where possible. Terminal ram lambs, as with the Merino flock, comprise 9.3% of the total lamb flock. These are sold in the first quarter of the month of December while the other half of the terminal lambs (ewes) are sold in the middle of December. The remaining, non-terminal ram lambs are sold in the middle of January. Non-terminal lambs, both ewes and rams are shorn in January before the sale of the ram lambs. Cull ewes are sold in September as are ewe hoggets that are not used as replacements.

### 3.6 Data Analysis

The ‘Main Page’ (Appendix C 1) in the model is linked to ten pages (Appendix C 2 - C 11) which provide the background data that formulate the end decision of the model. All of these pages are integral parts of the system which includes the biological and physical constraints, financial limitations and returns as well as the demands and production within the system. Each of these sections of data combine to provide a result of which sheep system is most appropriate considering all the constraints. The LP model is based on 2010 figures and facts where possible and some farm data is based on average years, for prudence. Wool prices, due to their confidential status, are derived from five year price medians and average contract prices.

The C.S. farmers all farm in different areas throughout Marlborough and Canterbury with some similar features which qualified them for this research, however, as every environment is different there are differences in dates, production and performance and as such assumptions were at times based upon some limited details and varied facts. All efforts were made to form the most representative representation of the C.S. data and combine with these assumptions based on typical farming practices.

The LP model enables factors to be included and excluded via a ‘Switch’ function. Through this the model was manipulated to include/exclude Canterbury or Marlborough environmental conditions, which impact upon feed supply. Canterbury conditions were used in the Base Model and were then substituted with the Marlborough conditions to examine the difference in results. This function was used to test the effect on the model if the Merino sheep breed was not an option for optimisation, thus causing the model to provide the optimal Corriedale/Halfbred system under the same conditions as the Base Model. Returning to the Base Model results under the Canterbury conditions, the various factors such as wool and meat price, lambing percentages and wool weights were adjusted to determine the tipping points between the Base Model (Merino optimised system) and the Base Corriedale/Halfbred System.

The tipping point is the percentage change at which the alternative system is chosen. It is the point at which this change occurs. Animal performance factors, input factors or price changes were adjusted to determine the level of increase or decrease required to cause a system change.

The results of the LP model were derived using the Excel ‘add in’, Solver function. Solver enables an optimal value to be found by changing cells in user specified cells (adjustable cells). Constraints are also applied to allow the model to resemble critical parts of the realistic situation. These constraints can restrict values or include values that are essential to more closely align the model with a realistic situation. The solver function was utilised when major factors were changed, in order to determine tipping points between systems. The tipping points were determined for several different scenarios with results shown in the following section.

# 4. Results

Manipulations to the model were made to determine tipping points between systems. These tipping points indicate at what point the alternative breed becomes optimal over the other. ‘Earnings Before Interest and Tax’ (EBIT) is used to show the profit or loss of the system. While not conventionally within the bounds of this definition, EBIT is used as it is the most suitable/indicative title and takes into account the variable and major fixed costs impacting upon the systems. It is identified that repair, maintenance and fertiliser, maybe lower than currently experienced on farm, in some cases, however, neither system is advantaged by these lower assumptions.

## Table 4.1

## Base Model Part A

| | Merino | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | M.A. Ewe | | | | | Sheep Meat | | | | | Wool | | | | |
| **EBIT** | **Sheep Stock Units** | **Cattle Stock Units** | **Rams** | **Rep. Ewe lamb** | **Ram Lamb** | **Ewe Hogget** | **2th Ewe** | **4th Ewe** | **6th Ewe** | **4yr Ewe** | **5yr Ewe** | **6yr Ewe** | **Jan Works Lamb Sales from Terminal** | **Apr. Ram Lamb Sales** | **Ewe Hogget Sale Up to June Feed** | **Ewe Hogget Sale Sept.** | **Cull Ewes Works Sept.** | **Lamb's Wool (16.5µ)** | **Hogget Wool (16.8µ)** | **2th Ewe Wool (17µ)** | **M.A. Ewe Wool (17.3µ)** | **Ram Wool (16µ)** |
| $314,694.83 | | | ($35.63) | ($3.92) | $0.00 | ($17.07) | ($20.26) | ($21.96) | ($21.96) | ($21.96) | ($17.58) | ($17.58) | $73.82 | $71.48 | ($3.92) | $101.58 | $59.86 | $17.97 | $16.20 | $16.20 | $15.26 | $19.54 |
| | 5,981.52 | 2,563.51 | 39 | 944 | 2,413 | 736 | 729 | 714 | 686 | 658 | 632 | 480 | 579 | 1,786 | 840 | 823 | 607 | 2,889 | 2,099 | 3,338 | 15,193 | 262 |

## Table 4.2

## Base Model Part B

| Cattle | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bulls** | **Weaners (Steers)** | **Weaners (Heifers)** | **R1 Heifers** | **R2 Heifers** | **3YO** | **4YO** | **5YO** | **6YO** | **7YO** | **8YO** | **9YO** | **10YO** | **Weaners Steer Store April** | **Weaners Heifers Store April** | **M.A. Cull Cows (April)** | **Bulls February** |
| ($219.20) | $0.00 | ($74.55) | ($74.55) | ($85.47) | ($112.98) | ($112.98) | ($112.98) | ($112.98) | ($112.98) | ($112.98) | ($112.98) | ($95.02) | $490.00 | $324.92 | $490.80 | $1,212.02 |
| 9 | 0 | 47 | 45 | 44 | 42 | 40 | 39 | 37 | 36 | 34 | 33 | 31 | 134 | 87 | 31 | 1 |

**Table 4.3 Base Model Production**

| MERINO | |
|---|---|
| **Wool Income** | **Sheep Meat Income** |
| $376,947.49 | $290,350.24 |
| **Total Wool Sold (kg greasy)** | **Total Lambs Sold** |
| 23,780 | 3,188 |
| **Average wool price** | **Total Sheep Meat sold in Kg** |
| $17.03 | 71,419 |
| **Sheep Meat $/kg** $4.07 | |
| **S.U. Wintered /ha** | |
| 4.56 | |

The Merino breed is selected by the Model as the optimal breed compared to the Corriedale/Halfbred. The optimal model (Base Model) has a winter stocking rate of 4.56 stock units per hectare (s.u./ha) with no supplementary feed in the system. Wool provides the largest income stream at $376,947.49 (gross) while sheep meat sales return $290,350.24 (gross). Greasy wool produced in the system totals 23,780 kg at an average price of $17.03/kg greasy. Total lambs sold number 3,188 with 579 of these sold as the progeny of terminal sire mating and 823 as ewe hoggets after September shearing.

The difference between the Canterbury and Marlborough systems is relatively minimal and the change in conditions does not cause a system change and changes are confined to stocking rates due to less feed being available in the Marlborough system. An EBIT from the Marlborough system of $281,075.07 is $33,619.76 lower than the Canterbury conditions generate. Total lambs sold equal 2,239 (126 less than Canterbury) with 548 of these sold as terminal progeny (31 less than Canterbury). A total of 22,516kg of greasy wool is produced in the Marlborough system. The winter stocking rate is 4.32s.u./ha which equates to 0.24 s.u. /ha less than the Canterbury system (4.56 s.u./ha). Total sheep meat sales of $274,924.87 are $15,424.37 less or 94.69% of the Canterbury sheep meat sales. Similarly total wool sales are $20,025.99 less than the Canterbury conditions.

The Canterbury system was chosen as the system to manipulate to determine tipping points in this research. The reason for the Canterbury region selection was the need to choose one system for simplicity and as the differences between the Canterbury and Marlborough results are minimal and neither provides a bias towards one sheep breed or the other the Canterbury region was therefore chosen for no defining reason over the Marlborough system.

A total of 2564 cattle s.u. are present in the Base Model, while the Base Corriedale/Halfbred model comprises 2549 cattle s.u. in-line with the slight reduction in s.u. when the Merino system is not an option for optimisation. All cattle remain the same apart from the rising two year old heifers, five and seven year old cows, and weaners that are sold store in April. All these stock classes decreased by one animal each. The rising two year old heifers costs $85.47 per head, the five and seven year old cows each cost $112.98 and the weaners sold store in April have their costs included in the M.A. cow costs as they are sold at weaning for $490. Therefore, the costs to the cattle system are reduced by $311.43 while the income lost from the weaner store sale is $490. Additional returns are reduced as the five and seven year old cattle are lost from the system and subsequently two calves are lost; potentially a loss of $490 per steer calf and/or $324.92 for a heifer calf. These animals lost from the system reduce the income to the system but must be reduced to align with the 30% constraint place upon them.

## Table 4.4

## Base Model less Merino Option Part A

| | | | Corriedale/Halfbred | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | M.A. Ewe | | | | | Sheep Meat | | | | | Wool | | | | |
| **EBIT** | **Sheep Stock Units** | **Cattle Stock Units** | **Rams** | **Rep. Ewe lamb** | **Ram Lamb** | **Ewe Hogget** | **2th Ewe** | **4th Ewe** | **6th Ewe** | **4yr Ewe** | **5yr Ewe** | **6yr Ewe** | **Nov. Works Lamb Sales from Terminal** | **Jan. Ram Lamb Sales** | **Ewe Hogget Sale Up to June Feed** | **Ewe Hogget Sale Sept.** | **Cull Ewes Works Sept.** | **Lamb's Wool (21µ)** | **Hogget Wool (22µ)** | **2th Ewe Wool (25µ)** | **M.A. Ewe Wool (26.1µ)** | **Ram Wool (26.3µ)** |
| $144,801.00 | | | ($35.79) | ($3.14) | $0.00 | ($18.00) | ($21.80) | ($21.35) | ($21.35) | ($21.35) | ($21.35) | ($16.95) | $100.41 | $70.92 | ($3.14) | $115.79 | $70.70 | $11.00 | $10.62 | $8.63 | $7.50 | $7.25 |
| | 5,947.07 | 2,548.75 | 32 | 648 | 2,249 | 635 | 609 | 585 | 556 | 528 | 501 | 376 | 540 | 1,665 | 1,015 | 995 | 476 | 2,948 | 2,042 | 2,684 | 10,792 | 240 |

## Table 4.5

## Base Model less Merino Option Part B

| Cattle | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bulls** | **Weaners (Steers)** | **Weaners (Heifers)** | **R1 Heifers** | **R2 Heifers** | **3YO** | **4YO** | **5YO** | **6YO** | **7YO** | **8YO** | **9YO** | **10YO** | **Weaners Steer Store April** | **Weaners Heifers Store April** | **M.A. Cull Cows (April)** | **Bulls February** |
| ($219.20) | $0.00 | ($74.55) | ($74.55) | ($85.47) | ($112.98) | ($112.98) | ($112.98) | ($112.98) | ($112.98) | ($112.98) | ($112.98) | ($95.02) | $490.00 | $324.92 | $490.80 | $1,212.02 |
| 9 | 0 | 47 | 45 | 43 | 42 | 40 | 38 | 37 | 35 | 34 | 33 | 31 | 133 | 87 | 31 | 1 |

**Table 4.6 Base Model (Corriedale/Halfbred) Production**

| CORRIEDALE/HALFBRED | |
|---|---|
| **Wool Income** | **Sheep Meat Income** |
| $ 159,946.91 | $321,110.84 |
| **Total Wool Sold (kg greasy)** | **Total Lambs Sold** |
| 18,705 | 3,199 |
| **Average wool price** | **Total Sheep Meat sold in Kg** |
| $ 9.00 | 69,469 |
| **Sheep Meat $/kg** $4.62 | |
| **S.U. Wintered /ha** | |
| 4.25 | |

When the Corriedale/Halfbred system is chosen as the default system, an EBIT of $144,801.00 is generated. The Base Model's (Merino) EBIT is ahead by $169,893.83. The stocking rate of the Corriedale/Halfbred system is 4.25 s.u./ha wintered, down by 0.31s.u./ha from the Base Model system. In total 3,199 lambs are sold with 540 as terminal progeny and 995 of these sold as ewe hoggets after September shearing.

When comparing sheep meat returns the Corriedale/Halfbred system generates 10.6% more income from sheep meat compared to the Merino system and only 42.43% equivalent of the Merino wool income. This system, like the Base Model (Merino) system, does not select any supplementary feed to purchase or make.

When a factor change caused the alternative breed system to be identified as optimal then a swap to the other system occurred. In some cases the EBIT figure provides revenue that is invested in additional feed. This causes a higher stocking to rate to be enabled.

These additional sources of feed were examined and through the switch function they were disabled to provide further validation that the tipping point identified was accurate. Lambing percentage increases resulted in wintered sheep numbers being altered slightly downward as a result of additional feed demand.

### 4.1 Wool Price Decrease

It was found a 79% decrease in wool price causes the Corriedale/Halfbred system to become the optimal system. The wool price decrease was applied to both systems equally as they are in reality affected by the same market conditions. An EBIT of $18,442.94 results from these changes.

### 4.2 Meat Price Increase

A 653% increase in meat prices was required to change the optimal breed to the Corriedale/Halfbred system. The increase in profit caused an EBIT of $2,072,873.86 to result and 1200 bales of baleage to be purchased and another 1,200 bales to be made on farm, leading to an increase in stock numbers. However, with the exclusion of this additional feed the tipping point remains the same when tested and stock numbers are the same as the optimal Base Corriedale/Halfbreds Model.

### 4.3 Increase in Corriedale/Halfbred Lambing percentage and decrease of Corriedale/Halfbred wool price

A decrease in wool price and an increase in lambing percentage is a rudimentary way of partially looking at the broad effects of a crossbred sheep on returns and productivity in this system. Crossbreds have a higher lambing percentage than fine wool sheep and wool that is currently worth less than fine and mid-micron wool.

A decrease of wool by 39% and an increase in lambing percentage by 216% caused a breed change from the Base Model. Wool was decreased by 39% as the average wool price is then $5.49 for the Corriedale/Halfbred wool which is $0.04 more than the '31µ Lamb's wool price' (New Zealand Farmers Weekly, 2010). The initial lambing percentage of 124%, increased by 216%, translated to a 267% lambing percentage for the Corriedale/Halfbred sheep.

### 4.4 Merino Fleece Weight Decrease

A decrease in Merino fleece weight was tested with the tipping point identified at a 46% decrease in fleece weight required for a breed change. This would provide wool quantities seen in Table 4.7.

**Table 4.7: Merino wool weights**

| Merino | | |
|---|---|---|
| | **KG greasy** | **KG greasy adjusted** |
| **Rams** | 6.73 | 3.77 |
| **Ewe Hogget** | 2.85 | 1.60 |
| **2th Ewe** | 4.58 | 2.56 |
| **4th Ewe** | 5.00 | 2.80 |
| **6th Ewe** | 5.00 | 2.80 |
| **4yr Ewe** | 5.00 | 2.80 |
| **5yr Ewe** | 4.50 | 2.52 |
| **6yr Ewe** | 4.25 | 2.38 |
| **Lamb** | 1.10 | 0.62 |

### 4.5 Corriedale/Halfbred Lambing % Increase

A 96% increase in lambing percentage from the Corriedale/Halfbred system causes a system change to occur. The lambing percentage increase equates to a 243% lambing percentage from 2th and M.A. ewes from the original 124%.

### 4.6 Merino Lambing % Decrease

A 48% decrease in Merino lambing percentage is required to cause a breed change to occur. The lambing percentage decrease changes the lambing percentage for 106% for 2ths to 55% and 108% to 56%.

# 5. Discussion

The LP model's selection of the Merino sheep system as the optimal breed is a result of several factors. More wool, lambs and total sheep meat are produced in the Base Merino Model than the Base Corriedale/Halfbred Model. Cattle numbers are also slightly higher in the Base Model as a result of their requirement in the system.

### 5.1 Base Model and Base Corriedale/Halfbred Model

The level of performance of the alternative system is determined by using the 'Switch' function to exclude the Merino breed option as an optimising option. This causes the model to choose the remaining Corriedale/Halfbred option, providing the optimal figures for this breed in the model. The EBIT resulting from the Base Corriedale/Halfbred Model is $144,801.00 and therefore $169,893.83 less than the Base Model EBIT of $314,694.83.

The Base Model includes more animals than the Corriedale/Halfbred optimised system. This is a result of the Merino having a lower liveweight in all sheep stock classes and less lambs per ewe, consequently requiring less feed per animal in comparison to the Corriedale/Halfbred sheep. When looking at the Base model activity numbers (green row) in Table 4.1 compared to the Base Corriedale/Halfbred activity numbers, Table 4.4, there is a greater number of Merino sheep compared to the Corriedale/Halfbred Sheep. The stock units as they also appear are also less than the Merino numbers but not as large as the actual animal numbers show (the difference between stock numbers and stock units is explained below).

## 5.2 Sheep Requirements

Stock units are a way of quantifying the energy requirements of different animals and stock classes for comparison and reference. This allows for feed requirement calculations to be made to determine the optimal stocking rates (s.u./ha). The Lincoln University Farm Technical Manual standards (Fleming, 2003) were used to define a stock unit.

A stock unit consists of a 55 kg ewe that eats a diet of 10.5MJME value and 550kg of dry matter per year with a lamb also fed until weaning (3.5 months). For example, by these standards applied to the LP data, one Merino 4th ewe is the equivalent of 1.03 stock units based upon it's liveweight of 57.5kg in June and the 108% lambing performance. A Merino ewe requires 6180MJME/year. The Corriedale/Halfbred sheep weighs 65kg, with a lambing performance of 124% lambs per ewe per year requires 6960MJME per year with a subsequent stocking rate of 1.16s.u. The larger feed requirement of the Corriedale/Halfbred sheep shows largely why more Merino sheep can be supported in the optimal system than the Corriedale/Halfbred optimised system. Feed demand is different between systems, not only the amount required but the timing of this demand. The model can exploit differences in timing, meaning that feed at certain times is less in some systems than others. Consequently, at certain times of the year, less stock are run due to a feed deficit. This also means that a sheep that requires a larger feed intake at these times will be run at a lower stocking rate, affecting the overall stocking rate of the system and subsequent productivity. In this particular comparison the difference in timing is limited as the sheep have similar event timing such as shearing, mating and lambing.

## 5.3 System Outputs

When comparing the outputs of the 'Base Model' and the 'Base Corriedale/Halfbred Model' the differences between these two systems demonstrate further variables that contribute to the resulting optimal Merino breed.

## 5.4 Wool

Overall wool sales from the Base Model of $376,947.50 are greater than the $159,946.92 total wool sales from the Base Corriedale/Halfbred Model. This is a result of less wool and lower prices per kg involved in the Base Corriedale/Halfbred Model. The average fleece weight (ewes, hoggets, lambs and rams) of the Corriedale/Halfbred is 2.78kg while the Merino flock average fleece weight is slightly higher at 3.00kg. Combined with this higher average fleece weight is the higher number of animals. The Base Model shears more sheep in the year with 7301 sheep shorn from lambs to rams while the Base Corriedale/Halfbred Model shears 6501 sheep.

Compounding this is the average wool price in the Base Model of $17.03/kg greasy compared to the $9.00/kg greasy seen in the Base Corriedale/Halfbred Model. For example a 4th Ewe in the Base System producing a 5kg fleece at $15.26/kg greasy has a gross return of $76.30 while the equivalent aged sheep in the Base Corriedale/Halfbred Model sheep clips a 4.43kg greasy fleece valued at $7.50/kg greasy thus a gross return on the fleece of $33.23.

## 5.5 Sheep Meat

Another factor in favour of the Base Model is the income from cull ewe sales and ram lamb sales which each exceed the Base Corriedale/Halfbred Model.

Even though the Merino system is deemed the optimal system, not all income streams prove more rewarding for the Merino when compared to the alternative breed. The terminal progeny lambs sold in November for the Corriedale/Halfbred system gain a premium in the schedule at this time of year with $100.41 per head gross income for these lambs. The equivalent Merino lambs are slower maturing, not reaching the 17.5kg c.w. required until later. They are sold in January for $73.82 per head.

A further income stream, more profitable for the Corriedale/Halfbred system, is the sale of ewe lambs after shearing which are not required for the replacement flock. The Merino ewe lambs are sold at a carcass weight of 19.8kg while the Corriedale/Halfbred ewe lambs are sold at 22.48kg c.w. Both are sold at the same time at the same per kilogram price, thus the greater carcass weight of the Corriedale/Halfbred leads to a relatively higher gross return compared to the Merino breed.

Meat overall is more profitable in the Corriedale system compared to the Base Model which sells more meat but at a lower per kilogram price. The average price of sheep meat sold in the Base Corriedale/Halfbred system is $4.62 compared to the Base Model which has an average meat sale price of $4.07. As meat is compared on a $ per kilogram ($/kg) basis the lower price for the meat is not due to lighter stock weights at sale date but rather the date at which sale occurs. Premiums pre-Christmas allow the earlier maturing Corriedale/Halfbred sheep to be sold and capture these price highs whereas the Merino, a slower maturing sheep, is sold in the following months and thus at a lower price per kilogram. This confirms that the Merino system is largely advantaged by the superior wool income.

### 5.6 Cattle In The System

The model consists of a cattle herd component of 30% of the total stock units (effectively requiring 30% of available feed) to reflect an average, realistic cattle component seen on the C.S. farms. Cattle are utilised for their pasture management where they can be grazed on pastures unpalatable for sheep and in this system they add another income stream to the property with the sale of weaners, cull cows and a bull annually. These numbers fluctuate throughout the various system factor changes but are consistently required to maintain the 30% level.

### 5.7 Supplementary Feed

Supplementary feed can be purchased or made by the model, if required, to cover a feed deficit or make use of large sale price increases which then allows for greater stock numbers to be supported in an attempt to increase gross profit opportunities.

When meat prices were increased considerably supplements were utilised to meet the needs of additional stock in the system that were included to capture more of the increased meat prices, other than this the other scenarios did not employ this additional feed source.

Simulating a drought in the summer months caused barley to be purchased and fed to cover the deficits and the considerable increase in meat prices also caused 100ha of baleage to be made and an equal amount to be purchased to combine for a total of 2400 bales of baleage on farm. At a 209% increase in meat prices baleage is made on farm, while meat prices required a 281% increase before additional baleage is purchased. This additional feed allowed the stocking rate to increase.

## 5.8 Scenario Tipping Point Analysis

### 5.8.1 Wool Price Decrease

Meat and Wool Economic Service data on New Zealand wool prices (Beef + Lamb New Zealand, 2009c) trends showed fluctuations in wool prices in recent years. This is of concern to C.S. farmers as their decisions are made based upon obtaining a rewarding but stable and sustainable system.

The model's average Merino wool price of $17.03 is 89% greater than the model's Corriedale /Halfbred wool price. With the considerable and critical advantage of wool price assisting the Merino's position in the model the fluctuating market is of concern to potential breed changing farmers and current Merino farmers. Two C.S. farmers, who had looked into the possibility of increasing their Merino flock into areas where an alternative breed was currently farmed, felt that the wool price would need to be above $20/kg greasy for them to initiate a change on their farms.

Merino wool is the traditional fine wool while Corriedale/Halfbred wool is often a stronger fine wool or mid-micron wool. The market is, however, demanding more fine wool and fine mid-micron wool as a result of the finer mid-micron wool being utilised in outdoor performance clothing such as SmartWool socks and garments, as confirmed in Cronshaw's (2010) article. This article explained the increased demand was from the increased size of contracts from a major company. Some of the Corriedale/Halfbred wool such as lamb and hogget wool fits within the boundaries of fine wool as stipulated by (MAF, 2003b). Therefore, their value is linked to Merino values and prices were adjusted at an equal rate to accommodate for this.

A 79% decrease in Merino and Corriedale/Halfbred wool prices is the tipping point for the model to find the optimal breed as the Corriedale/Halfbred. This indicates also that part of the Merino breed's advantages and reasons for the optimal position in the Base Model is its relatively superior wool price. A decrease of this size causes the average Merino wool price to fall from $17.03 /kg to $3.57while the Corriedale/Halfbred wool price is reduced from an average $9.00/kg to just $1.89/kg (Table 1).

**Table 5.1: Wool prices and wool price changes at tipping point**

| | **Lamb Wool** | **Hogget Wool** | **2th Ewe Wool** | **M.A. Ewe Wool** | **Ram Wool** |
|---|---|---|---|---|---|
| **Merino Wool Description** | **(16.5µ)** | **(16.8µ)** | **(17µ)** | **(17.3µ)** | **(16µ)** |
| **Merino $/kg 100%** | $17.97 | $16.20 | $16.20 | $15.26 | $19.54 |
| **Merino $/kg -79%** | $3.77 | $3.40 | $3.40 | $3.20 | $4.10 |
| | | | | | |
| **Corriedale/Halfbred Wool Description** | **(21µ)** | **(22µ)** | **(25µ)** | **(26.1µ)** | **(26.3µ)** |
| **Corriedale/Halfbred $/kg 100%** | $11.00 | $10.62 | $8.63 | $7.50 | $7.25 |
| **Corriedale/Halfbred $/kg -79%** | $2.31 | $2.23 | $1.81 | $1.58 | $1.52 |

At this decreased wool income rate, the Corriedale/Halfbred system returns only $33,588.85 with meat returns of $321,110.84 providing the majority of the gross income of this system. Providing evidence that the wool price adds a considerable advantage to the Merino system, however, once removed the meat income exceeds the wool influence and in doing so finds that the Corriedale/Halfbred system is the optimal system. It is unlikely the wool price will drop this far for this category of wool, based on the current demand outstripping supply (PGP 2010) and the quality that is globally unsurpassed (Brackenridge, 1995).

### 5.8.2 Meat Price Increase

Having identified that the meat price is superior in the Base Corriedale/Halfbred Model and that wool income is the major driving force behind the optimisation of the Merino system in the Base Model, the meat price was increased to determine if the income generated from this could outweigh the Merino wool price. The Corriedale/Halfbred sheep in this analysis have a higher lambing percentage and a faster growth rate than the Merino sheep while also possessing a lower average fleece weight. However, the meat income is greater than that of the Base Model as indicated by the price/kg, although less meat is sold in the Corriedale/Halfbred system than the Base Model and yet income from sheep meat is in excess of the Base Model return. Due to this, meat prices were increased to determine the tipping point where meat income enables the Corriedale/Halfbred to become the optimal breed. Both breeds lack differentiation in the meat market and therefore prices for the meat were increased at the same rate. A 653% increase caused a number of changes in the model to result.

Firstly supplementary feed was utilised and subsequent stock were purchased to utilise this extra feed and maximise the gains from the extreme meat price. Baleage was purchased and made to a total of 2400 bales, and used to support stock through the winter from June through until the end of August. The Canterbury conditions characteristically have a spike of pasture growth in the early summer months of November and December with an average pasture growth of over 40kgDM/ha/day (Ogle, 2007) while the winter growth rates (from April to the start of September) provide less than 10kgDM/ha/day (Ogle, 2007) requiring extra feed to be supplied for an increase in stocking rate.

### 5.8.3 Meat Price Increase Without Supplement Options

The supplementary feed was then removed from the system options, causing stock numbers to decline and align with the Base Corriedale/Halfbred Model numbers. This helped to determine that the tipping point was still the same if the stocking rate was not allowed to increase. The tipping point remained at 653%.

The likelihood of this considerable increase occurring is minimal due to the range of protein sources in today's market (milk and white meat products) which offer themselves as substitutes for red meat. For example, the price of lambs sold pre-Christmas with a premium in the Base Corriedale/Halfbred Model is $100.41, while the 635% price increase would cause the same lamb to be sold for $655.70. This sized price increase would cause a dramatic drop in demand leading to a collapsing of the red meat market and therefore highly unlikely.

#### 5.8.4 Increase In Lambing % and Decrease In Wool Prices

A crude crossbred versus Merino sheep scenario was included in the simulations to allow an indication of tipping points. Gow, Stevenson, Westgren and Sonka (2005) indicated that other sheep breeds could often not be farmed in the high country environment and this has some bearing upon the C.S. properties. While the C.S. properties did not have high country land as the bulk of their properties, they were often neighbouring high country properties and/or possessed some Class 7 & 8 land combined with a high degree of similar environmental conditions, such as hot dry summers and cold winters. This does not rule out English-based crossbreds entirely, as is often the case in a high country farm system. Therefore, the ability of the C.S. properties to farm breeds other than the Merino or Merino cross-breeds (such as the Corriedale or Halfbred) was broadly applied to the model. The input changes include an increase in lambing percentage and a decrease in wool price. These sheep have a greater reproductive performance, larger body weight and growth rates and also have a stronger micron fleece. An example of these sheep is the Perendale which as Meadows (2008) indicates have a fleece with an MFD range of 31µ-35µ, largely in excess of the Merino and Corriedale/Halfbred sheep. The changes in this scenario did not include an increase in sheep liveweight as the Corriedale/Halfbred breeds liveweight and feed profile is similar to that of the crossbred animal. However, an increase of 216% in lambing performance and a decrease of 39% in wool price was the tipping point at which the 'Crossbred System' (Corriedale/Halfbred system with the lambing percentage increased and wool price decrease) was chosen as the optimal system. The effect on actual lambing percentage of the 216% increase caused a change from the original 124% to 267%. This rate is highly unlikely in reality as Meadows (2008) supports with his data indicating a range of 90%-130% for the

Corriedale lambing percentage and 85%-130% for the Halfbred currently in New Zealand. A 39% decrease in Corriedale/Halfbred wool prices causes a change from $9.00 to $5.49, while the average wool price for Merino wool remains unchanged at $17.03/kg. As a result of this stock numbers alter, for example ram numbers drop from 32 seen in the Base Corriedale/Halfbred Model to 27 due to increased feed requirements, resulting from the greater reproductive performance. However, lambing percentages of this size generally require greater quality feed, more shelter and more hospitable climates for the lambs to mature in, as well as pasture quality and quantity to support these lambs. Sheep with lambing percentages this high are involved mainly in meat production systems and therefore feed to fatten these lambs is critical.

This type of system would not be able to be supported in the C.S. property type lands due to the short growing season and the environmental conditions these properties are subject to. This echoes the thoughts of Gow, Stevenson, Westgren and Sonka (2005) that other breeds could not be farmed in these environments. Care must be taken with this basic adaptation of a crossbred type sheep.

### 5.8.5 Corriedale Lambing % Increase

The 124% lambing percentage of the Corriedale/Halfbred sheep is 16% greater than the Merino sheep. This however is not enough to provide more lambs for sale to capture the superior average meat prices available for the Corriedale/Halfbred system as the Base Model optimises the Merinos. Therefore, increasing the lambing percentage was used as a scenario to find the tipping point. An increase of 96% was required to tip the system in favour of the Corriedale/Halfbred. This caused a lambing percentage of 243%. A lambing percentage of this scale is unlikely to occur with Beef + Lamb New Zealand (n.d.) publication on New Zealand Sheep Breeds indicating that the Perendale sheep in the South Island is the largest lamb producer with reproductive performance from this breed numbering up to 170%.

### 5.8.6 Merino Lambing % Decrease

The lambing percentage of 108% for M.A. ewes and 106% for the 2ths is relatively high when compared with the Merino Inc (2003) *100% Club* study that concluded that Merinos in their traditional regions have an average lambing percentage of 82.5%. Therefore, the reduction of

Merino lambing percentage by 48% caused the system to tip to the alternative breed. This showed the Merino Inc (2003) result still allows the Base Model to select the Merino breeds as the most optimal (in-line with that reports final recommendations) and doesn't require a change of breed until lambing percentage reaches 52 % of its assumed rate in the model.

#### 5.8.7 Merino Fleece Weight Decrease

As the Merino wool price provides the largest incentive for the model to optimise this breed the fleece weight was reduced by 46% at which point the tipping point was confirmed for the Corriedale/Halfbred system to become the optimal system. This resulted in relatively low fleece weights and weights that were outside the range described by Meadows (2008). Therefore, while not incapable of happening, a decrease of fleece weight to this level is highly unlikely.

#### 5.8.8 Interview Insights

While the Model suggests the Merino is the optimal system various factors exist that deter (either in part or whole) some farmers from farming the Merino breed. This is the case in three of the seven C.S. properties visited which have no Merino sheep and an additional three which have only part of their flock dedicated to Merino sheep. Therefore, the Merino breed selection by the model and the robustness of these results when tested with likely scenarios is in some cases at a large disparity with the farms visited. This is in part due to the model using representative data from the seven different properties instead of individual data from each property. Admittedly, an individual model and system analysis with each farmer to assess the merits and disadvantages of a breed change on each farm would be the most accurate way in determining whether change would benefit their circumstances appropriately. However, this was not possible in the time frame and as such, the representative model is used to indicate a basic direction as an initial stage in a process that would involve many considerations unique to each property and management team.

The negative issues highlighted by the farmers for expanding the Merino area were often also provided with a solution or another farmer inadvertently provided a mitigating idea that could lessen these issues. Footrot, lice, worms, fly-strike, grazing behaviour, lamb growth rates and perceived market directions are all factors identified. These go some way to explaining the current lack of these breeds on the seven C.S. properties.

Footrot appears to be a large concern to six of the C.S. farmers. Footrot is a large deterrent due to the many implications it provides to all parts of a farm system and the detrimental effect it has on stock and staff as Patterson & Patterson (1991) explain.

Those C.S. farmers who farm Corriedales or Halfbreds with no Merinos in their system, identify that they have experienced footrot with their sheep breed and feel that the Merino possess a greater risk of contracting this disease which is in line with Patterson & Patterson's (1991) identification that the Merino is the most susceptible breed to footrot infection. Additionally, the farmers who have a mix of Merinos in their systems also identify that certain areas of their farms provide a higher risk area due to the heavier soils and greater pasture growth. In these areas they farm either a Corriedale or Halfbred flock and explained that they were able to manage the footrot these flocks have, with greater ease than they believe they could with the Merino in these areas. None of the farmers felt that footrot would be a totally limiting factor for a breed change to the Merino but explained that costs would increase if a footrot infection were to eventuate and, at present, are content to maintain the breeds they have as the incentives to risk the Merinos is not warranted. For this risk to be taken they would require price increases on their wool price.

The C.S. farmer who has a sole Merino flock still experiences footrot but described it as "manageable" with the use of the Lincoln University Footrot Gene-Marker Test, culling of the worst cases, separation of the different levels of infection to help to increase recovery while also attempting to encourage immunity. The Gene-Marker test use is in contrast to another C.S. farmer who does not employ this technology due to fellow farmers deterring him with examples of this technology's apparent failure, however the disregard for this technology may be unfounded and an opportunity may be missed by this farmer. A lack of information was also expressed by another farmer who communicated he was not "fully up-to-speed" (Farmer E, personal communication, 2010) on the Merino footrot work and would be largely concerned with contracting footrot at off-farm grazing locations. Neighbouring farms with poor subdivision also cause concern for two of the seven farmers identifying that footrot can be contracted from infected neighbouring flocks. Further to these examples is Waihi Pukawa station described in the "Station confident about adding red deer to the mix", (2005) article which explained the successful farming of Merino on the Central North Island Plateau and included an important point from the Station manager that he felt the coarse, free-draining soils prevalent in this area due to the pumice-based soils contributed to good foot condition and reduced the warm moist conditions required for the development of the Footrot disease.

This was further re-enforced by several C.S. farmers who felt that the dry, free draining and often stony soils offered a large challenge to the Footrot disease and thus found their Merinos performed exceptionally well compared to the other breeds trialled in these areas. These areas also offered harder grazing conditions that suited Merino. Preventative methods were also endorsed by farmers who stood sheep in a footbath after shearing to exclude any bacteria and provide greater immunity to infected sheep from neighbouring properties. Additionally clean musters were stressed as highly important. Another C.S. farmer who had experienced widespread footrot infection on his property but managed to successfully control the problem described, "the footrot problem is 30% management, 30% foot shape and 40% genetics" (Farmer C, personal communication, 2010). In light of all this, the factors that farmers feel may restrict them or cause extra costs and time may indeed be overcome with management techniques and utilisation of technology available to them to develop a successful flock that is not hampered by footrot.

Two of the C.S. farmers, both with Merino sheep in their farm systems, had experienced a lice infestation. Both insisted that plunge dipping with a lice eradicating chemical either straight off shears or 6-8 weeks post shearing allowing the chemical to soak into the short fleece, clean musters and exclusion of infected sheep through straggle aerial shooting and adequate fencing are all required to maintain a lice free flock. Additionally, dipping lambs at weaning has enabled one farmer to avoid lamb crutching.

Worms also appear to some of the C.S. farmers to pose an additional cost as they feel the Merino has higher worm prevalence. Mitigating methods used by some of the C.S. farmers currently with Merinos in their systems, include rotational grazing, drenching and monitoring which help determine the level of worms and appropriate allocation of drench when required.

Fly-strike is also identified as a problem that is exacerbated by the wrinkled skin of the Merino, especially in the breach and back areas. These farmers and others also commented that a greater emphasis is being put on the plainer bodied Merino by breeders, with one ram breeder confirming this trend (Farmer C, personal communication, 2010) but also explaining that these animals do come at a relatively larger cost as they are in high demand.

Pasture management with Merinos is identified by all three non- Merino farmers and two of the mixed- breed (Corriedale/Halfbred and Merino) farmers as a negative of the Merino. The Merino is said to unevenly graze blocks as a result of their preference for staying high on hills for the majority of the day and leaving lower altitude feed to reduce in quality. Mitigation techniques employed include the use of salt blocks positioned in areas the Merinos do not tend to frequent. If the salt is also placed in areas where the Merino does not visit for water then the area grazed is potentially increased. The use of cattle has also been used as a method of controlling pasture quality in areas the Merinos neglect. One farmer (Farmer C, personal communication, 2010) described the action he would take if grazing Merinos in his damper shady areas (which has been considered) where the Halfbreds are currently grazed. A reduction of fertiliser would occur and an increase in cattle stocking rate would be used to graze the shady areas. Merinos appear from farmer comments to have a 'sulky' nature, which is explained as a sheep that is not comfortable in the conditions they are provided with, such as small paddocks and results in poor health causing them to sit and reduce feed intakes. This leads to lower animal production and poor pasture utilisation. This type of behaviour encourages one farmer who has irrigation to comment ""because of the irrigation on the flats we need the Halfbred or Corriedale to makes the most of that" (Farmer E, personal communication, 2010).

Reasons for the current farming of Corriedale and Halfbred sheep in these systems is in part due to the ability to grow larger lambs earlier in the season to increase meat returns while also having a plainer body to reduce fly strike. The Halfbred is also supported by their respective farmers as having greater tolerance for feed deficits throughout the year and a better recovery from such periods than they believe the Merino would possess. Lamb size is also an advantage that the Corriedale and Halfbred farmers included as motivation for farming these sheep. The ability to have a larger birth weight improves lamb survival against the Merino which the non-

Merino farmers feel have a poor lamb survivability in comparison and are deterred by this predicted lack of available lambs for sale. The Model tested a reduction in lambing percentage for the Merinos and dramatic losses were required to turn the system in favour of the Corriedale/Halfbred.

Three of the seven farms with Merinos are moving their flocks towards a Poll Merino type animal. This allows for a plainer bodied sheep, greater growth rates and larger carcass size in an attempt to make them more dual purpose. This type of sheep is also less prone to fly-strike. The Model would suggest that this is unnecessary as the wool prices cover the lack of meat in comparison to the Corriedale/Halfbred system. However, the move will increase meat income which, in the model’s case strengthening the Merino system’s position, but in the case of the C.S. farmers utilising these sheep will increase gross returns and provide a further risk reduction strategy by strengthening the quality and quality of another product from the stock. The C.S. farmer with the sole Merino flock system is one of these properties and quotes, “when you do the figures on them, the Merino is the dual purpose sheep” (Farmer B, personal communication, November 2010).

### 5.8.9 Meat and Wool Future Views

All C.S. farmers feel that fine wool prices have lifted due to a recent demand for the products and believe the future is positive for the product, however they are wary of the fluctuations and the past experiences (some cite the 1980’s rise and fall in demand for Merino stock) as being largely unsuccessful for many. This positive outlook however means that farmers are open to advancing their farms to make the most of opportunities and are willing to look at the Merino to determine whether it can meet their needs in reference to the market conditions, as long as the returns are sustainable and come with a level of assurance. Some farmers are currently, actively comparing breeds with neighbours while at the other end of the spectrum others are content with their breeds but do appear to still remain open to information and do not disregard a breed change if it offers adequate incentives. One farmer who actively pursues the meat option with Halfbreds ensures his flock maintains a fleece of between 22-26μ as a risk management strategy and a secondary income stream. He feels that the meat prices are the direction to head towards with more security in meat demand than fine wool demand (Farmer E, personal communication, 2010). This system would be in-line with the Base Corriedale/Halfbred Model, which places meat income above wool income. However, in this case the comparison to the Merino system is apt as the EBIT and optimisation broadly indicates this farmer may benefit from a breed change.

With regards to meat industry direction, the farmers identify the demand for meat, globally, is only partially met with the view that there are many opportunities for New Zealand meat overseas. All remain positive about the industry while two expressed frustration as well at the lack of movement in the marketing of Merino meat as a niche product. However, since the interviews in November 2010 and the writing of this Dissertation (February 2011) TNZMC and Silver Fern Farms (SFF) have offered an opportunity to develop this niche market. This comes in the form of contracts as part of a partnership deal between SFF and TNZMC which offers three year contracts to fine wool growers (Wallace, 2010). These potentially increase the price gained by fine wool growers for meat and remove some price fluctuation risk from the meat prices received. It must be noted that the benefits from this will be incurred across the Corriedale, Halfbred and Merino evenly as the threshold for the acceptance into the contracts allows for this. This type of plan should meet the main objective of the farmers interviewed who value price security, premiums and a niche product market when compared to the fluctuations of a commodity product.

### 5.9 Changes To The Merino Breed To Encourage A Breed Change Identified By C.S. Farmers

- More dual purpose ability
  - Plainer bodied Merino
  - Lamb weight higher for lamb survival and early sales
  - Maintain or improve wool when moving towards a more dual purpose focused Merino
  - Improve lambing percentage and weaning percentage
- Improve ability to withstand periods of nutrition restriction (quantity and/or quality of feed) and the ability to recover condition from this efficiently after the restricted period has passed
- Provide consistent performance over and above the current systems
- Not require significantly more time or effort than current system
- Increase uniformity of grazing
- Improve mothering ability
- Increase fertility
- Decrease risk of neighbouring sheep contaminating flocks with disease (e.g. having boundaries further from neighbouring properties and the ability to maintain fences adequately)
- Greater disease resistance

Three of the seven farmers, who have a mixture of Merinos and either Corriedale or Halfbreds explained that the price would need to increase to at least $20/kg greasy for them to consider placing Merinos into their more risky areas. However, if this price were to eventuate their change would be regardless of whether the above changes to the sheep had occurred or not.

### 5.10 Farmers Views On A Breed Change

Of the seven farmers interviewed none appear to constrain their farm from changing to Merino flocks either in part or as a total system change by their own actions. All are open to the idea with confidence and would be able and willing to successfully farm the Merino either as a system change from their non-merino breed or increasing their current Merino flocks into the areas where their other breed is currently. Four of the C.S. farmers explained if they did change to the Merino they may require some off-farm assistance for information and could all identify sources for this such as neighbours, wool classers, more experienced farming friends, industry training organisations and TNZMC. The remaining three farmers explained that they were confident they could handle the change if required without much assistance off farm.

# 6. Conclusions

The data collected and integrated into the LP and the interview insights gained for this representative model showed the Merino breed to be superior to that of the Corriedale/Halfbred sheep. The background to the Merino breed's optimal position has been discussed earlier. Simply, this showed the ability of the Merino system to support more sheep than the Corriedale/Halfbred system, due to the Merinos' smaller body weight and subsequently lower feed requirement. The Merino also has a larger fleece per sheep, giving more wool per sheep and is further increased by the higher price for Merino wool. Wool is the major advantage the Merino breed has over the Corriedale/Halfbred sheep in conjunction with the lower live weight. The Corriedale/Halfbred has a higher meat return due to a faster growth rate allowing seasonal premiums to be obtained compared to the Merino breed.

The Merino wool price advantage was shown when a decrease of -79% of all wool prices enabled the Corriedale/Halfbred to become optimal. This reduction in wool price allowed the Corriedale/Halfbred breed's meat price to exceed the Merino wool price.

Research Objective 1:

> *To ascertain a comprehensive list and explanation of constraints and the impact they have on potential and current Merino systems in non-traditional land.*

The LP indicates that the Merino breed in the model is not limited by financial constraints (it is a profitable system). Additionally, all farmers stated they were willing to change breeds if their property was suitable and the breed change met their requirements. These requirements are summarised as having a farming system that is rewarding, stable and sustainable. The financial viability and farmer enthusiasm provide a positive outlook for increasing Merino numbers in these non-traditional areas. This could ultimately increase the national Merino flock size.

The following constraints have been identified as challenges to current and potential Merino systems. These challenges are: footrot, lice, worms, fly-strike, grazing behaviour, lamb growth rates and perceived market directions. These factors have previously been discussed (Section 5) as to their effect with appropriate mitigation techniques. Admittedly, all methods increase costs such as the purchase of plainer bodied sheep, genetically superior sheep in terms of footrot resistance and growth rates, further inputs for animal health and grazing behaviour (e.g. salt blocks and labour to move stock for rotational grazing). These items have been addressed by some current farmers who graze Merinos in non–traditional Merino country and are testament to the success of these techniques and the Merino abilities if managed correctly.

However, three of the four farmers with Merinos have a mixed breed system. These three indicated that they graze their Merinos in their hotter, harsher country and leave their other breed (Corriedale or Halfbred) for the relatively more productive and wetter areas. These harsher areas allow for the Merino health problems to be reduced (e.g. footrot is less likely in drier stony areas where feet are naturally "manicured" and soil moisture levels are lower). These farmers have found that the alternative breed of the Halfbred or Corriedale do not perform to their maximum in the harsher areas due to a mixture of factors (topography, climate and feed availability).

<u>Research Objective 2:</u>

> *To determine if Merino systems have potential in non-traditional areas currently farmed with the Corriedale and/or Halfbred sheep.*

These farmers provide an important example and motivation leading to the major recommendation of this study.

It appears from this study that the Merino sheep has great potential in non-traditional areas. However, this does not mean that a total breed change should occur on farms in those areas with the alternative breed. It indicates that there is a potentially successful opportunity for these farmers to increase their returns by utilising the Merino breed on their properties. Based upon the findings of the representative LP and interviews, it would be advisable for farms involved in this study, and those in similar land classes, to do two things:

1) Investigate thoroughly the option of changing to a Merino breed if currently farming Corriedale or Halfbred flock with a property-specific approach. Individual farm constraints will obviously provide limitations to each farm system and may prove, inevitably, to restrict this sheep breed; however, this report should encourage growers to trial the Merino sheep breed if not already farming Merinos. A breed change is obviously a very large undertaking on a farm and will be dependent upon case-by-case situations as to whether or not they are able to make this move, at this time. The tolerance of the model to wool price decreases also indicated that at extremely low wool returns for both systems, the Corriedale/Halfbred system is better. The wool price decrease required for the -79% tipping point is extreme and unlikely. Additionally, prices that many would consider low, relative to today's prices, would still support the Merino breed as the optimal breed. This shows a relatively large amount of tolerance for market movements and in doing so indicates that the Merino system is worth exploring.

2) Allow the analysis of the breed change to look at changing part of the property to Merinos to make use of the suitable area, thus gaining greater production from harsher areas of the properties (in terms of terrain, climate and feed availability) and gaining a greater risk-management situation with an additional, different breed. A major factor that will allow farmers in non-traditional areas to farm the Merino with greater success is the influence of the Poll Merino that will in future aid the increase of meat returns, reduce fly-strike issues and enable feed to be utilised more efficiently as lambs can be sent away earlier, allowing for more ewes and subsequently more lambs and wool to be produced.

Research Objective 3:

> *If the Merino is shown to be optimal then this project would be used to encourage increases in the national Merino flock.*

As the Merino breed has been shown to be optimal in this model, the recommendation to farmers to investigate the change on a case-by-case basis is encouraged.

Research Objective 4:

*Provide a document that is easily understood and practically useful.*

The LP is combined with a methodology and based upon C.S. data and basic assumptions that are realistic and applicable.

Research Objective 5:

*Provide data to aid persons looking to develop these types of systems most appropriately.*

Methods of managing the most common issues identified in the interviews were identified in the discussion and explained in depth.

**Further Areas For Research**

1) Research into the costs of reducing the micron of the Corriedale and Halfbred fleeces both in terms of fibre modification technologies as well as the investigation of the physical and financial effects of reducing the micron in Corriedale and Halfbred flocks.

2) The profitability effect on both systems from the recent release of meat contracts for Merino-based sheep meat. These contracts apply to Merino and Merino-cross sheep but having previously identified that the Corriedale/Halfbred breeds have a superior meat income to the Merino due to growth rates and time of sale, the contracts may further encourage this and enable the meat price to provide greater competition against superior straight Merino wool returns.

# 7. References

Animals Australia. (n.d.). *Mulesing Deadline Delay – Another pain in the backside.* Retrieved January 11, 2011, from http://www.animalsaustralia.org/features/mulesing-deadline-delay.php

Ashley-Jones, C. (2010, December 17). *Dairy Cattle Numbers Close to 6 million.* Retrieved from http://search.stats.govt.nz/search?af=&w=livestock+numbers&date=12m&button2.x=18&button2.y=4

Australian Bureau of Statistics. (2010a. April 9). *Media Release: Sheep and lamb numbers fall to their lowest levels since 1905.* Retrieved from: http://www.abs.gov.au/ausstats/abs@.nsf/mediareleasesbytitle/D793AD9EE6BCF107CA257456001F1839?OpenDocument

Australian Bureau of Statistics. (2010b. April 9). *The Wool Industry: Looking back and forward.* Retrieved from: http://www.abs.gov.au/Ausstats/abs@.nsf/46d1bc47ac9d0c7bca256c470025ff87/1476d522ebe22464ca256cae0015bad4!OpenDocument

Automobile Association. (2008). *AA Petrol Watch.* Retrieved from http://www.aa.co.nz/motoring/owning/running-costs/petrolwatch/Pages/December2008.aspx

Automobile Association. (2010). *AA Petrol Watch.* Retrieved from http://www.aa.co.nz/motoring/owning/running-costs/petrolwatch/Pages/AA-Petrolwatch-2010.aspx

Bascand, G. (2010, February 9). *Dairy Cattle Numbers continue to rise.* Retrieved from http://www.stats.govt.nz/browse_for_stats/industry_sectors/agriculture/agriculturalproduction_mrjun09prov.aspx

Beef + Lamb New Zealand Economic Service. (2010b, October 26). *Sheep and Beef Outlook Drivers.* Retrieved from http://www.beeflambnz.com/main.cfm?id=259

Beef + Lamb New Zealand Economic Service. (2010c, August 2). *Wool Statistics: Wool Exports July – June 2009-2010.* Retrieved from http://www.beeflambnz.com/main.cfm?id=259

Beef + Lamb New Zealand Economic Service. (2010a, September 20). *NZ Meat Sector Domestic Pastoral Trends.* Retrieved from: http://www.mia.co.nz/docs/miaconference/2010/Presentations/100920%20Rob%20Davison.PDF

Beef+Lamb New Zealand Economic Service. (n.d.) *Sheep & Beef Breeds.* Retrieved February 22, 2011 from http://www.beeflambnz.com/main.cfm?id=397

Brakenridge, J.D. (1995). *Wool: The Official Publication of the Massey Wool Association of New Zealand Inc,8* (7), 37-38.

Buchanan, O.R. (1954). *The Wool Education Society: Sheep Farming in NZ.* London, England: Department of Education of the International Wool Secretarial

Chaston, T. (Ed.). (2008). *Financial Budget Manual 2008.* Christchurch, New Zealand Lincoln University Agriculture and Life Science Division.

Cronshaw, T. (2010, March 23). U.S. Sock supplier wants more NZ Merino wool. *The Southland Times.* Retrieved from http://findarticles.com/p/articles/mi_8058/is_20100323/ai_n52686331/

DairyNZ. (2009, February 13). *Submission by DairyNZ to the Emissions Trading Scheme Review Committee.* Retrieved from http://www.dairynz.co.nz/file/fileid/29022

Dalton, D.C. (2006). *New Zealand Sheep and their wool.* Hong Kong, China: Colorcraft Ltd.

Dent, J.B., Harrison, S.R. & Woodford, K.B. (1986). *Farm Planning with Linear Programming: Concept and Practice.* Sydney, Australia: Butterworths Pty Ltd.

Fleming, P. H. (Ed.). (2003). *Farm Technical Manual.* Christchurch, New Zealand: Farm Management Group Lincoln University.

*Gow, H., Stevenson, M., Westgren, R. & Sonka, S. (2005). Farmer Identification and Commitment Responses to Institutional Change in Marketing Channel Structures*: Proceedings of the AAEA Annual Meeting, Providence, Rhode Island, 24-27 July 2005. Urbana, IL: University of Illinois at Urbana-Champaign.

Greer, G. (2003). *Review of the New Zealand Merino industry: A report to Merino New Zealand Inc.* Agribusiness & Economics Research Unit, Lincoln University. Retrieved January 9, 2011 from http://www.Merinoinc.co.nz/Reports/ReviewIndustry.pdf

Greer, G. (2004). *The Impact of Tenure Review on the Economic Output of Crown Pastoral Lease Land: A Confidential Report to MAF Policy.* Retrieved March 28, 2010, from http://www.highcountryaccord.co.nz/index.php?doc=29

Harrigan, J. (2010, May 31). NZ Merino gets $15m PGP grant. *The New Zealand Farmers Weekly*. Retrieved from http://www.nzfarmersweekly.co.nz/article/8280.html

High Country Accord. (n.d.). *Land Tenure Review*. Retrieved May 16, 2010, from http://www.highcountryaccord.co.nz/index.php?page=12#1wha

Hutchinson, J. (1994). Merinos on un-traditional ground – the volcanic plateau. *Wool Report 1994*, 13.

Icebreaker. (2009, February 9). *Press Releases: Sports people flock to Merino outdoor clothing.* Retrieved from http://media.icebreaker.com/index.php?s=43&item=11

Inland Revenue Department. (2010, May 25). *Technical Tax Area: National average market values of specified livestock determination 2010.* Retrieved from http://www.ird.govt.nz/technical-tax/determinations/livestock/national-averages/livestock-nationalavemarketvalues-2010.html

International Wool Textile Organisation. (2008). *Market Information: Edition 2008.* p.14.

Land Information New Zealand. (n.d.). Tenure review Backgrounds & Process. Retrieved March 25, 2010 from, http://www.linz.govt.nz/crown-property/pastoral-land-tenure-review/tenure- review/tenure-review-background/index.aspx

Ludemann, C. (2009). *Is increasing ewe prolificacy the key to increasing Canterbury Dry Land Farm profitability?* (Masters dissertation). Lincoln University, Lincoln, New Zealand.

Lynch, R., Gardiner, P., Wallace, R., Hamilton-Seymour, B., Harold, R., Cao, K., and Forbes, R. (2006). *Agricultural Economies of Australia and New Zealand*. Retrieved from http://www.abare.gov.au/interactive/ausNZ_ag/htm/nz_wool.htm

Lynn, I.H., Manderson, A.K., Page, M.J., Harmsworth, G.R., Eyles, G.O., Douglas, G.B., Mackay, A.D., Newsome, P.J.F. (2009). *Land Use Capability Survey Handbook: A New Zealand Handbook for the classification of land.* (3rd ed.). Retrieved October 12, 2010, from http://www.landcareresearch.co.nz/research/soil/luc/

Macfie, R. (2005, February 28). *Moonstruck: Inside Icebreaker.* Retrieved from (http://unlimited.co.nz/unlimited.nsf/growth/moonstruck-inside-icebreaker)

MacKintosh, L. (2001). *Overview of New Zealand Climate.* Retrieved January 10, 2011, from the National Institute of Water & Atmospheric Research [NIWA] website: http://www.niwa.co.nz/education-and-training/schools/resources/climate/overview

Marsh, V. (2005). The merino makes a break from the flock for a life of luxury product branding. *The Financial Times.* August 17. p.11.

Massey, C. (2007). *The Australian Merino: A Story of a Nation.* Australia: Random House.

Matthews, M. (1996). *The North Island Merino - Production, Disease and Welfare*: Proceedings of the 26th Annual Seminar, Society of Sheep & Beef Cattle Veterinarians NZVA and 2nd Pan Pacific Vet Conference on Sheep, 1996.

Meadows, G. (2008). *Pocket Guide to Sheep Breeds of New Zealand.* Auckland, New Zealand: New Holland Publishers

Meat & Wool New Zealand. (2009, September 21). *Meat and Wool Sector: Domestic Trends.* Retrieved from the Meat and Wool New Zealand website, http://www.meatandwoolnz.com/main.cfm?id=261

Merino Inc. (2003). *Reports: Farm Management*. Retrieved April 29, 2010, from http://www.merinoinc.co.nz/Reports/100pcClub-Summary.pdf

Merino Inc. (2009). *Newsletter: Spring 2009*. Retrieved March 20, 2010, from the website: http://www.merinoinc.co.nz/news.html

Merino Inc. (2010). *About Us: Background and History.* Retrieved January 9, 2017, from http://www.Merinoinc.co.nz/about.html#background

Merino Inc. (n.d.). *Fact Sheet: Where do Merino live?* Retrieved January 10, 2010, from http://www.merinoinc.co.nz/Factsheets/Merino_FAQ.pdf

Ministry of Agriculture and Forestry. (2003a). *Wool Industry.* Retrieved January 10, 2010, from http://www.maf.govt.nz/mafnet/rural-nz/profitability-and-economics/contribution-of-land-based-industries-nz-economic-growth/contribution15.htm

Ministry of Agriculture and Forestry. (2003b). *Wool Production in New Zealand.* Retrieved January 8, 2011, from the Ministry of Agriculture and Forestry website: http://www.maf.govt.nz/mafnet/rural-nz/overview/nzoverview009.html

Ministry of Agriculture and Forestry. (2009). *Situation and Outlook for the Primary Sectors: Wool.* Retrieved January 9, 2011, from http://www.maf.govt.nz/mafnet/rural-nz/statistics-and-forecasts/sonzaf/2009/index.htm

Ministry of Agriculture and Forestry. (2009a). *Meat: The Future: opportunities and challenges for the New Zealand Sheep Meat and Beef sector of the next 10-15 years*. Retrieved from the Ministry of Agriculture and Forestry website: http://www.maf.govt.nz/mafnet/publications/meat-the-future/index.htm

Ministry of Agriculture and Forestry. (2009b). *Situation and Outlook for New Zealand Agriculture and Forestry.* Retrieved January 9, 2011, from: http://www.maf.govt.nz/mafnet/rural-nz/statistics-and-forecasts/sonzaf/2009/sonzaf-2009.pdf

Ministry of Agriculture and Forestry. (2010a, August 1). *Pastoral Monitoring 2010 Canterbury/Marlborough Hill Country Sheep and Beef.* Retrieved from http://www.maf.govt.nz/newsresources/publications.aspx?title=Farm%20Monitoring%20Report&keywords=beef%_20sheep

Ministry of Agriculture and Forestry. (2010b). *Situation and Outlook for New Zealand Agriculture and Forestry.* Retrieved January 9, 2011, from http://www.maf.govt.nz/mafnet/rural-nz/statistics-and-forecasts/sonzaf/2010/2010-sonzaf.pdf

Ministry of Agriculture and Forestry. (n.d.). *Pastoral Agriculture: The Competitive Edge.* Retrieved January 11, 2011, from: http://www.maf.govt.nz/mafnet/rural-nz/overview/nzoverview007.htm

Morris, S.T., Kenyon, P.R. & West, D.M. (2005). Effect of hogget nutrition in pregnancy on lamb birthweight and survival to weaning. *New Zealand Journal of Agricultural Research, 48*, 165-175. doi: 0028-8233/05/4802-0165

New Zealand Trade & Enterprise. (2010). *Outstanding Leader: John Brakenridge*. Retrieved from New Zealand Trade and Enterprise website: http://www.nzte.govt.nz/latest-events/new-zealand-international-business-awards/award-winners-2010/pages/outstanding-leader.aspx

Nicol, A. & Saunders, C. (2009, March 1). *Wool Products and Marketing.* Retrieved from http://www.teara.govt.nz/en/meat-and-wool/7

Nicol, A.M. & Brookes, I.M. (2007). The Metabolisable Energy Requirements of Grazing Livestock. In P. V. Rattray, I. M. Brookes and A. M. Nicol (Eds.), *Pasture and Supplements for Grazing Animals Occasional Publication 14* (pp.151-172). Hamilton, New Zealand: NZ Society of Animal Production

NZX Agri. (2010, April 19). New Zealand Farmers Weekly. Retrieved from http://viewer.zmags.com/showmag.php?mid=rdqrrt#/page0/

Ogle, G.I. (2007). Farmax Pro (Version 6.3.71.3) [Computer Software]. Hamilton, New Zealand: Farmax Ltd.

Patterson, R., Patterson, H. (1991). The selection and breeding of Merino sheep for footrot resistance. *New Zealand Society of Animal Production*, *51*. 283-286.

Primary Growth Partnership. (2010, May 26). *Merino Sheep – more than wool: The New Zealand Merino Company.* Retrieved from http://www.maf.govt.nz/Portals/0/Documents/agriculture/assist-funding/pgp/media-bkgrnd-nzm.pdf

Saporito, B. (2010, March 22). *TIME: Icebreaker is a natural.* Retrieved from http://www.time.com/time/magazine/article/0,9171,1971425,00.html

Station confident about adding deer to the mix. (2005, June 1). *Country-Wide.* Retrieved from http://www.country-wide.co.nz/article/3630.html

Statistics New Zealand. (2010, May 13). *Agricultural Production Statistics: June 2009 (Final).* Retrieved from http://www.stats.govt.nz/browse_for_stats/industry_sectors/agriculture-horticulture-forestry/AgriculturalProduction_HOTPJun09final.aspx

Stevens, P.G. (1967). *Sheep: Part 2 Sheep Farming Development and Sheep breeds in New Zealand.* Christchurch, New Zealand: Whitcombe and Tombs Limited.

Stevenson, M.D. (2004). *Stakeholder responses to institutional change in the New Zealand Merino Industry*. Urbana, IL:University of Illinois, Urbana-Champaign

Straight Furrow. (2010-2011) Market Report. *Straight Furrow New Zealand's Rural Weekly, 63*(1) –*64*(1).

Stringleman, H. & Peden, R. (2009, March 1). *Sheep Farming: New Zealand Sheep Breeds.* Retrieved from Te Ara - the Encyclopaedia of New Zealand website: http://www.teara.govt.nz/en/sheep-farming/6

Sumner, R.M.W. (2005). Relationship of mean fibre diameter and time of shearing with wool yellowing in Merino sheep farmed under North Island conditions. *New Zealand Society of Animal Production, 65*.191-196.

Sumner, R.M.W., Young, S.R., Upsdell, M.P. (2003). Wool yellowing and pH within Merino and Romney fleeces. *New Zealand Society of Animal Production, 63.* 155-159.

Tarawera Publishing Ltd. (2011, January 25). *Compare mortgage rates.* Retrieved from http://www.goodreturns.co.nz/compare-mortgage-rates.html?CategoryID=201&loan_type=rate_1year&start_day=1&start_date=201001&end_day=1&end_date=201101&lender_ID%5B%5D=25

Tenure review cuts Merino numbers. (2008, June 7). *The Press.* Retrieved from http://www.stuff.co.nz/business/farming/477377

The New Zealand Merino Company. (2006a). *About Merino: The Brand.* Retrieved January 9, 2011, from http://www.nzMerino.co.nz/about/about.asp

The New Zealand Merino Company. (2006b). *New Zealand Merino is one of life's luxuries.* Retrieved January 13, 2011, from http://www.nzmerino.co.nz/home.asp

The New Zealand Merino Company. (2011a). *A new fibre category: Zque- 'ethical wool'.* Retrieved January 11, 2011, from http://www.zque.co.nz/

The New Zealand Merino Company. (2011b). *Animal Welfare: It takes a tough Merino to make the perfect fibre.* Retrieved January 11, 2011, from http://www.zque.co.nz/content/animal-welfare.php

Wallace, N. (2008, April 25). NZ avoid boycotts by dropping mulesing. *Otago Daily Times.* Retrieved from http://www.odt.co.nz/tags/agriculture/3988/nz-avoids-boycotts-dropping-mulesing

Wolfe, R. (2006). *A Short History of Sheep in New Zealand*. Auckland, New Zealand: Random House New Zealand

Wood, A. (2010, January 12). NZ Merino Farmers seek greater control. *The Press*. Retrieved from: http://www.stuff.co.nz/business/farming/3221670/NZ-Merino-farmers-seek-greater-control

# 8. Appendix A: Questionnaire

# Questionnaire

## As Part of Case Study Research for

## Rob Kidd's Masters Research:

## *'How can New Zealand producers increase the level of fine wool production?'*

**Farmer Participant Name: ______________________________**

**Property Name: ________________________________**

For any further details, queries or questions please feel free to contact Rob Kidd at anytime.

Mob: 027 285 4259

Email: rob.kidd@lincolnuni.ac.nz

## SHEEP:

## BREED 1

**Breed:**

**Numbers:**

| *Lambs* | *Ewe Hoggets* | *Ram Hoggets* | *2th Ewes* | *M.A. Ewes* | *Rams* |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

**Mating Date:**

**Lambing %:**

**Weaning %:**

**Death Rates:**

| *Lambs* | *Ewe Hoggets* | *Ram Hoggets* | *2th Ewes* | *M.A. Ewes* | *Rams* |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

**Culling Rate and Policy:**

**Replacement Rate:**

**Sheep Weight Profile:**

| *Dec* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *July* | *Aug* | *Sept* | *Oct* | *Nov* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Summer | | | Autumn | | | Winter | | | Spring | | |
| | | | | | | | | | | | |

**Sheep *Sale* Dates & Numbers:**

| | *Lambs* | *$* | *Ewe Hoggets* | *$* | *Ram Hoggets* | *$* | *Cull Ewes* | *$* | *Rams* | *$* | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | | | | | | | | |
| Number | | | | | | | | | | | |

**Sheep Weights**

| | *Jun* | *July* | *Aug* | *Sept* | *Oct* | *Nov* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ram Lambs | | | | | | | | | | | | |
| Ewe Lambs | | | | | | | | | | | | |
| Ewe Hoggets | | | | | | | | | | | | |
| Ram Hoggets | | | | | | | | | | | | |
| 2th Ewes | | | | | | | | | | | | |
| M.A. Ewes | | | | | | | | | | | | |
| Rams | | | | | | | | | | | | |

**Sheep *Purchased* Dates & Numbers:**

| | *Lambs* | *$* | *Ewe Hoggets* | *$* | *Ram Hoggets* | *$* | *Cull Ewes* | *$* | *Rams* | *$* | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | | | | | | | | |
| Number | | | | | | | | | | | |

**<u>Hogget Mating (if applicable)</u>**

**Numbers mated:**

**Mating Date:**

**Lambing %:**

**Weaning %:**

**Weaning Date:**

**Culling Rate and Policy:**

**Destination of hogget mated lambs:**

| | ***Lambs*** | ***$*** | ***Ewe Hoggets*** | ***$*** | ***Ram Hoggets*** | ***$*** |
|---|---|---|---|---|---|---|
| Date | | | | | | |
| Number | | | | | | |

**<u>WOOL</u>**

**<u>Details</u>**

| | *Ram Lambs* | *Ewe Lambs* | *Ewe Hoggets* | *Ram Hoggets* | *2th Ewes* | *M.A. Ewes* | *Rams* |
|---|---|---|---|---|---|---|---|
| *μ* | | | | | | | |
| $/kg | | | | | | | |
| Fleece weight | | | | | | | |

**<u>Shearing Dates</u>**

| | *Ram Lambs* | *Ewe Lambs* | *Ewe Hoggets* | *Ram Hoggets* | *2th Ewes* | *M.A. Ewes* | *Rams* |
|---|---|---|---|---|---|---|---|
| Date | | | | | | | |

**<u>Shearing Costs</u>** <u>(total costs are the most important and will suffice of breakdown is unavailable)</u>

| | *Shearing 1* | *Shearing 2(if applicable)* |
|---|---|---|
| | | |
| Wool Classer | | |
| Shearers | | |
| Cost of Shearing | | |
| **Total** | | |

**Wool sales method:**

**ANIMAL HEALTH**

(Total costs are the most important and will suffice of breakdown is unavailable)

| | ***Totals*** |
|---|---|
| | |
| Dipping | |
| Feet | |
| Drenching & Inoculating | |
| Tagging | |
| Tailing | |
| **Total Animal Health** | |

or per stock class

(Total costs are the most important and will suffice if breakdown is unavailable)

| | *Lambs* | *Ewe Hoggets* | *Ram Hoggets* | *2th Ewes* | *M.A. Ewes* | *Rams* |
|---|---|---|---|---|---|---|
| | | | | | | |
| Dipping | | | | | | |
| Feet | | | | | | |
| Drenching & Inoculating | | | | | | |
| Tagging | | | | | | |
| Tailing | | | | | | |
| **Totals** | | | | | | |

**MANAGEMENT**

**Fertiliser**

| *Land Type* | Area | *Fertiliser Type* | *Application rate* | *Frequency* |
|---|---|---|---|---|
| | | | | |
| | | | | |

**Lime**

| *Land Type* | Area | *Lime Type* | *Application rate* | *Frequency* |
|---|---|---|---|---|
| | | | | |
| | | | | |

**Re-grassing Programme**

| *Land Type* | Area | *Seed Mix/ Types* | *Sowing Rates* | *Frequency* | *Cultivation Method* | *Cost $* |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |

**Re-grassing Fertiliser**

| *Land Type* | *Fertiliser Type* | *Application rate* | *Frequency* | *Costs$* | *Application Method* | *Costs $* |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

**Pasture Growth Curve**

| | *Dec* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *July* | *Aug* | *Sept* | *Oct* | *Nov* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Curve | | | | | | | | | | | | |
| Residuals | | | | | | | | | | | | |

**Do you experience any time of feed shortages that are unavoidable in an average yearly cycle?**

## CATTLE:

### Breed 1

**Cattle Breed:**

**Numbers:**

| *Calves* | *Weaners* | *Heifers* | *Steers* | *M.A. Cows* | *Bulls* |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

**Mating Date:**

**Calving %:**

**Weaning %:**

**Death Rates:**

| *Calves* | *Weaners* | *Heifers* | *Steers* | *M.A. Cows* | *Bulls* |
|---|---|---|---|---|---|
| | | | | | |

**Culling Rate and Policy:**

**Replacement Rate**:

**Cattle weight Profile:**

| *Dec* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *July* | *Aug* | *Sept* | *Oct* | *Nov* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Summer | | | Autumn | | | Winter | | | Spring | | |
| | | | | | | | | | | | |

**Cattle Weights**

| | *Dec* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *July* | *Aug* | *Sept* | *Oct* | *Nov* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calves | | | | | | | | | | | | |
| Weaners | | | | | | | | | | | | |
| Steers | | | | | | | | | | | | |
| Heifers | | | | | | | | | | | | |
| M.A. Cows | | | | | | | | | | | | |
| Bulls | | | | | | | | | | | | |

**Cattle *Sale* Dates & Numbers:**

| | *Calves* | *$* | *Weaners* | *$* | *Heifers* | *$* | *Steers* | *$* | *M.A. Cows* | *$* | *Bulls* | *$* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | | | | | | | | | |
| Number | | | | | | | | | | | | |

**Cattle *Purchased* Dates & Numbers:**

| | *Calves* | *$* | *Weaners* | *$* | *Heifers* | *$* | *Steers* | *$* | *M.A. Cows* | *$* | *Bulls* | *$* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | | | | | | | | | | | |
| Number | | | | | | | | | | | | |

# 9. Appendix B: Interview Questions

---

**CHECK THAT DICTAPHONE USE IS ACCEPTABLE.** ☐

**WRITE ANYWAY IN CASE DICTAPHONE FAILS.**

**Case Study Interview Questions:**

- **Interviewee(s):**
- **Property Name:**
- **Case Study Farm Address:**
- **Region:**

---

**PROPERTY DETAILS**

- **Total Farm Size:**
- **Effective Farm Size:**
- **Tenure:**
- **Total Stock Units**
- **Climate (average per year)**
    - Snow :
    - Floods:
    - Predominant wind:
- **Average Rainfall (mm/inches):**
- **Rainfall (seasonal) distribution (%)**
        - Summer:
        - Autumn:
        - Winter:
        - Spring:
- **Rainfall Distribution across property**
- **Soil Types:**
    - Names and areas
    - Experience with them/ Properties
- **Topography**
    - Contour
    - Altitude
    - Aspect
- **Subdivision :** (Map would be helpful to attain with locations and sizes marked)
    - No. Of paddocks:
    - Average size of paddocks or paddock sizes:

- **Labour**
    - Numbers required throughout the year and skill level

| | Jan | Feb | Mar | Apr | May | Jun | July | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Permanent** | | | | | | | | | | | | |
| **Casual** | | | | | | | | | | | | |
| **Seasonal** | | | | | | | | | | | | |

- **Water supply source**
- **Irrigation**
    - **Area covered**
    - **Type of system**

- **Drainage**
    - **Quality**

- **Land use –incl. Supplements grown**

| *Land Description* | *Area* | *Type of Pasture* | *MJME Value* | *Additional Comments* |
|---|---|---|---|---|
| | | | | |
| | | | | |

- **Feed Brought in?**

| | Quantity | Price | Frequency |
|---|---|---|---|
| **Silage** | | | |
| **Baleage** | | | |
| **Hay** | | | |
| **Nuts** | | | |

**WOOL**

**Explanation of the Supply chain wool is inserted into:**

Target Market:

Contracts:

Auction:

Greasy weights and clean weights or a percentage figure?

**History of the Farm**

- Original owners/ settlers?
- Breeds throughout previous ownership
- Cattle?
- Staff numbers?
- Part of a bigger run?
- How many owners in the properties history?
- When did you come to the property?/ When did you take over running it?
- What did you do before being in charge of the property?

**Farmer Details**

- Estimate of Age
- Attitude to future direction of wool, meat
- View on Future Directions
- Options considered for the future of the property/ Personal plans for the next 10-20 years for the property?
- What is current breed:
- Reasons for current breed?
    - Market opportunities?
    - Feed supply fit?
    - Income (wool vs. lamb)?
- Initial thoughts of a breed change –positive and negative
- What would cause a breed change?
    - Tipping points?
        - Money
        - Personal reasons
        - Lamb?
        - Wool
        - Management practises?
        - Critical block that supports system

(If a breed change has occurred): What was the transition like?

- Personally
- Management impacts
- Financially (figures available)?
- Ease?
- Willing to do again?
- If not what were the major factors that have deterred you?

    - Which features of the other possible breeds would need to be changed to result in a new breed being farmed

- Expectations of key markets (wool and meat)

- **<u>IMPORTANT – if in Merinos then what are the advantages of these sheep in these areas over the other breeds?</u>**

  - What is the mean micron of the property?
  - What constrains the property from changing to a mean micron of <25μ?
  - What constrains the property from moving to merino sheep? ////
  - What is the motivation for farming merinos opposed to another breed such as Halfbred or Corriedale?

    - Management issues? (*(if merino: what would the negatives be of other breeds)*
      - Are there possible solutions for this?
      - Have you looked into possible solutions?
      - What was the problem with the possible solutions
      - What needs to change for these solutions to be utilised?

    - Stock health *(if merino: what would the negatives be of other breeds)*
      - Are there possible solutions for this?
      - Have you looked into possible solutions?
      - What was the problem with the possible solutions
      - What needs to change for these solutions to be utilised?
    - Knowledge a barrier? *(if merino: what would the negatives be of other breeds)*
      - Anywhere/one that would provide this knowledge?
      - Are these knowledge sources available for use?
      - Would you be willing to learn to overcome these issues?
    - Property unsuitability? *(if merino: what would the negatives be of other breeds)*
      - What are the factors that affect this?
      - Of the things that need changing what can and what cannot be altered? E.g. altitude cannot be altered but Lucerne could counter some of the drought conditions altitude can bring.
      - Possible to purchase land nearby to change this situation?
      - Land use changes considered?
      - Size?
      - Ratio of different land types?
    - Personal?
      - What is the root of these beliefs/ thoughts?
      - Past experiences?
      - Past employment or family experiences or historical property data

**Additional to the pre-sent questionnaire**

- Important to have the weights of stock on at least the 30th of June:

| | Numbers | Birth Weight | Weaning Weight | Sale Weight |
|---|---|---|---|---|
| Lambs wethers | | | | |
| Hoggets wethers | | | | |
| 2ths wethers | | | | |
| M.A. wethers | | | | |

Replacement Rate %:

Death rate %:

| | Number Sold | Date | Price Received Av. | |
|---|---|---|---|---|
| Lambs wethers | | | | |
| Hoggets wethers | | | | |
| 2ths wethers | | | | |
| M.A. wethers | | | | |

Why farm wethers?

Vet Costs per year for sheep?

Vet Costs per year for cattle?

# 10. Appendix C: LP

# Appendix C 1

## LP Main Page (Part A)

| | | | 1,626.00 | | | Merino | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | M.A. Ewe | | | | | | | | | | NON-CONTRACT | | | | |
| | | | | Sheep Stock Units | Cattle Stock Units | Rams | Rep. Ewe Lamb | Ram Lamb | Ewe Hogget | 2th Ewe | 4th Ewe | 6th Ewe | 4yr Ewe | 5yr Ewe | 6yr Ewe | Jan Works Lamb Sales from Terminal | Apr. Ram Lamb Sales | Ewe Hogget Sale Up to June Feed | Ewe Hogget Sale Sept. | Cull Ewes Works Sept. | Lambs Wool (16.5µ) | Hogget Wool (16.8µ) | 2th Ewe Wool (17µ) | M.A. Ewe Wool (17.3µ) | Ram Wool (16µ) |
| **Land** | 1,626.00 | ≥ | 1,626.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Kale** | 26.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Purchased Barley** | 100,000.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| Feed Purchased Barley | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Buy Baleage** | 2,640,000 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| Bought baleage fed out | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Make Baleage** | 2,640,000 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **July** | 0.00 | ≥ | -0.00 | | | 651.66 | 0.00 | 0.00 | 353.59 | 560.03 | 582.34 | 582.34 | 582.34 | 524.11 | 494.99 | | | | 353.59 | | | | | | |
| **August** | 0.00 | ≥ | -0.00 | | | 543.05 | 0.00 | 0.00 | 287.64 | 453.88 | 481.87 | 481.87 | 481.87 | 433.68 | 409.59 | | | | 287.64 | | | | | | |
| **September** | 0.00 | ≥ | -0.00 | | | 525.53 | 0.00 | 0.00 | 308.56 | 699.65 | 721.37 | 721.37 | 721.37 | 649.23 | 613.16 | | | | 308.56 | | | | | | |
| **October** | 0.00 | ≥ | 0.00 | | | 549.25 | 0.00 | 0.00 | 337.92 | 802.02 | 822.85 | 822.85 | 822.85 | 740.57 | 732.34 | | | | | | | | | | |
| **November** | 0.00 | ≥ | -0.00 | | | 532.19 | 342.86 | 0.00 | 332.58 | 871.60 | 880.87 | 880.87 | 880.87 | 792.78 | 783.97 | 316.61 | 316.61 | 332.58 | | | | | | | |
| **December** | 0.00 | ≥ | -0.00 | | | 550.58 | 334.15 | 0.00 | 349.19 | 399.38 | 396.63 | 396.63 | 396.63 | 356.97 | 353.00 | 316.57 | 316.57 | 349.19 | | | | | | | |
| **January** | 0.00 | ≥ | -0.00 | | | 551.25 | 337.85 | 0.00 | 351.88 | 405.73 | 394.25 | 394.25 | 394.25 | 354.82 | 350.88 | 80.99 | 323.97 | 351.88 | | | | | | | |
| **February** | 0.00 | ≥ | 0.00 | | | 498.52 | 315.58 | 0.00 | 311.91 | 378.19 | 355.09 | 355.09 | 355.09 | 319.58 | 316.03 | | 304.62 | 311.91 | | | | | | | |
| **March** | 0.00 | ≥ | 0.00 | | | 554.09 | 345.42 | 0.00 | 349.12 | 425.88 | 398.16 | 398.16 | 398.16 | 358.35 | 354.37 | | 337.22 | 349.12 | | | | | | | |
| **April** | 0.00 | ≥ | -0.00 | | | 537.03 | 344.98 | 0.00 | 341.91 | 416.72 | 378.43 | 378.43 | 378.43 | 340.58 | 336.80 | | 253.52 | 341.91 | | | | | | | |
| **May** | 0.00 | ≥ | -0.00 | | | 548.00 | 370.77 | 0.00 | 357.34 | 419.37 | 391.04 | 391.04 | 391.04 | 351.94 | 348.03 | | | 357.34 | | | | | | | |
| **June** | 0.00 | ≥ | -0.00 | | | 525.53 | 370.05 | 0.00 | 287.22 | 350.60 | 375.36 | 375.36 | 375.36 | 337.82 | 334.07 | | | 287.22 | | | | | | | |
| **Rams** | 0.00 | ≥ | 0.00 | | | -1.00 | | | | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | | | | | | | | | | |
| **Ewe Lamb Tie** | 0.00 | ≥ | 0.00 | | | | 1.00 | | | -0.45 | -0.46 | -0.46 | -0.46 | -0.46 | -0.46 | | | 1.00 | | | | | | | |
| **Ewe Hogget Sale Tie** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | -0.98 | 1.00 | | | | | | |
| **Ram Lamb Tie incl. terminal ewe lambs** | 0.00 | ≥ | 0.00 | | | | | 1.00 | | -0.61 | -0.62 | -0.62 | -0.62 | -0.62 | -0.62 | | | | | | | | | | |
| **January Works Lamb Sales from Terminal** | 0.00 | ≥ | 0.00 | | | | | -0.24 | | | | | | | | 1.00 | | | | | | | | | |
| **April Ram Lamb Sales** | 0.00 | ≥ | -0.00 | | | | | -0.74 | | | | | | | | | 1.00 | | | | | | | | |
| **Ewe Hogget Tie** | 0.00 | ≥ | 0.00 | | | | -0.78 | | 1.00 | | | | | | | | | | | | | | | | |
| **2th Tie** | 0.00 | ≥ | 0.00 | | | | | | -0.99 | 1.00 | | | | | | | | | | | | | | | |
| **4th Tie** | 0.00 | ≥ | -0.00 | | | | | | | -0.98 | 1.00 | | | | | | | | | | | | | | |
| **6th Tie** | 0.00 | ≥ | 0.00 | | | | | | | | -0.96 | 1.00 | | | | | | | | | | | | | |
| **4yr Tie** | 0.00 | ≥ | -0.00 | | | | | | | | | -0.96 | 1.00 | | | | | | | | | | | | |
| **5yr Tie** | 0.00 | ≥ | 0.00 | | | | | | | | | | -0.96 | 1.00 | | | | | | | | | | | |
| **6yr Tie** | 0.00 | ≥ | 0.00 | | | | | | | | | | | -0.76 | 1.00 | | | | | | | | | | |
| **Cull Ewes Works September Tie** | 0.00 | ≥ | -0.00 | | | | | | | | | | | -0.20 | -1.00 | | | | | 1.00 | | | | | |
| **Lambs Wool (16.5µ)** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | -1.10 | -1.10 | | | 1.00 | | | | |
| **Hogget Wool (16.8µ) Tie** | 0.00 | ≥ | -0.00 | | | | | | -2.85 | | | | | | | | | | | | | 1.00 | | | |
| **2th Ewe Wool (17µ) Tie** | 0.00 | ≥ | -0.00 | | | | | | | -4.58 | | | | | | | | | | | | | 1.00 | | |
| **M.A. Ewe Wool (17.3µ) Tie** | 0.00 | ≥ | -0.00 | | | | | | | | -5.00 | -5.00 | -5.00 | -4.50 | -4.25 | | | | | | | | | 1.00 | |
| **Ram Wool (16µ) Tie** | 0.00 | ≥ | 0.00 | | | -6.73 | | | | | | | | | | | | | | | | | | | 1.00 |
| **Rams** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Ewe Lamb Tie** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Ewe Hogget Sale Tie** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Ram Lamb Tie incl. terminal ewe lambs** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **November Works Lamb Sales from Terminal** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **January Ram Lamb Sales** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Ewe Hogget Tie** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **2th Tie** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **4th Tie** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **6th Tie** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **4yr Tie** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **5yr Tie** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **6yr Tie** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Cull Ewes Works September Tie** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Lambs Wool (21µ)** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Hogget Wool (22µ)** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **2th Ewe Wool (25µ)** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **M.A. Ewe Wool (26.1µ)** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Ram Wool (26.3µ)** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Bulls** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Weaners (Steers) Tie** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Weaner Heifer Tie** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **R1 Heifer Tie** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **R2 Heifer Tie** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **3YO Cow** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **4YO Cow** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **5YO Cow** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **6YO Cow** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **7YO Cow** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **8YO Cow** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **9YO Cow** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **10YO Cow** | 0.00 | ≥ | 0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **M.A. Cull Cow Sales April** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Bulls Sale February Tie** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Sheep S/U** | 0.00 | ≥ | 0.00 | 1.00 | | -1.09 | -0.46 | 0.00 | -0.66 | -1.03 | -1.03 | -1.03 | -1.03 | -0.93 | -0.90 | -0.12 | -0.31 | -0.45 | -0.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Cattle S/U** | 0.00 | ≥ | 0.00 | | 1.00 | | | | | | | | | | | | | | | | | | | | |
| **Stock Ratios** | 0.00 | ≥ | 0.00 | -0.30 | 0.70 | | | | | | | | | | | | | | | | | | | | |
| **Switch** | 0.00 | ≥ | -0.00 | | | | | | | | | | | | | | | | | | | | | | |
| **Cash Cost/Profit** | | | 314,694.83 | | | -35.63 | -3.92 | 0.00 | -17.07 | -20.26 | -21.96 | -21.96 | -21.96 | -17.58 | -17.58 | 73.82 | 71.48 | -3.92 | 101.58 | 59.86 | 17.97 | 16.20 | 16.20 | 15.26 | 19.54 |
| **Activity Levels** | | | | 5,982 | 2,564 | 39 | 944 | 2,413 | 736 | 729 | 714 | 686 | 658 | 632 | 480 | 579 | 1,786 | 840 | 823 | 607 | 2,889 | 2,099 | 3,338 | 15,193 | 262 |

# Appendix C 1

## LP Main Page (Part B)

Corriedale/Halfbred

| Rams | Rep. Ewe lamb | Ram Lamb | Ewe Hogget | 2th Ewe | M.A. Ewe: 4th Ewe | 6th Ewe | 4yr Ewe | 5yr Ewe | 6yr Ewe | Nov. Works Lamb Sales from Terminal | Jan. Ram Lamb Sales | Ewe Hogget Sale Up to June Feed | Ewe Hogget Sale Sept. | Cull Ewes Works Sept. | Non Contract: Lambs Wool (21µ) | Hogget Wool (22µ) | 2th Ewe Wool (24µ) | M.A. Ewe Wool (26.1µ) | Ram Wool (26.3µ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 714.42 | 0.00 | 0.00 | 398.11 | 612.87 | 633.34 | 633.34 | 633.34 | 570.01 | 538.34 | | | | 398.11 | | | | | | |
| 595.35 | 0.00 | 0.00 | 343.75 | 523.49 | 548.15 | 548.15 | 548.15 | 493.33 | 465.93 | | | | 343.75 | | | | | | |
| 576.15 | 0.00 | 0.00 | 359.24 | 792.53 | 813.56 | 813.56 | 813.56 | 732.20 | 691.53 | | | | 359.24 | | | | | | |
| 601.55 | 0.00 | 0.00 | 377.31 | 944.45 | 964.60 | 964.60 | 964.60 | 868.14 | 819.91 | | | | | | | | | | |
| 582.78 | 389.87 | 0.00 | 371.18 | 1,027.98 | 1,036.81 | 1,036.81 | 1,036.81 | 933.13 | 793.16 | 355.18 | 355.18 | 389.87 | | | | | | | |
| 602.84 | 376.54 | 0.00 | 381.82 | 438.74 | 433.80 | 433.80 | 433.80 | 390.42 | 368.73 | 352.52 | 352.52 | 376.54 | | | | | | | |
| 603.50 | 378.08 | 0.00 | 384.20 | 442.93 | 431.46 | 431.46 | 431.46 | 388.32 | 366.74 | 358.42 | 358.42 | 378.08 | | | | | | | |
| 545.68 | 351.20 | 0.00 | 347.50 | 411.52 | 388.72 | 388.72 | 388.72 | 349.85 | 330.41 | | 335.11 | 351.20 | | | | | | | |
| 606.29 | 382.44 | 0.00 | 381.28 | 462.60 | 435.29 | 435.29 | 435.29 | 391.76 | 370.00 | | 369.45 | 382.44 | | | | | | | |
| 587.52 | 380.48 | 0.00 | 380.40 | 452.11 | 414.49 | 414.49 | 414.49 | 373.04 | 352.31 | | 368.88 | 380.48 | | | | | | | |
| 600.15 | 407.60 | 0.00 | 389.89 | 456.11 | 428.30 | 428.30 | 428.30 | 385.47 | 364.06 | | 395.68 | 407.60 | | | | | | | |
| 576.15 | 352.41 | 0.00 | 310.90 | 387.53 | 411.51 | 411.51 | 411.51 | 370.36 | 349.78 | | 352.65 | 352.41 | | | | | | | |
| -1.00 | | | | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | | | | | | | | | | |
| | 1.00 | | | -0.53 | -0.53 | -0.53 | -0.53 | -0.53 | -0.53 | | | 1.00 | | | | | | | |
| | | | | | | | | | | | | -0.98 | 1.00 | | | | | | |
| | | 1.00 | | -0.71 | -0.71 | -0.71 | -0.71 | -0.71 | -0.71 | | | | | | | | | | |
| | | -0.24 | | | | | | | | 1.00 | | | | | | | | | |
| | | -0.74 | | | | | | | | | 1.00 | | | | | | | | |
| | -0.96 | | 1.00 | | | | | | | | | | | | | | | | |
| | | | -0.96 | 1.00 | | | | | | | | | | | | | | | |
| | | | | -0.98 | 1.00 | | | | | | | | | | | | | | |
| | | | | | -0.95 | 1.00 | | | | | | | | | | | | | |
| | | | | | | -0.96 | 1.00 | | | | | | | | | | | | |
| | | | | | | | -0.95 | 1.00 | | | | | | | | | | | |
| | | | | | | | | -0.75 | 1.00 | | | | | | | | | | |
| | | | | | | | | -0.20 | -1.00 | | | | | 1.00 | | | | | |
| | | | | | | | | | | | -1.10 | -1.10 | | | 1.00 | | | | |
| | | | -4.02 | | | | | | | | | | | | | 1.00 | | | |
| | | | | -4.41 | | | | | | | | | | | | | 1.00 | | |
| | | | | | -4.43 | -4.43 | -4.43 | -3.99 | -3.72 | | | | | | | | | 1.00 | |
| -7.81 | | | | | | | | | | | | | | | | | | | 1.00 |
| -1.20 | -0.50 | 0.00 | -8.74 | -1.16 | -1.18 | -1.16 | -1.16 | -1.04 | -0.97 | -0.18 | -0.48 | -0.50 | -0.18 | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 |
| -35.79 | -3.14 | 0.00 | -18.00 | -21.80 | -21.35 | -21.35 | -21.35 | -21.35 | -16.95 | 100.41 | 70.92 | -3.14 | 115.79 | 70.70 | 11.00 | 10.62 | 6.63 | 7.50 | 7.25 |
| -8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Cattle

| Bulls | Weaners (Steers) | Weaners (Heifers) | R1 Heifers | R2 Heifers | 3YO | 4YO | 5YO | 6YO | 7YO | 8YO | 9YO | 10YO | Weaners Steer Store April | Weaners Heifers Store April | M.A. Cull Cows (April) | Bulls February |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3,753.83 | 0.00 | 0.00 | 1,505.04 | 1,862.16 | 3,144.91 | 3,144.91 | 3,144.91 | 3,144.91 | 3,144.91 | 3,144.91 | 3,144.91 | 3,144.91 | | | | |
| 3,753.83 | 0.00 | 0.00 | 1,623.90 | 1,885.68 | 3,828.90 | 3,828.90 | 3,828.90 | 3,828.90 | 3,828.90 | 3,828.90 | 3,828.90 | 3,828.90 | | | | |
| 3,836.34 | 0.00 | 0.00 | 1,903.43 | 1,854.71 | 3,509.21 | 3,509.21 | 3,509.21 | 3,509.21 | 3,509.21 | 3,509.21 | 3,509.21 | 3,509.21 | | | | |
| 3,768.11 | 0.00 | 0.00 | 2,030.99 | 1,961.58 | 4,077.01 | 4,077.01 | 4,077.01 | 4,077.01 | 4,077.01 | 4,077.01 | 4,077.01 | 4,077.01 | | | | |
| 3,657.10 | 0.00 | 0.00 | 2,028.68 | 1,943.01 | 4,183.43 | 4,183.43 | 4,183.43 | 4,183.43 | 4,183.43 | 4,183.43 | 4,183.43 | 4,183.43 | | | | |
| 3,748.61 | 0.00 | 0.00 | 2,158.65 | 2,052.14 | 4,081.41 | 4,081.41 | 4,081.41 | 4,081.41 | 4,081.41 | 4,081.41 | 4,081.41 | 4,081.41 | | | | |
| 3,774.93 | 0.00 | 0.00 | 2,116.86 | 2,095.79 | 3,997.81 | 3,997.81 | 3,997.81 | 3,997.81 | 3,997.81 | 3,997.81 | 3,997.81 | 3,997.81 | | | | |
| 3,409.61 | 0.00 | 0.00 | 1,909.85 | 1,927.01 | 3,717.79 | 3,717.79 | 3,717.79 | 3,717.79 | 3,717.79 | 3,717.79 | 3,717.79 | 3,717.79 | | | | |
| 3,774.93 | 0.00 | 0.00 | 2,312.00 | 2,165.79 | 4,236.58 | 4,236.58 | 4,236.58 | 4,236.58 | 4,236.58 | 4,236.58 | 4,236.58 | 4,236.58 | | | | |
| 3,653.16 | 0.00 | 1,946.00 | 2,297.20 | 2,135.58 | 4,214.28 | 4,214.28 | 4,214.28 | 4,214.28 | 4,214.28 | 4,214.28 | 4,214.28 | 4,214.28 | | | | |
| 3,774.93 | 0.00 | 2,148.65 | 2,432.91 | 2,249.77 | 2,216.81 | 2,216.81 | 2,216.81 | 2,216.81 | 2,216.81 | 2,216.81 | 2,216.81 | | | | | |
| 3,632.74 | 0.00 | 1,780.18 | 1,399.18 | 1,779.98 | 2,459.67 | 2,459.67 | 2,459.67 | 2,459.67 | 2,459.67 | 2,459.67 | 2,459.67 | | | | | |
| -1.00 | | | | | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | | | | |
| | 1.00 | | | | -0.46 | -0.46 | -0.46 | -0.46 | -0.46 | -0.46 | -0.46 | 0.46 | 1.00 | | | |
| | | 1.00 | | | -0.46 | -0.46 | -0.46 | -0.46 | -0.46 | -0.46 | -0.46 | -0.46 | | 1.00 | | |
| | | -0.97 | 1.00 | | | | | | | | | | | | | |
| | | | -0.96 | 1.00 | | | | | | | | | | | | |
| | | | | -0.96 | 1.00 | | | | | | | | | | | |
| | | | | | -0.96 | 1.00 | | | | | | | | | | |
| | | | | | | -0.96 | 1.00 | | | | | | | | | |
| | | | | | | | -0.96 | 1.00 | | | | | | | | |
| | | | | | | | | -0.96 | 1.00 | | | | | | | |
| | | | | | | | | | -0.96 | 1.00 | | | | | | |
| | | | | | | | | | | -0.96 | 1.00 | | | | | |
| | | | | | | | | | | | -0.96 | 1.00 | | | | |
| | | | | | | | | | | | | -1.00 | | | 1.00 | |
| -0.13 | | | | | | | | | | | | | | | | 1.00 |
| -7.39 | 0.00 | -0.98 | -3.95 | -3.95 | -7.28 | -7.28 | -7.28 | -7.28 | -7.28 | -7.28 | -7.28 | -6.50 | 0.00 | 0.00 | 0.00 | 0.00 |
| -219.20 | 0.00 | -74.55 | 74.55 | -85.47 | -112.98 | -112.98 | -112.98 | -112.98 | -112.98 | -112.98 | -112.98 | -95.02 | 490.00 | 324.92 | 490.80 | 1,212.02 |
| 9 | 0 | 47 | 45 | 44 | 42 | 40 | 39 | 37 | 36 | 34 | 33 | 31 | 134 | 87 | 31 | 1 |

# Appendix C 1

## LP Main Page (Part C)

| Make Baleage Canterbury (December) | Feed Baleage June | Feed Baleage July | Feed Baleage August | Make Baleage Marlborough (October) | Feed Baleage June | Feed Baleage July | Feed Baleage August | Buy Baleage | Feed Baleage June | Feed Baleage July | Feed Baleage August | Purchased Barley | Purchased Barley Feed Out January | Purchased Barley Feed Out February | Purchased Barley Feed Out March | Grow Kale | Kale Fed June | Kale Fed July | Kale Fed August | July | August | September | October | November | December | January | February | March | April | May | June | PASTURE SUPPLY: *CANTERBURY* MJ ME/ha/month | PASTURE SUPPLY: *MARLBOROUGH* MJ ME/ha/month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | 1.00 | | | | | | | | | | | | | | | | 1.00 | 1.00 |
| | | | | | | | | | | | | | | | | -1.00 | 1.00 | 1.00 | 1.00 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | 1.00 | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | -1.00 | 1.00 | 1.00 | 1.00 | | | | | | | | | | | | | | | | | | |
| | | | | | | | | 1.00 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | -1.00 | 1.00 | 1.00 | 1.00 | | | | | | | | | | | | | | | | | | | | | | |
| -1.00 | 1.00 | 1.00 | 1.00 | -1.00 | 1.00 | 1.00 | 1.00 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | -0.90 | | | | -1 | | | | -1.00 | | | | | | | | -1 | | -0.85 | 1.00 | | | | | | | | | | | -563.39 | -563.39 |
| | | | -0.90 | | | | -1 | | | | -1.00 | | | | | | | | -1 | | -0.85 | 1.00 | | | | | | | | | | -1,004.49 | -2,209.88 |
| | | | | | | | | | | | | | | | | | | | | | | -0.85 | 1.00 | | | | | | | | | -1,682.42 | -6,212.90 |
| | | | | 1 | | | | | | | | | | | | | | | | | | | -0.85 | 1.00 | | | | | | | | -4,247.63 | -10,088.57 |
| | | | | | | | | | | | | | | | | | | | | | | | | -0.85 | 1.00 | | | | | | | -7,988.02 | -6,212.90 |
| 1 | | | | | | | | | | | | | | | | | | | | | | | | | -0.85 | 1.00 | | | | | | -11,248.10 | -3,969.92 |
| | | | | | | | | | | | | | -1.00 | | | | | | | | | | | | | -0.85 | 1.00 | | | | | -7,276.00 | -2,782.00 |
| | | | | | | | | | | | | | | -1.00 | | | | | | | | | | | | | -0.85 | 1.00 | | | | -7,006.79 | -2,061.11 |
| | | | | | | | | | | | | | | | -1.00 | | | | | | | | | | | | | -0.85 | 1.00 | | | -2,795.10 | -1,921.63 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | -0.85 | 1.00 | | -1,183.41 | -2,366.82 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | -0.85 | 1.00 | -724.98 | -1,631.20 |
| | -0.90 | | | | -1 | | | | -1.00 | | | | | | | | -1 | | | 1.00 | | | | | | | | | | | -0.85 | -333.89 | -500.84 |
| | | | | 1.00 | 1.00 | 1.00 | 1.00 | | | | | | | | | | | | | | | | | | | | | | | | | | 1.00 |
| -0.014 | -0.004 | -0.004 | -0.004 | -0.014 | -0.004 | -0.004 | -0.004 | -0.0327 | -0.0037 | -0.0037 | -0.0037 | -0.0317 | -0.001 | -0.001 | -0.001 | -0.0163 | -0.00040 | -0.00040 | -0.00040 | | | | | | | | | | | | | -195.65 | -195.65 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 8,886,706 | 4,616,509 | 1,987,521 | 0 | 2,137,326 | 8,431,559 | 20,905,829 | 25,192,584 | 28,805,894 | 24,533,777 | 18,429,110 | 13,488,880 | 1,626 | -0 |

**Appendix C 2**

**Wool Prices**

# Fine Wool Price by Micron -Majority Contract Prices

*SOURCE: Mark Stevenson, R & D Manager - Production Science at The New Zealand Merino Company*

| | Range from C.S. Data | Assumed µ figure for L.P. | Price (cents/kg) | Contract Price (cents/kg) | Price per micron | Comments |
|---|---|---|---|---|---|---|
| MERINO | | | | | | |
| Lambs | 18-20 | **16.5** | **$ 17.97** | | **$ 17.97** | not shorn |
| Ewe Hoggets | 14.5-19 | **16.8** | **$ 16.20** | - | **$ 16.20** | |
| Ram Hoggets | 14.5 | **16.8** | **$ 16.20** | - | **$ 16.20** | |
| 2th ewes | 15-19 | **17** | **$ 15.76** | - | **$ 16.20** | |
| M.A. ewes | 15.2-19.3 | **17.3** | **$ 15.26** | - | **$ 15.26** | |
| Rams | 13-19 | **16** | **$ 18.70** | - | **$ 19.54** | |
| | | | | | | |
| CORRIEDALE/HALFBRED | | | | | | |
| Lambs | 24.5 | **21** | | | **$ 11.00** | not shorn |
| Ewe Hoggets | 21-26 | **22** | **$ -** | **$ 10.90** | **$ 10.62** | |
| Ram Hoggets | 22 | **22** | **$ -** | **$ 10.90** | **$ 10.62** | |
| 2th ewes | 24-26 | **25** | **$ -** | **$ 9.00** | **$ 8.63** | |
| M.A. ewes | 24.8-29 | **26.1** | **$ 7.50** | **$ -** | **$ -** | |
| Rams | 25-28 | **26.3** | **$ 7.25** | **$ -** | **$ -** | |
| | | | | | | |
| MERINO - Icebreaker | | | | | | |
| Lambs | - | **17.5** | | **$ 13.00** | **n/a** | not shorn |
| Ewe Hoggets | - | **17.8** | | **$ 14.85** | **n/a** | |
| Ram Hoggets | - | **17.8** | | **$ 14.85** | **n/a** | |
| 2th ewes | - | **18.5** | | **$ 14.50** | **n/a** | |
| M.A. ewes | - | **18.8** | | **$ 14.35** | **n/a** | |
| Rams | - | **18.8** | | **$ 14.35** | **n/a** | |

# Appendix C 3

## Meat Data Price Page

| Straight Furrow Prices 2010 South Island | Date of Publication | M-2 bull (296-320kgLW) $/kg | M-2 bull (kgLW) $/hd | Lambs 15.5kg YM | Lambs 15.5kg YM Monthly Average | Lambs 17.5kg YX | Lambs 17.5kg YX Monthly Average | Lambs 17.5kg YX Monthly Average $/kg CW | Lambs 19.0kg YX | Lambs 19.0kg YX Monthly Average |
|---|---|---|---|---|---|---|---|---|---|---|
| DEC | 22-Dec-09 | | | $ 70.22 | | $ 79.10 | | | $ 85.76 | |
| | 29-Dec-09 | | | $ 68.36 | $ 69.29 | $ 77.00 | $ 78.05 | $ 4.46 | $ 82.08 | $ 83.92 |
| JAN | 5-Jan-10 | | | $ 68.36 | | $ 77.52 | | $ - | $ 82.08 | |
| | 12-Jan-10 | | | $ 66.50 | | $ 74.90 | | $ - | $ 81.20 | |
| | 19-Jan-10 | | | $ 64.48 | | $ 72.46 | | $ - | $ 78.45 | |
| | 26-Jan-10 | | | $ 65.26 | $ 66.15 | $ 73.50 | $ 74.59 | $ 4.26 | $ 79.68 | $ 80.35 |
| FEB | 2-Feb-10 | $ 2.88 | | $ 66.03 | | $ 74.20 | | $ - | $ 81.44 | |
| | 9-Feb-10 | $ 2.96 | | $ 66.34 | | $ 74.72 | | $ - | $ 80.44 | |
| | 16-Feb-10 | $ 3.06 | | $ 66.81 | | $ 75.26 | | $ - | $ 81.58 | |
| | 23-Feb-10 | $ 3.13 | $ 1,212.02 | $ 67.58 | $ 66.69 | $ 76.12 | $ 75.08 | $ 4.29 | $ 82.53 | $ 81.50 |
| MAR | 2-Mar-10 | | | $ 67.58 | | $ 76.12 | | $ - | $ 82.53 | |
| | 9-Mar-10 | | | $ 67.58 | | $ 76.12 | | $ - | $ 82.53 | |
| | 16-Mar-10 | | | $ 67.58 | | $ 76.12 | | $ - | $ 82.53 | |
| | 23-Mar-10 | | | $ 67.43 | | $ 75.95 | | $ - | $ 82.34 | |
| | 30-Mar-10 | | | $ 66.03 | $ 67.24 | $ 74.72 | $ 75.81 | $ 4.33 | $ 81.01 | $ 82.19 |
| APR | 6-Apr-10 | | | $ 66.19 | | $ 74.55 | | $ - | $ 80.82 | |
| | 13-Apr-10 | | | $ 66.19 | | $ 74.55 | | $ - | $ 80.82 | |
| | 20-Apr-10 | | | $ 67.12 | | $ 74.55 | | $ - | $ 82.34 | |
| | 27-Apr-10 | | | $ 68.82 | $ 67.08 | $ 77.52 | $ 75.29 | $ 4.30 | $ 84.05 | $ 82.01 |
| MAY | 4-May-10 | | | $ 70.53 | | $ 79.82 | | $ - | $ 86.13 | |
| | 11-May-10 | | | $ 71.30 | | $ 80.34 | | $ - | $ 87.08 | |
| | 18-May-10 | | | $ 72.85 | | $ 81.72 | | $ - | $ 88.61 | |
| | 25-May-10 | | | $ 74.25 | $ 72.23 | $ 83.65 | $ 81.38 | $ 4.65 | $ 90.13 | $ 87.99 |
| JUN | 1-Jun-10 | | | $ 75.18 | | $ 84.35 | | $ - | $ 91.46 | |
| | 8-Jun-10 | | | $ 75.18 | | $ 84.35 | | $ - | $ 91.46 | |
| | 15-Jun-10 | | | $ 78.25 | | $ 87.45 | | $ - | $ 94.82 | |
| | 22-Jun-10 | | | $ 78.25 | | $ 87.45 | | $ - | $ 94.82 | |
| | 29-Jun-10 | | | $ 78.25 | $ 77.02 | $ 88.15 | $ 86.35 | $ 4.93 | $ 95.58 | $ 93.63 |
| JUL | 6-Jul-10 | | | $ 79.49 | | $ 89.55 | | $ - | $ 97.10 | |
| | 13-Jul-10 | | | $ 79.49 | | $ 89.55 | | $ - | $ 97.10 | |
| | 20-Jul-10 | | | $ 80.70 | | $ 90.95 | | $ - | $ 98.62 | |
| | 27-Jul-10 | | | $ 80.70 | $ 80.10 | $ 90.95 | $ 90.25 | $ 5.16 | $ 98.62 | $ 97.86 |
| AUG | 3-Aug-10 | | | $ 81.51 | | $ 91.83 | | $ - | $ 99.57 | |
| | 10-Aug-10 | | | $ 82.46 | | $ 93.10 | | $ - | $ 101.83 | |
| | 17-Aug-10 | | | $ 81.69 | | $ 92.05 | | $ - | $ 99.82 | |
| | 24-Aug-10 | | | $ 82.47 | | $ 92.05 | | $ - | $ 100.77 | |
| | 31-Aug-10 | | | $ 83.55 | $ 82.34 | $ 93.80 | $ 92.57 | $ 5.29 | $ 101.72 | $ 100.74 |
| SEPT | 7-Sep-10 | | | $ 84.01 | | $ 94.15 | | $ - | $ 102.10 | |
| | 14-Sep-10 | | | $ 85.56 | | $ 95.90 | | $ - | $ 104.00 | |
| | 21-Sep-10 | | | $ 85.56 | | $ 95.90 | | $ - | $ 104.00 | |
| | 28-Sep-10 | | | $ 85.87 | $ 85.25 | $ 96.77 | $ 95.68 | $ 5.47 | $ 104.95 | $ 103.76 |
| OCT | 5-Oct-10 | | | $ 88.97 | | $ 96.77 | | $ - | $ 108.37 | |
| | 12-Oct-10 | | | $ 88.97 | | $ 99.92 | | $ - | $ 108.37 | |
| | 19-Oct-10 | | | $ 88.97 | | $ 99.92 | | $ - | $ 108.37 | |
| | 26-Oct-10 | | | $ 89.75 | $ 89.17 | $ 100.80 | $ 99.35 | $ 5.68 | $ 109.32 | $ 108.61 |
| NOV | 2-Nov-10 | | | $ 89.75 | | $ 100.80 | | $ - | $ 109.32 | |
| | 9-Nov-10 | | | $ 89.44 | | $ 100.27 | | $ - | $ 108.75 | |
| | 16-Nov-10 | | | $ 88.66 | | $ 99.57 | | $ - | $ 107.99 | |
| | 23-Nov-10 | | | $ 87.89 | | $ 98.70 | | $ - | $ 107.04 | |
| | 30-Nov-10 | | | $ 89.81 | $ 89.11 | $ 100.90 | $ 100.05 | $ 5.72 | $ 109.45 | $ 108.51 |
| DEC | 7-Dec-10 | | | $ 88.50 | | $ 100.55 | | $ - | $ 109.07 | |
| | 14-Dec-10 | | | $ 88.10 | | $ 98.80 | | $ - | $ 107.17 | |
| | 21-Dec-10 | | | $ 87.49 | $ 88.03 | $ 98.45 | $ 99.27 | $ 5.67 | $ 106.79 | $ 107.68 |

| Date of Publication | Lamb 21.0 kg YX | Lamb 21.0 kg YX Monthly Average | Lamb 21.0 kg YX Monthly Average $/kg | Mutton 21.0 kg MX 1 | Mutton 21.0 kg MX 1 Monthly Average | Mutton 21.0 kg MX 1 Monthly Average $/kg cw | p2 steer (270-295) -c/kg gross | m cow (170-195 kg) c/kg | m cow (170-195 kg) $/kg Monthly Average for a 182.5kg m cow | Cull Cow assumed @ 480 kg LW assuming 50% dressed weight of 240kg |
|---|---|---|---|---|---|---|---|---|---|---|
| 22-Dec-09 | $ 97.14 | | | $ 43.69 | | | $ 296 | $ 172 | | |
| 29-Dec-09 | $ 95.04 | $ 96.09 | $ 4.58 | $ 43.69 | $ 43.69 | $ 2.08 | $ 296 | $ 180 | 1.76 | $ 422.40 |
| 5-Jan-10 | $ 95.04 | | $ - | $ 43.69 | | $ - | $ 296 | $ 187 | | $ - |
| 12-Jan-10 | $ 90.09 | | $ - | $ 43.69 | | $ - | $ 301 | $ 187 | | $ - |
| 19-Jan-10 | $ 86.43 | | $ - | $ 43.48 | | $ - | $ 301 | $ 185 | | $ - |
| 26-Jan-10 | $ 87.90 | $ 89.87 | $ 4.28 | $ 43.48 | $ 43.59 | $ 2.08 | $ 301 | $ 190 | 1.87 | $ 449.40 |
| 2-Feb-10 | $ 87.48 | | $ - | $ 43.48 | | $ - | $ 303 | $ 195 | | $ - |
| 9-Feb-10 | $ 88.97 | | $ - | $ 44.74 | | $ - | $ 311 | $ 202 | | $ - |
| 16-Feb-10 | $ 89.50 | | $ - | $ 47.68 | | $ - | $ 320 | $ 210 | | $ - |
| 23-Feb-10 | $ 90.00 | $ 88.99 | $ 4.24 | $ 49.15 | $ 46.26 | $ 2.20 | $ 326 | $ 215 | 2.06 | $ 493.20 |
| 2-Mar-10 | $ 90.30 | | $ - | $ 49.78 | | $ - | $ 335 | $ 233 | | $ - |
| 9-Mar-10 | $ 90.30 | | $ - | $ 49.78 | | $ - | $ 331 | $ 220 | | $ - |
| 16-Mar-10 | $ 90.30 | | $ - | $ 49.78 | | $ - | $ 335 | $ 233 | | $ - |
| 23-Mar-10 | $ 90.63 | | $ - | $ 49.78 | | $ - | $ 333 | $ 237 | | $ - |
| 30-Mar-10 | $ 87.79 | $ 89.86 | $ 4.28 | $ 49.78 | $ 49.78 | $ 2.37 | $ 326 | $ 222 | 2.29 | $ 549.60 |
| 6-Apr-10 | $ 88.11 | | $ - | $ 49.78 | | $ - | $ 318 | $ 212 | | $ - |
| 13-Apr-10 | $ 88.11 | | $ - | $ 49.78 | | $ - | $ 318 | $ 202 | | $ - |
| 20-Apr-10 | $ 88.11 | | $ - | $ 49.78 | | $ - | $ 318 | $ 202 | | $ - |
| 27-Apr-10 | $ 91.68 | $ 89.00 | $ 4.24 | $ 51.46 | $ 50.20 | $ 2.39 | $ 322 | $ 202 | 2.05 | $ 490.80 |
| 4-May-10 | $ 93.96 | | $ - | $ 54.61 | | $ - | $ 323 | $ 206 | | $ - |
| 11-May-10 | $ 95.17 | | $ - | $ 55.03 | | $ - | $ 327 | $ 210 | | $ - |
| 18-May-10 | $ 96.74 | | $ - | $ 55.03 | | $ - | $ 330 | $ 213 | | $ - |
| 25-May-10 | $ 98.63 | $ 96.13 | $ 4.58 | $ 56.08 | $ 55.19 | $ 2.63 | $ 340 | $ 228 | 2.14 | $ 514.20 |
| 1-Jun-10 | $ 100.94 | | $ - | $ 56.08 | | $ - | $ 343 | $ 231 | | $ - |
| 8-Jun-10 | $ 100.94 | | $ - | $ 57.76 | | $ - | $ 350 | $ 240 | | $ - |
| 15-Jun-10 | $ 104.64 | | $ - | $ 59.13 | | $ - | $ 353 | $ 245 | | $ - |
| 22-Jun-10 | $ 104.64 | | $ - | $ 59.76 | | $ - | $ 353 | $ 245 | | $ - |
| 29-Jun-10 | $ 105.48 | $ 103.33 | $ 4.92 | $ 59.76 | $ 58.50 | $ 2.79 | $ 356 | $ 245 | 2.41 | $ 578.88 |
| 6-Jul-10 | $ 107.16 | | $ - | $ 59.76 | | $ - | $ 355 | $ 245 | | $ - |
| 13-Jul-10 | $ 107.16 | | $ - | $ 60.60 | | $ - | $ 355 | $ 245 | | $ - |
| 20-Jul-10 | $ 108.84 | | $ - | $ 60.60 | | $ - | $ 358 | $ 245 | | $ - |
| 27-Jul-10 | $ 108.84 | $ 108.00 | $ 5.14 | $ 60.60 | $ 60.39 | $ 2.88 | $ 361 | $ 245 | 2.45 | $ 588.00 |
| 3-Aug-10 | $ 109.89 | | $ - | $ 61.26 | | $ - | $ 368 | $ 248 | | $ - |
| 10-Aug-10 | $ 111.72 | | $ - | $ 61.26 | | $ - | $ 368 | $ 248 | | $ - |
| 17-Aug-10 | $ 110.18 | | $ - | $ 61.33 | | $ - | $ 376 | $ 251 | | $ - |
| 24-Aug-10 | $ 112.28 | | $ - | $ 61.33 | | $ - | $ 376 | $ 251 | | $ - |
| 31-Aug-10 | $ 112.28 | $ 111.27 | $ 5.30 | $ 63.43 | $ 61.72 | $ 2.94 | $ 396 | $ 258 | 2.51 | $ 602.88 |
| 7-Sep-10 | $ 112.70 | | $ - | $ 63.43 | | $ - | $ 403 | $ 365 | | $ - |
| 14-Sep-10 | $ 114.80 | | $ - | $ 63.43 | | $ - | $ 410 | $ 270 | | $ - |
| 21-Sep-10 | $ 114.80 | | $ - | $ 63.43 | | $ - | $ 410 | $ 270 | | $ - |
| 28-Sep-10 | $ 115.85 | $ 114.54 | $ 5.45 | $ 63.85 | $ 63.54 | $ 3.03 | $ 400 | $ 366 | 2.93 | $ 702.60 |
| 5-Oct-10 | $ 119.63 | | $ - | $ 63.85 | | $ - | $ 400 | $ 266 | | $ - |
| 12-Oct-10 | $ 119.63 | | $ - | $ 67.59 | | $ - | $ 388 | $ 261 | | $ - |
| 19-Oct-10 | $ 119.63 | | $ - | $ 68.22 | | $ - | $ 380 | $ 256 | | $ - |
| 26-Oct-10 | $ 120.68 | $ 119.89 | $ 5.71 | $ 69.06 | $ 67.18 | $ 3.20 | $ 378 | $ 256 | 2.60 | $ 623.40 |
| 2-Nov-10 | $ 120.68 | | $ - | $ 69.27 | | $ - | $ 378 | $ 256 | | $ - |
| 9-Nov-10 | $ 120.05 | | $ - | $ 71.37 | | $ - | $ 375 | $ 250 | | $ - |
| 16-Nov-10 | $ 119.25 | | $ - | $ 74.10 | | $ - | $ 372 | $ 247 | | $ - |
| 23-Nov-10 | $ 118.16 | | $ - | $ 75.19 | | $ - | $ 388 | $ 250 | | $ - |
| 30-Nov-10 | $ 121.77 | $ 119.98 | $ 5.71 | $ 78.18 | $ 73.61 | $ 3.51 | $ 365 | $ 252 | 2.51 | $ 602.40 |
| 7-Dec-10 | $ 120.43 | | $ - | $ 78.01 | | $ - | $ 365 | $ 255 | | $ - |
| 14-Dec-10 | $ 118.33 | | $ - | $ 76.12 | | $ - | $ 363 | $ 255 | | $ - |
| 21-Dec-10 | $ 118.33 | $ 119.03 | $ 5.67 | $ 75.18 | $ 76.44 | $ 3.64 | $ 376 | $ 267 | 2.59 | $ 621.60 |

## Appendix C 4

## Farm Working Expenses

| | |
|---|---|
| **MAF: Pastoral Monitoring 2010** | |
| **Canterbury/ Marlborough Hill Country** | |
| **Sheep and Beef** | |
| | |
| **Farm Working Expenses** | Per Hectare ($) |
| | |
| Permanent Wages | 67.65 |
| Casual wages | 7 |
| ACC | 1 |
| **Total labour expenses** | **75.65** |
| Animal Health | 12 |
| Electricity | 5 |
| Fertiliser | 21 |
| Lime | 2 |
| Freight | 0 |
| Regrassing costs | 6 |
| Shearing expenses | 13 |
| Weed and pest control | 6 |
| Fuel | 9 |
| Vehicle costs (excl. Fuel) | 7 |
| Repairs and maintenance | 14 |
| **Total other working expenses** | **95** |
| Communication costs (phone and mail) | 1 |
| Accountancy | 3 |
| Legal and consultancy | 2 |
| Other administration | 3 |
| Rates | 8 |
| Insurance | 4 |
| ACC Employer | 2 |
| Other expenditure | 2 |
| **Total overhead expenses** | **25** |
| **Total farm working expenses ($/ha)** | **195.65** |
| *EXCLUDED:* | |
| *Water charges (irrigation)* | *1* |
| *Cash crop expenses (incl. Forestry expenses)* | *1* |
| *Breeding* | *1* |
| *Permanent wages was $17/ha and was changed for an increase in labour units and pay rate* | |
| | |
| http://www.maf.govt.nz/news-resources/publications.aspx?title=Canterbury/Marlborough hill country sheep and beef | |

# Appendix C 5

## Stock Costs

| | S.U. | Capital Value 2010 | Interest Rate | Months on Farm | Interest Cost | Death Rate | Cost of Deaths | An. Health | Breeding/ ($0.19/s.u.) | Freight (50km from farm to yards) | Shearing | TOTAL | Total Cost/ head |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Merino** | | | | | | | | | | | | | |
| **Rams** | 1.09 | $ 237.00 | 6.5% | 100% | $ 15.41 | 4% | $ 9.48 | $ 5.12 | $ 0.21 | $ 0.67 | $ 4.75 | $ 35.63 | -$35.63 |
| **Ram Lambs** | 0.45 | $ - | 6.5% | 100% | $ - | 2% | $ - | $ 5.12 | $ - | $ 0.51 | $ - | $ 5.62 | -$5.62 |
| **Ram Lambs Sold January Terminal Prgeny** | 0.45 | $ - | 6.5% | 19% | $ - | 0% | $ - | $ 0.96 | $ - | $ 0.51 | $ - | $ 0.69 | -$0.69 |
| **Ram Lambs Sold April** | 0.45 | $ - | 6.5% | 50% | $ - | 2% | $ - | $ 2.56 | $ - | $ 0.51 | $ 2.46 | $ 4.25 | -$4.25 |
| **Ewe Lambs** | 0.46 | $ - | 6.5% | 67% | $ - | 2% | $ - | $ 3.41 | $ - | $ 0.51 | $ - | $ 3.92 | -$3.92 |
| **Ewe Lambs Sold January - Terminal Progeny** | 0.46 | $ - | 6.5% | 25% | $ - | 2% | $ - | $ 1.28 | $ - | $ 0.51 | $ - | $ 1.79 | -$1.79 |
| **Ewe Hoggets** | 0.66 | $ 88.00 | 6.5% | 100% | $ 5.72 | 1% | $ 0.88 | $ 5.12 | $ 0.13 | $ 0.48 | $ 4.75 | $ 17.07 | -$17.07 |
| **Ewe Hoggets Sold Start of September** | 0.66 | $ 88.00 | 6.5% | 17% | $ 5.72 | 1% | $ 0.88 | $ 0.85 | $ 0.13 | $ 0.48 | $ 4.75 | $ 6.49 | -$6.49 |
| **Ram Hoggets Sold June** | 0.75 | $ 81.00 | 6.5% | 100% | $ 5.27 | 1% | $ 0.81 | $ 5.12 | $ 0.14 | $ 0.48 | $ 4.75 | $ 16.56 | -$16.56 |
| **2th Ewes** | 1.03 | $ 122.00 | 6.5% | 100% | $ 7.93 | 2% | $ 1.83 | $ 5.12 | $ 0.20 | $ 0.44 | $ 4.75 | $ 20.26 | -$20.26 |
| **M.A. EWES (R 3s and 4yo)** | 1.03 | $ 107.00 | 6.5% | 100% | $ 6.96 | 4% | $ 4.28 | $ 5.12 | $ 0.20 | $ 0.67 | $ 4.75 | $ 21.96 | -$21.96 |
| **R 5 Ewes and older** | 1.03 | $ 88.00 | 6.5% | 83% | $ 4.77 | 3% | $ 2.93 | $ 4.26 | $ 0.20 | $ 0.67 | $ 4.75 | $ 17.58 | -$17.58 |
| **Corriedale/ Halfbred** | | | | | | | | | | | | | |
| **Rams** | 1.20 | $ 237.00 | 6.5% | 100% | $ 15.41 | 5% | $ 10.90 | $ 3.96 | $ 0.23 | $ 0.67 | $ 4.63 | $ 35.79 | -$35.79 |
| **Ram Lambs** | 0.48 | $ - | 6.5% | 100% | $ - | 2% | $ - | $ 3.96 | $ - | $ 0.51 | $ - | $ 4.46 | -$4.46 |
| **November Ram Lamb Sales from Terminal** | 0.48 | $ - | 6.5% | 2% | $ - | 0% | $ - | $ 0.08 | $ - | $ 0.51 | $ - | $ 0.51 | -$0.51 |
| **Ram Lambs Sold January** | 0.48 | $ - | 6.5% | 21% | $ - | 2% | $ - | $ 0.82 | $ - | $ 0.51 | $ 2.46 | $ 3.14 | -$3.14 |
| **Ewe Lambs** | 0.50 | $ - | 6.5% | 67% | $ - | 2% | $ - | $ 2.64 | $ - | $ 0.51 | $ - | $ 3.14 | -$3.14 |
| **November Ewe Lamb Sales from Terminal** | 0.48 | $ - | 6.5% | 4% | $ - | 0% | $ - | $ 0.16 | $ - | $ 1.87 | $ - | $ 1.88 | -$1.88 |
| **Ewe Hoggets** | 0.74 | $ 88.00 | 6.5% | 100% | $ 5.72 | 4% | $ 3.08 | $ 3.96 | $ 0.14 | $ 0.48 | $ 4.63 | $ 18.00 | -$18.00 |
| **Ewe Hoggets sold at the start of September** | 0.74 | $ 88.00 | 6.5% | 17% | $ 5.72 | 4% | $ 3.08 | $ 0.66 | $ 0.14 | $ 0.48 | $ 4.75 | $ 6.83 | -$6.83 |
| **Ram Hoggets** | 0.77 | $ 81.00 | 6.5% | 100% | $ 5.27 | 2% | $ 1.22 | $ 3.96 | $ 0.15 | $ 0.48 | $ 4.63 | $ 15.69 | -$15.69 |
| **2th Ewes** | 1.16 | $ 122.00 | 6.5% | 100% | $ 7.93 | 4% | $ 4.64 | $ 3.96 | $ 0.22 | $ 0.44 | $ 4.63 | $ 21.80 | -$21.80 |
| **M.A. EWES (R 3s and 4yo)** | 1.16 | $ 107.00 | 6.5% | 100% | $ 6.96 | 5% | $ 4.92 | $ 3.96 | $ 0.22 | $ 0.67 | $ 4.63 | $ 21.35 | -$21.35 |
| **R 5 Ewes and older** | 1.16 | $ 88.00 | 6.5% | 83% | $ 4.77 | 4% | $ 3.37 | $ 3.30 | $ 0.22 | $ 0.67 | $ 4.63 | $ 16.95 | -$16.95 |
| **Cattle** | | | | | | | | | | | | | |
| **Calves (Steers and Heifers)** | 1.55 | $ 237.00 | 6.5% | 0% | $ 15.41 | 3% | $ 5.93 | $ 4.96 | $ 0.29 | $ 1.40 | $ - | $ 27.98 | -$27.98 |
| **Weaners (R1 Heifers)** | 3.95 | $ 564.00 | 6.5% | 25% | $ 36.66 | 4% | $ 22.56 | $ 12.65 | $ 0.75 | $ 1.93 | $ - | $ 20.08 | -$20.08 |
| **Weaners (R1 Steers)** | 3.95 | $ 564.00 | 6.5% | 25% | $ 36.66 | 4% | $ 22.56 | $ 12.65 | $ 0.75 | $ 1.93 | $ - | $ 20.08 | -$20.08 |
| **Weaners (R1 Steers and Heifers)** | 3.95 | $ 564.00 | 6.5% | 25% | $ 36.66 | 4% | $ 22.56 | $ 12.65 | $ 0.75 | $ 1.93 | $ - | $ 74.55 | -$74.55 |
| **Steers (R2)** | 4.18 | $ 791.00 | 6.5% | 0% | $ 51.42 | 3% | $ 23.73 | $ 13.39 | $ 0.79 | $ 2.83 | $ - | $ 92.16 | -$92.16 |
| **Heifers (R2)** | 3.99 | $ 680.00 | 6.5% | 100% | $ 44.20 | 4% | $ 24.93 | $ 12.75 | $ 0.76 | $ 2.83 | $ - | $ 85.47 | -$85.47 |
| **3YO Cows** | 7.28 | $ 791.00 | 6.5% | 100% | $ 51.42 | 4% | $ 31.64 | $ 23.29 | $ 1.38 | $ 5.25 | $ - | $ 112.98 | -$112.98 |
| **4YO Cows** | 7.28 | $ 791.00 | 6.5% | 100% | $ 51.42 | 4% | $ 31.64 | $ 23.29 | $ 1.38 | $ 5.25 | $ - | $ 112.98 | -$112.98 |
| **5YO Cows** | 7.28 | $ 791.00 | 6.5% | 100% | $ 51.42 | 4% | $ 31.64 | $ 23.29 | $ 1.38 | $ 5.25 | $ - | $ 112.98 | -$112.98 |
| **6YO Cows** | 7.28 | $ 791.00 | 6.5% | 100% | $ 51.42 | 4% | $ 31.64 | $ 23.29 | $ 1.38 | $ 5.25 | $ - | $ 112.98 | -$112.98 |
| **7YO Cows** | 7.28 | $ 791.00 | 6.5% | 100% | $ 51.42 | 4% | $ 31.64 | $ 23.29 | $ 1.38 | $ 5.25 | $ - | $ 112.98 | -$112.98 |
| **8YO Cows** | 7.28 | $ 791.00 | 6.5% | 100% | $ 51.42 | 4% | $ 31.64 | $ 23.29 | $ 1.38 | $ 5.25 | $ - | $ 112.98 | -$112.98 |
| **9YO Cows** | 7.28 | $ 791.00 | 6.5% | 100% | $ 51.42 | 4% | $ 31.64 | $ 23.29 | $ 1.38 | $ 5.25 | $ - | $ 112.98 | -$112.98 |
| **10YO Cows** | 7.28 | $ 791.00 | 6.5% | 83% | $ 51.42 | 4% | $ 31.64 | $ 23.29 | $ 1.38 | $ 5.25 | $ - | $ 95.02 | -$95.02 |
| **Bulls** | 7.39 | $ 1,799.00 | 6.5% | 100% | $ 116.94 | 4% | $ 71.96 | $ 23.65 | $ 1.40 | $ 5.25 | $ - | $ 219.20 | -$219.20 |
| Fued adjustment cost since December 2008 | **35%** | | | | | | | assumed from MAF ($3.20/s.u.) | | | | | |
| | | | 6.5% | | | | | $3.20 | | | | | |

## Appendix C 6

## Cattle Feed Demand

### Bulls

| Bulls | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | S/U comsumption | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | 800 | 800 | 800 | 803 | 806 | 809 | 806 | 806 | 806 | 806 | 806 | 800 | 6000 S/Us | 500 |
| Maintenance (0.7 x MJ ME/kg^0.75) | 0.7 | 121 | 121 | 121 | 121 | 122 | 122 | 122 | 122 | 122 | 122 | 122 | 121 | | |
| LWG : at MJ ME/kg LWG: | 55 | 0.00 | 0.00 | 0.10 | 0.10 | 0.10 | -0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 30 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| TOTAL ME: | | 121.1 | 121.1 | 121.2 | 121.6 | 121.9 | 120.9 | 121.8 | 121.8 | 121.8 | 121.8 | 121.8 | 121.1 | | |
| kgDM/hd/day: | | 14.1 | 13.2 | 11.5 | 11.6 | 11.6 | 12.0 | 12.4 | 12.8 | 15.2 | 15.2 | 14.7 | 15.3 | | |
| Days | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | |
| Monthly Requirements. | | 3754 | 3754 | 3636 | 3768 | 3657 | 3749 | 3775 | 3410 | 3775 | 3653 | 3775 | 3633 | 44338 | 7.39 |
| Month | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
| Season | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM (Marlborough) | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | |


### Calves (Heifers)

| Calves (Heifers) | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | S/U comsumption | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | | | | | | | | 120.0 | 148.0 | 179.0 | 209.0 | 240.0 | 6000 S/Us | 500 |
| Maintenance (0.67 x MJ ME/kg^0.75) | 0.67 | | | | | | | | 26.7 | 31.3 | 36.1 | 40.5 | 44.9 | | |
| LWG : at MJ ME/kg LWG: | 27.8 | | | | | | | | 1.00 | 1.00 | 1.00 | 1.00 | 0.50 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 20 | | | | | | | | 27.8 | 27.8 | 27.8 | 27.8 | 13.9 | | |
| TOTAL ME: | | | | | | | | | 55.5 | 60.1 | 64.9 | 69.3 | 59.3 | | |
| kgDM/hd/day: | | | | | | | | | 5.8 | 7.5 | 8.1 | 8.4 | 7.5 | | |
| Days | | | | | | | | | 28 | 31 | 30 | 31 | 30 | | |
| Monthly Requirements. | | | | | | | | | 1555 | 1862 | 1946 | 2149 | 1780 | 9292 | 1.55 |
| Month | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
| Season | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM (Marlborough) | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | |

Calving : September 1

Weaning

### Calves (Steers)

| Calves (Steers) | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | S/U comsumption | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | | | | | | | | 120.0 | 150.8 | 184.9 | 217.9 | 252.0 | 6000 S/Us | 500 |
| Maintenance (0.67 x MJ ME/kg^0.75) | 0.67 | | | | | | | | 26.7 | 31.7 | 37.0 | 41.8 | 46.6 | | |
| LWG : at MJ ME/kg LWG: | 24 | | | | | | | | 1.10 | 1.10 | 1.10 | 1.10 | 0.55 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 20 | | | | | | | | 26.8 | 26.8 | 26.8 | 26.8 | 13.4 | | |
| TOTAL ME: | | | | | | | | | 54.7 | 59.7 | 64.9 | 69.7 | 60.6 | | |
| kgDM/hd/day: | | | | | | | | | 5.0 | 5.4 | 4.6 | 7.7 | 20.2 | | |
| Days | | | | | | | | | 28 | 31 | 30 | 31 | 30 | | |
| Monthly Requirements. | | | | | | | | | 1531 | 1849 | 1947 | 2162 | 1818 | 9306 | 1.55 |
| Month | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
| Season | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM (Marlborough) | | 3 | 11 | 28 | 44 | 28 | 18 | 13 | 11 | 11 | 14 | 9 | 3 | 16.1 MJME/kgDM | |

Calving : September 1

Weaning

LW Increase above heifers 110%

### R1 Steers & Heifers

| R1 Steers & Heifers | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | S/U comsumption | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | 242 | 245 | 251 | 266 | 281 | 296 | 312 | 324 | 334 | 350 | 365 | 240 | 6000 S/Us | 500 |
| Maintenance (0.67 x MJ ME/kg^0.75) | 0.67 | 45.1 | 45.6 | 46.4 | 48.5 | 50.6 | 52.6 | 54.7 | 56.3 | 57.6 | 59.6 | 61.5 | 44.9 | | |
| LWG : at MJ ME/kg LWG: | 33 | 0.10 | 0.20 | 0.50 | 0.50 | 0.50 | 0.50 | 0.40 | 0.35 | 0.50 | 0.50 | 0.50 | 0.05 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 20 | 3.3 | 6.6 | 16.5 | 16.5 | 16.5 | 16.5 | 13.2 | 11.6 | 16.5 | 16.5 | 16.5 | 1.7 | | |
| TOTAL ME: | | 48.5 | 52.4 | 63.4 | 65.5 | 67.6 | 69.6 | 68.3 | 68.2 | 74.6 | 76.6 | 78.5 | 46.6 | | |
| kgDM/hd/day: | | 5.6 | 5.7 | 6.0 | 6.2 | 6.4 | 6.9 | 7.0 | 7.2 | 9.3 | 9.6 | 9.5 | 5.9 | | |
| Days | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | |
| Monthly Requirements. | | 1505 | 1624 | 1903 | 2031 | 2029 | 2159 | 2117 | 1910 | 2312 | 2297 | 2433 | 1399 | 23719 | 3.95 |
| Month | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
| Season | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM (Marlborough) | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | |

### Heifers (R2)

| Heifers (R2) | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | S/U comsumption | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | 366.0 | 372.2 | 378.4 | 390.4 | 402.8 | 414.8 | 427.2 | 438.1 | 446.5 | 457.3 | 469.3 | 360.0 | 6000 S/Us | 500 |
| Maintenance (0.65 x MJ ME/kg^0.75) | 0.65 | 59.8 | 60.6 | 61.3 | 62.8 | 64.3 | 65.7 | 67.2 | 68.5 | 69.4 | 70.7 | 72.1 | 59.1 | | |
| LWG : at MJ ME/kg LWG: | 51.00 | 0.20 | 0.20 | 0.40 | 0.40 | 0.40 | 0.40 | 0.35 | 0.30 | 0.35 | 0.40 | 0.40 | 0.20 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 20 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | | |
| TOTAL ME: | | 60.1 | 60.8 | 61.8 | 63.3 | 64.8 | 66.2 | 67.6 | 68.8 | 69.9 | 71.2 | 72.6 | 59.3 | | |
| kgDM/hd/day: | | 7.0 | 6.6 | 5.9 | 5.0 | 6.2 | 6.6 | 6.9 | 7.2 | 8.7 | 8.9 | 8.7 | 7.5 | | |
| Days | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | |
| Monthly Requirements. | | 1862 | 1886 | 1855 | 1962 | 1943 | 2052 | 2096 | 1927 | 2166 | 2136 | 2250 | 1780 | 23913 | 3.99 |
| Month | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
| Season | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM (Marlborough) | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | |

## Steers (R2)

S/U consumption

| | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | 279.0 | 383.3 | 397.6 | 412.6 | 428.1 | 443.1 | 458.6 | 472.6 | 483.3 | 497.7 | 513.7 | 270.0 | 6000 s/Uc | 500 |
| Maintenance (0.65 x MJ ME/kg^0.75) | 0.65 | 61.4 | 62.5 | 63.7 | 65.5 | 67.3 | 69.1 | 70.9 | 72.5 | 73.8 | 75.3 | 77.0 | 60.3 | | |
| LWG : at MJ ME/kg LWG: | 42.75 | 0.30 | 0.30 | 0.50 | 0.50 | 0.50 | 0.50 | 0.45 | 0.40 | 0.45 | 0.50 | 0.50 | 0.30 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 20 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | | |
| TOTAL ME: | | 61.8 | 62.9 | 64.3 | 66.1 | 67.9 | 69.7 | 71.4 | 72.9 | 74.3 | 75.9 | 77.6 | 60.7 | | |
| kgDM/hd/day: | | 7.2 | 6.8 | 6.1 | 6.3 | 6.5 | 6.9 | 7.3 | 7.7 | 9.3 | 9.5 | 9.4 | 7.7 | | |
| Days | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | |
| Monthly Requirements. | | 1915 | 1950 | 1928 | 2048 | 2037 | 2159 | 2213 | 2043 | 2303 | 2278 | 2407 | 1820 | 25101 | 4.18 |
| Month | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
| Season | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM (Marlborough) | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | |

## M.A. Breeding Cow

S/U consumption

| | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | 477.0 | 483.2 | 495.6 | 492.6 | 501.9 | 510.9 | 511.5 | 505.3 | 499.7 | 493.5 | 487.5 | 480.0 | 6000 s/Uc | 500 |
| Maintenance (0.70 x MJ ME/kg^0.75) | 0.7 | 76.4 | 77.2 | 78.7 | 78.3 | 79.4 | 80.5 | 80.6 | 79.8 | 79.2 | 78.4 | 77.7 | 76.8 | | |
| LWG : at MJ ME/kg LWG: | 55.00 | 0.20 | 0.40 | -0.10 | 0.30 | 0.30 | 0.02 | -0.20 | -0.20 | -0.20 | -0.20 | -0.20 | -0.10 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 30 | 11.0 | 22.0 | -3.0 | 16.5 | 16.5 | 1.1 | -6.0 | -6.0 | -6.0 | -6.0 | -6.0 | -3.0 | | |
| Pregnancy MJ ME/ ewe. | | 13.8 | 23.9 | 41.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.3 | | |
| Lactation MJ ME/ewe. | | 0.0 | 0.0 | 0.0 | 36.4 | 43.2 | 50.1 | 54.6 | 59.2 | 63.7 | 68.3 | 0.0 | 0.0 | | |
| TOTAL ME: | | 101.4 | 123.5 | 117.0 | 131.5 | 139.4 | 131.7 | 129.0 | 132.8 | 136.7 | 140.5 | 71.5 | 82.0 | | |
| kgDM/hd/day: | | 11.8 | 13.4 | 11.1 | 12.5 | 13.3 | 13.0 | 13.2 | 14.0 | 17.1 | 17.6 | 8.6 | 10.4 | | |
| Days | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | |
| Monthly Requirements. | | 3145 | 3829 | 3509 | 4077 | 4183 | 4081 | 3998 | 3718 | 4237 | 4214 | 2217 | 2460 | 43668 | 7.28 |
| Month | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
| Season | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM (Marlborough) | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | |

Calving : September

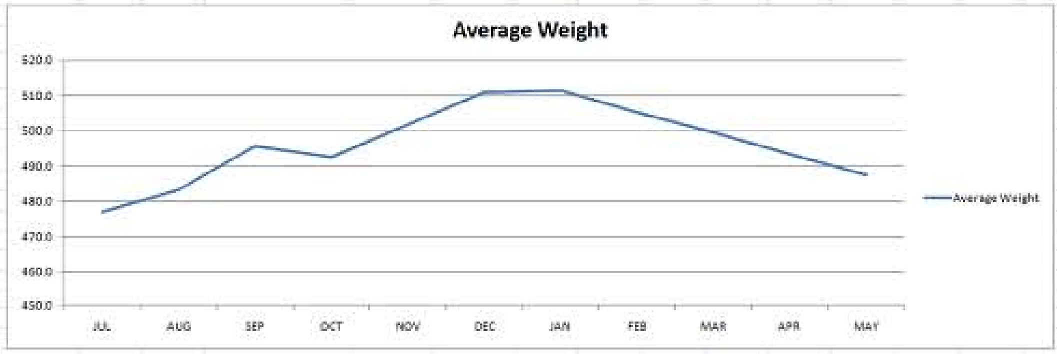
Mating: 30 Nov

CATTLE Pregnancy (adjusted for pregancy rate of 92%)

| | 92% | Weeks before Calving | | | |
|---|---|---|---|---|---|
| | Birthweight (kg) | -12 | -8 | -4 | 0 |
| Assumed weight: | 30.0 | 5.5 | 10.1 | 18.4 | 31.3 |
| | 40.0 | 8.3 | 13.8 | 23.9 | 41.4 |
| | 50.0 | 10.1 | 16.6 | 29.4 | 50.6 |

CATTLE Lactation (adjusted from weaning rate of 91%)

| | 91% | Months After Calving | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Weaning Weight (kg) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Assumed weight: | 150 | 31.9 | 36.4 | 41.0 | 45.5 | 50.1 | 50.1 | 50.1 |
| | 200 | 36.4 | 43.2 | 50.05 | 54.60 | 59.2 | 63.7 | 68.25 |
| | 250 | 45.5 | 54.6 | 63.7 | 70.5 | 77.4 | 81.9 | 86.5 |
| | 300 | 54.6 | 63.7 | 72.8 | 81.9 | 91.0 | 97.8 | 104.7 |



## Appendix C 7

## Sheep Feed Demand

### Merino RAM

S/U consumption: 6000 S/Us | 500

| | Input | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | 74.75 | 74.75 | 74.75 | 74.75 | 74.87 | 74.99 | 75.12 | 75.24 | 75.35 | 75.51 | 75.66 | 74.75 | | |
| Maintenance (0.56 x MJ ME/kg^0.75) | 0.56 | 21.0 | 17.5 | 17.5 | 17.5 | 17.5 | 17.6 | 17.6 | 17.6 | 17.6 | 17.7 | 17.7 | 17.5 | | |
| LWG : at MJ ME/kg LWG | 50 | 0.00 | 0.00 | 0.00 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.01 | 0.01 | 0.00 | 0.00 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 30 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.0 | 0.0 | | |
| TOTAL ME | | 21.0 | 17.5 | 17.5 | 17.7 | 17.7 | 17.8 | 17.8 | 17.8 | 17.9 | 17.9 | 17.7 | 17.5 | | |
| kgDM/hd/day | | 2.4 | 1.9 | 1.7 | 1.7 | 1.7 | 1.8 | 1.8 | 1.9 | 2.2 | 2.2 | 2.1 | 2.2 | | |
| Days | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | |
| **Monthly Requirements.** | | **652** | **543** | **526** | **549** | **532** | **551** | **551** | **499** | **554** | **537** | **548** | **526** | **6567** | **1.09** |
| **Month** | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | |

Assume shearing in July

MERINO Shearing

40% of maintenance added per week for 2 weeks after shearing



### Merino RAM Lamb

S/U consumption: 6000 S/Us | 500

| | Input | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | | | | | 25.0 | 29.1 | 32.2 | 35.0 | 37.4 | 39.7 | 41.9 | 44.20 | | |
| Maintenance (0.50x MJ ME/kg^0.75) | 0.5 | | | | | 6.4 | 7.2 | 7.8 | 8.3 | 8.7 | 9.1 | 9.6 | 9.9 | | |
| LWG : at MJ ME/kg LWG | 30.00 | | | | | 0.138 | 0.100 | 0.089 | 0.087 | 0.073 | 0.073 | 0.076 | 0.076 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 0 | | | | | 4.1 | 3.0 | 2.7 | 2.6 | 2.2 | 2.2 | 2.3 | 2.3 | | |
| TOTAL ME | | | | | | 10.6 | 10.2 | 10.5 | 10.9 | 10.9 | 11.3 | 11.7 | 12.1 | | |
| kgDM/hd/day | | | | | | 1.0 | 1.0 | 1.1 | 1.1 | 1.4 | 1.4 | 1.4 | 1.5 | | |
| Days | | | | | | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 32 | | |
| **Monthly Requirements.** | | | | | | **317** | **317** | **324** | **305** | **337** | **338** | **364** | **388** | **2689** | **0.45** |
| **Month** | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | |

**Lamb Sale 17.5kg CW - April**

| | LW | Dressing | Carcass Weight |
|---|---|---|---|
| **Start of Month** | 37.4 | 45% | **16.8** |
| **Middle of Month** | 38.5 | 45% | **17.3** |
| **3/4 of Month** | 39.11 | 45% | **17.6** |
| **End of Month** | 39.7 | 45% | **17.9** |


| | |
|---|---|
| **Growth Rate Factor above ewe growth rate** | 110% |

### Merino RAM Lamb (Terminal)

S/U consumption: 6000 S/Us | 500

| | Input | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | | | | | 27.5 | 32.5 | 37.6 | 42.7 | [illegible] | [illegible] | [illegible] | [illegible] | | |
| Maintenance (0.50x MJ ME/kg^0.75) | 0.5 | | | | | 6.9 | 7.8 | 8.7 | 9.6 | [illegible] | [illegible] | [illegible] | [illegible] | | |
| LWG : at MJ ME/kg LWG | 30.00 | | | | | 0.165 | 0.165 | 0.165 | 0.165 | [illegible] | [illegible] | [illegible] | [illegible] | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 0 | | | | | 5.0 | 5.0 | 5.0 | 5.0 | [illegible] | [illegible] | [illegible] | [illegible] | | |
| TOTAL ME | | | | | | 11.9 | 12.8 | 13.7 | 14.6 | [illegible] | [illegible] | [illegible] | [illegible] | | |
| kgDM/hd/day | | | | | | 0.1 | 0.2 | 0.3 | 0.3 | [illegible] | [illegible] | [illegible] | [illegible] | | |
| Days | | | | | | 30 | 31 | 31 | 28 | [illegible] | [illegible] | [illegible] | [illegible] | | |
| **Monthly Requirements.** | | | | | | **356** | **399** | **424** | **407** | [illegible] | [illegible] | [illegible] | [illegible] | **3214** | **0.54** |
| **Month** | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM | | 12.3 | 45.1 | 114.8 | 180.4 | 114.8 | 73.8 | 53.3 | 45.1 | 45.1 | 57.4 | 36.9 | 12.3 | 65.9 MJME/kgDM | |

**Terminal Lamb - January Sale**

| | LW | Dressing | Carcass Weight |
|---|---|---|---|
| **Start of Month** | 37.6 | 45% | **16.9** |
| **1/4 of the month** | 38.84 | 45% | **17.5** |
| **Middle of Month** | 40.1 | 45% | **18.1** |
| **End of Month** | 42.7 | 45% | **19.2** |

## Merino EWE Lamb

| | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | S/U consumption | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | | | | | 25.0 | 28.8 | 31.6 | 34.1 | 36.3 | 38.3 | 40.3 | 42.5 | 6000 S/Us | 500 |
| Maintenance (0.45x MJ ME/kg^0.75) | 0.45 | | | | | 6.4 | 7.1 | 7.7 | 8.1 | 8.5 | 8.9 | 9.2 | 9.6 | | |
| LWG : at MJ ME/kg LWG: | 40.00 | | | | | 0.125 | 0.091 | 0.081 | 0.079 | 0.068 | 0.066 | 0.069 | 0.050 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 0 | | | | | 5.0 | 3.6 | 3.2 | 3.2 | 2.6 | 2.6 | 2.8 | 2.0 | | |
| TOTAL ME: | | | | | | 11.4 | 10.8 | 10.9 | 11.3 | 11.1 | 11.5 | 12.0 | 11.6 | | |
| kgDM/hd/day: | | | | | | 1.1 | 1.1 | 1.1 | 1.2 | 1.4 | 1.4 | 1.4 | 1.5 | | |
| Days | | | | | | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 32 | | |
| **Monthly Requirements.** | | | | | | **343** | **334** | **338** | **316** | **345** | **345** | **371** | **370** | **2762** | **0.46** |
| **Month** | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | |

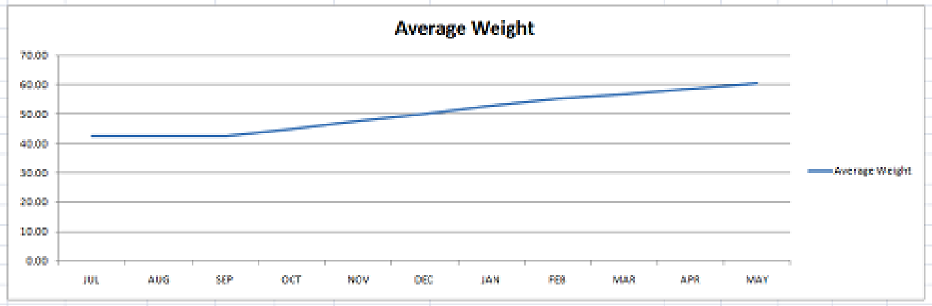
## Merino RAM - HOGGET

| | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | S/U consumption | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | 42.50 | 42.50 | 42.50 | 44.81 | 47.54 | 50.18 | 52.91 | 55.29 | 56.83 | 58.54 | 60.52 | 42.5 | 6000 S/Us | 500 |
| Maintenance (0.50x MJ ME/kg^0.75) | 0.5 | 10.7 | 9.6 | 9.6 | 10.0 | 10.4 | 10.8 | 11.3 | 11.7 | 11.9 | 12.2 | 12.5 | 9.6 | | |
| LWG : at MJ ME/kg LWG: | 28.00 | 0.00 | 0.00 | 0.08 | 0.09 | 0.09 | 0.09 | 0.08 | 0.06 | 0.06 | 0.07 | 0.06 | 0.00 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 0 | 0.0 | 0.0 | 2.2 | 2.5 | 2.5 | 2.5 | 2.2 | 1.5 | 1.5 | 1.8 | 1.5 | 0.0 | | |
| TOTAL ME: | | 10.7 | 9.6 | 11.7 | 12.4 | 12.9 | 13.3 | 13.4 | 13.2 | 13.4 | 14.0 | 14.0 | 9.6 | | |
| kgDM/hd/day: | | 1.2 | 1.0 | 1.1 | 1.2 | 1.2 | 1.3 | 1.4 | 1.4 | 1.7 | 1.8 | 1.7 | 1.2 | | |
| Days | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | |
| **Monthly Requirements.** | | **331** | **297** | **352** | **385** | **386** | **412** | **417** | **370** | **417** | **421** | **435** | **287** | **4508** | **0.75** |
| **Month** | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | |

Assume July shearing

MERINO Shearing — **40% of maintenance added per week for 2 weeks after shearing**

| Growth Rate Factor above ewe growth rate | 110% |
|---|---|




## Merino EWE Lamb (from Terminal)

| | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | S/U consumption | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | | | | | 27.5 | 32.0 | 35.4 | 38.4 | ~~40.6~~ | ~~42.7~~ | ~~44.6~~ | ~~46.8~~ | 6000 S/Us | 500 |
| Maintenance (0.45x MJ ME/kg^0.75) | 0.45 | | | | | 6.9 | 7.7 | 8.3 | 8.9 | ~~9.3~~ | ~~9.6~~ | ~~9.9~~ | ~~10.3~~ | | |
| LWG : at MJ ME/kg LWG: | 40.00 | | | | | 0.150 | 0.109 | 0.097 | 0.079 | ~~0.066~~ | ~~0.066~~ | ~~0.069~~ | ~~0.050~~ | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 0 | | | | | 6.0 | 4.4 | 3.9 | 3.2 | ~~2.6~~ | ~~2.6~~ | ~~2.8~~ | ~~2.0~~ | | |
| TOTAL ME: | | | | | | 12.9 | 12.1 | 12.2 | 12.0 | ~~11.9~~ | ~~12.2~~ | ~~12.7~~ | ~~12.3~~ | | |
| kgDM/hd/day: | | | | | | 0.5 | 0.7 | 0.9 | 1.1 | ~~1.1~~ | ~~0.9~~ | ~~1.4~~ | ~~1.1~~ | | |
| Days | | | | | | 30 | 31 | 31 | 28 | ~~31~~ | ~~30~~ | ~~31~~ | 32 | | |
| **Monthly Requirements.** | | | | | | **387** | **376** | **379** | **337** | ~~**369**~~ | ~~**367**~~ | ~~**393**~~ | ~~**393**~~ | **3001** | **0.50** |
| **Month** | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | ~~MAR~~ | ~~APR~~ | ~~MAY~~ | ~~JUN~~ | | |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | ~~Autumn~~ | ~~Autumn~~ | ~~Autumn~~ | ~~Winter~~ | | |
| MJ ME/kgDM | | 3 | 11 | 28 | 44 | 28 | 18 | 13 | 11 | ~~44~~ | ~~44~~ | ~~9~~ | ~~3~~ | 16.1 MJME/kgDM | |

| **Terminal Lamb - January Sale** | LW | Dressing % | Carcass Weight |
|---|---|---|---|
| **Start of Month** | 35.4 | 45% | **15.9** |
| **Middle of Month** | 36.9 | 45% | **16.6** |
| **End of Month** | 38.4 | 45% | **17.3** |

## Merino EWE - HOGGET

S/U comsumption

| | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | 43.1 | 43.7 | 44.0 | 44.9 | 46.2 | 47.4 | 48.6 | 49.8 | 50.6 | 51.6 | 52.5 | 42.5 | 6000 S/Us | | 500 |
| Maintenance (0.45x MJ ME/kg^0.75) | 0.45 | 10.4 | 8.8 | 8.8 | 9.0 | 9.2 | 9.3 | 9.5 | 9.7 | 9.8 | 10.0 | 10.1 | 8.6 | | | |
| LWG : at MJ ME/kg LWG | 48.00 | 0.02 | 0.01 | 0.03 | 0.04 | 0.04 | 0.04 | 0.04 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | | | |
| ME for weight gain | | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 28.5 | 1.0 | 0.5 | 1.4 | 1.9 | 1.9 | 1.9 | 1.8 | 1.4 | 1.4 | 1.4 | 1.4 | 1.0 | | | |
| TOTAL ME: | | 11.4 | 9.3 | 10.3 | 10.9 | 11.1 | 11.3 | 11.4 | 11.1 | 11.3 | 11.4 | 11.5 | 9.6 | | | |
| kgDM/hd/day: | | 1.3 | 1.0 | 1.0 | 1.0 | 1.1 | 1.1 | 1.2 | 1.2 | 1.4 | 1.4 | 1.4 | 1.2 | | | |
| Days | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | | |
| **Monthly Requirements.** | | **354** | **288** | **309** | **338** | **333** | **349** | **352** | **312** | **349** | **342** | **357** | **287** | **3969** | **0.66** | |
| **Month** | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | | |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | | |
| MJ ME/kgDM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | | |

Assume July shearing

MERINO Shearing — **40% of maintenance added per week for 2 weeks after shearing**


## Merino EWE- 2TH

S/U comsumption

| | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | 52.50 | 52.50 | 52.50 | 52.80 | 53.11 | 53.56 | 54.18 | 54.86 | 55.65 | 56.58 | 57.48 | 52.50 | 6000 S/Us | | 500 |
| Maintenance (0.56 x MJ ME/kg^0.75) | 0.56 | 16.7 | 11.7 | 11.7 | 11.7 | 11.8 | 11.9 | 12.0 | 12.1 | 12.2 | 12.4 | 12.5 | 11.7 | | | |
| LWG : at MJ ME/kg LWG: | 50.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.02 | 0.00 | | | |
| ME for weight gain | | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 30 | 0.0 | 0.0 | 0.5 | 0.5 | 0.8 | 1.0 | 1.1 | 1.4 | 1.5 | 1.5 | 1.0 | 0.0 | | | |
| Pregnancy MJ ME/ ewe | | **1.38** | **2.95** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | |
| Lactation MJ ME/ewe. Weaning Weight = | 25.0 | 0.00 | 0.00 | **11.13** | **13.63** | **16.50** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | |
| TOTAL ME: | | 18.1 | 14.6 | 23.3 | 25.9 | 29.1 | 12.9 | 13.1 | 13.5 | 13.7 | 13.9 | 13.5 | 11.7 | | | |
| kgDM/hd/day: | | 2.1 | 1.6 | 2.2 | 2.5 | 2.8 | 1.3 | 1.3 | 1.4 | 1.7 | 1.7 | 1.6 | 1.5 | | | |
| Days | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | | |
| **Monthly Requirements.** | | **560** | **454** | **700** | **802** | **872** | **399** | **406** | **378** | **426** | **417** | **419** | **351** | **6183** | **1.03** | |
| **Month** | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | | |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | | |
| MJ ME/kgDM (Marlborough) | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | | |

Assume July Shearing

LAMBING: 28 August

WEANING: 6 November

MERINO Pregnancy

| | LAMBS | Weeks before Lambing | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Birthweight (kg) | **-6** | **-4** | **-2** | **0** | | Month 2 | Month 1 |
| 79% | **2.36** | **1.2** | **1.6** | **2.4** | **3.5** | | **1.38** | **2.95** |
| | 3.0 | 1.5 | 2.0 | 3.0 | 4.5 | | 1.75 | 3.75 |
| | 4.0 | 2.0 | 3.0 | 4.0 | 6.0 | | 2.50 | 5.00 |
| | 5.0 | 2.5 | 3.5 | 5.0 | 7.0 | | 3.00 | 6.00 |
| | 6.0 | 3.0 | 4.5 | 6.0 | 8.5 | | 3.75 | 7.25 |

MERINO Lactation

| LAMBS | s after Lambing | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Weaning Weight (kg | **2** | **4** | **6** | **8** | **10** | **12** | | | |
| | | | | | | | Month 3 | Month 2 | Month 1 |
| **20.0** | 8.5 | 9.50 | 10.5 | 11.5 | 12.5 | 13.0 | 12.8 | 11.0 | 9.0 |
| **25.0** | 10.5 | 11.75 | 13.0 | 14.25 | 16.0 | 17.0 | 16.5 | 13.6 | 11.1 |
| **30.0** | 12.0 | 14.0 | 16.0 | 18.0 | 20.0 | 21.0 | 20.5 | 17.0 | 13.0 |
| **35.0** | 14.5 | 17.0 | 19.5 | 22.0 | 24.5 | 26.0 | 25.3 | 20.8 | 15.8 |

MERINO Shearing

| Date | s After Shearing | | | | | |
|---|---|---|---|---|---|---|
| | **1** | | **2** | | | Month 1 |
| August | 5 | | 5 | | MJME/ew Cover comb assumed | 5.0 |
| October | 4 | | 4 | | MJME/ew Cover comb assumed | 4.0 |
| July | 5 | | 5 | | MJME/ew Cover comb assumed | 5.0 |
| January | 2 | | 2 | | MJME/ewe/day | 2.0 |

# Merino - M.A. EWE

| | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | S/U consumption | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | 57.5 | 57.2 | 56.9 | 57.2 | 57.5 | 57.7 | 57.8 | 57.9 | 58.0 | 58.1 | 58.1 | 57.5 | 6000 S/Us | | 500 |
| Maintenance (0.56 x MJ ME/kg^0.75) | 0.56 | 17.5 | 12.5 | 12.4 | 12.5 | 12.5 | 12.5 | 12.6 | 12.6 | 12.6 | 12.6 | 12.6 | 12.5 | | | |
| LWG : at MJ ME/kg LWG | 50.00 | -0.010 | -0.010 | 0.010 | 0.009 | 0.007 | 0.005 | 0.003 | 0.002 | 0.005 | 0.000 | 0.000 | 0.000 | | | |
| ME for weight gain | | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 30 | -0.3 | -0.3 | 0.5 | 0.5 | 0.4 | 0.3 | 0.2 | 0.1 | 0.3 | 0.0 | 0.0 | 0.0 | | | |
| Pregnancy MJ ME/ ewe | | **1.6** | **3.4** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | |
| Lactation MJ ME/ewe Weaning Weight = | 25.0 | 0.0 | 0.0 | **11.1** | **13.6** | **16.5** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | |
| TOTAL ME | | 18.8 | 15.5 | 24.0 | 26.5 | 29.4 | 12.8 | 12.7 | 12.7 | 12.8 | 12.6 | 12.6 | 12.5 | | | |
| kgDM/hd/day | | 2.2 | 1.7 | 2.3 | 2.5 | 2.8 | 1.3 | 1.3 | 1.3 | 1.6 | 1.6 | 1.5 | 1.6 | | | |
| Days | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | | |
| **Monthly Requirements.** | | **582** | **482** | **721** | **823** | **881** | **397** | **394** | **355** | **398** | **378** | **391** | **375** | **6178** | **1.03** | |
| **Month** | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | | |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | | |
| MJ ME/kgDM (Marlborough) | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | | |
| | | Assume July Shearing | LAMBING 28 August | | | WEANING 6 November | | | | | | | | | | |

MERINO Pregnancy

| LAMBS | Weeks before Lambing | | | |
|---|---|---|---|---|
| Birthweight (kg) | -6 | -4 | -2 | 0 |
| 90% **2.71** | **1.36** | **1.81** | **2.71** | **4.07** |
| 3.0 | 1.5 | 2.0 | 3.0 | 4.5 |
| 4.0 | 2.0 | 3.0 | 4.0 | 6.0 |
| 5.0 | 2.5 | 3.5 | 5.0 | 7.0 |
| 6.0 | 3.0 | 4.5 | 6.0 | 8.5 |

| Month 2 | Month 1 |
|---|---|
| **1.6** | **3.4** |
| 1.8 | 3.8 |
| 2.5 | 5.0 |
| 3.0 | 6.0 |
| 3.8 | 7.3 |

MERINO Lactation

| LAMBS | Weeks after Lambing | | | | | |
|---|---|---|---|---|---|---|
| Weaning Weight (kg) | **2** | **4** | **6** | **8** | **10** | **12** |
| **20.0** | 8.5 | 9.50 | 10.5 | 11.5 | 12.5 | 13.0 |
| **25.0** | 10.5 | 11.75 | 13.0 | 14.25 | 16.0 | 17.0 |
| **30.0** | 12.0 | 14.0 | 16.0 | 18.0 | 20.0 | 21.0 |
| **35.0** | 14.5 | 17.0 | 19.5 | 22.0 | 24.5 | 26.0 |

| Month 3 | Month 2 | Month 1 |
|---|---|---|
| 12.8 | 11.0 | 9.0 |
| 16.5 | 13.6 | 11.1 |
| 20.5 | 17.0 | 13.0 |
| 25.3 | 20.8 | 15.8 |

MERINO Shearing

| Date | Weeks After Shearing | | | | Month 1 |
|---|---|---|---|---|---|
| | **1** | **2** | | | |
| August | 5 | 5 | MJME/ewe/day | Cover comb assumed | 5.0 |
| October | 4 | 4 | MJME/ewe/day | Cover comb assumed | 4.0 |
| July | 5 | 5 | MJME/ewe/day | Cover comb assumed | 6.0 |
| January | 2 | 2 | MJME/ewe/day | | 2.0 |

## Corriedale/Halfbred RAM

| | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | S/U comsumption | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | 84.5 | 84.5 | 84.5 | 84.5 | 84.6 | 84.7 | 84.9 | 85.0 | 85.1 | 85.3 | 85.4 | 84.5 | 6000 S/Us | 500 |
| Maintenance (0.56 x MJ ME/kg^0.75) | 0.56 | 23.0 | 19.2 | 19.2 | 19.2 | 19.2 | 19.2 | 19.3 | 19.3 | 19.3 | 19.3 | 19.4 | 19.2 | | |
| LWG : at MJ ME/kg LWG | 50 | 0.00 | 0.00 | 0.00 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.01 | 0.01 | 0.00 | 0.00 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 30 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.0 | 0.0 | | |
| TOTAL ME: | | 23.0 | 19.2 | 19.2 | 19.4 | 19.4 | 19.4 | 19.5 | 19.6 | 19.6 | 19.6 | 19.4 | 19.2 | | |
| kgDM/hd/day: | | 2.7 | 2.1 | 1.8 | 1.8 | 1.9 | 1.9 | 2.0 | 2.1 | 2.4 | 2.4 | 2.3 | 2.4 | | |
| Days | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | |
| **Monthly Requirements.** | | **714** | **595** | **576** | **602** | **583** | **603** | **603** | **546** | **606** | **588** | **600** | **576** | **7192** | **1.20** |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | |

Assume shearing in July

Corriedale/Halfbred Shearing — **40% of maintenance added per week for 2 weeks after shearing**



## Corriedale/Halfbred RAM Lamb

| | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | S/U comsumption | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | | | | | 30.0 | 34.1 | 37.2 | 40.0 | 42.4 | 44.7 | 46.9 | 49.2 | 6000 S/Us | 500 |
| Maintenance (0.50x MJ ME/kg^0.75) | 0.5 | | | | | 7.4 | 8.1 | 8.7 | 9.1 | 9.6 | 9.9 | 10.3 | 10.7 | | |
| LWG : at MJ ME/kg LWG: | 32.50 | | | | | 0.138 | 0.100 | 0.089 | 0.087 | 0.073 | 0.073 | 0.076 | 0.03 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 0 | | | | | 4.5 | 3.3 | 2.9 | 2.8 | 2.4 | 2.4 | 2.5 | 1.1 | | |
| TOTAL ME: | | | | | | 11.8 | 11.4 | 11.6 | 12.0 | 11.9 | 12.3 | 12.8 | 11.8 | | |
| kgDM/hd/day: | | | | | | 1.1 | 1.1 | 1.2 | 1.3 | 1.5 | 1.5 | 1.5 | 1.5 | | |
| Days | | | | | | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | |
| **Monthly Requirements.** | | | | | | **355** | **353** | **358** | **335** | **369** | **369** | **396** | **353** | **2888** | **0.48** |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | |

**Lamb Sale 17.5kg CW - April**

| | LW | Dressing | Carcass Weight |
|---|---|---|---|
| **Start of Month** | 37.2 | 45% | **16.8** |
| **Middle of Month** | 38.6 | 45% | **17.4** |
| **3/4 of the Month** | 39.3 | 45% | **17.7** |
| **End of Month** | 40.0 | 45% | **18.0** |

| | |
|---|---|
| **Growth Rate Factor above ewe growth rate** | **110%** |


## Corriedale/Halfbred RAM Lamb (Terminal)

| | | | | | | | | | | | | | | S/J comsumption | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | | | | | 33.0 | 38.0 | 43.1 | 48.18 | ~~50.61~~ | ~~52.86~~ | ~~55.04~~ | ~~57.39~~ | 6000 S/Us | 500 |
| Maintenance (0.50x MJ ME/kg^0.75) | 0.5 | | | | | 7.9 | 8.8 | 9.7 | 10.52 | ~~10.81~~ | ~~11.27~~ | ~~11.62~~ | ~~11.99~~ | | |
| LWG : at MJ ME/kg LWG: | 32.50 | | | | | 0.165 | 0.165 | 0.165 | 0.09 | ~~0.07~~ | ~~0.07~~ | ~~0.08~~ | ~~0.03~~ | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 0 | | | | | 5.4 | 5.4 | 5.4 | 2.8 | ~~2.4~~ | ~~2.4~~ | ~~2.5~~ | ~~1.1~~ | | |
| TOTAL ME: | | | | | | 13.3 | 14.2 | 15.0 | 13.3 | ~~13.2~~ | ~~13.6~~ | ~~14.1~~ | ~~13.1~~ | | |
| kgDM/hd/day: | | | | | | 1.3 | 1.4 | 1.5 | 1.4 | ~~1.7~~ | ~~1.7~~ | ~~1.7~~ | ~~1.7~~ | | |
| Days | | | | | | 30 | 31 | 31 | 28 | ~~31~~ | ~~30~~ | ~~31~~ | ~~30~~ | | |
| **Monthly Requirements.** | | | | | | **398** | **439** | **466** | **374** | **411** | **409** | **437** | **392** | **3325** | **0.55** |
| Season | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.6 | 8 | 8 | 8.3 | 7.9 | 9.3 MJME/kgDM | |

**Terminal Lamb - December Sale**

| | LW | Dressing | Carcass Weight |
|---|---|---|---|
| **Start of Month** | 38.0 | 45% | **17.1** |
| **1/4 of month** | 39.23 | 45% | **17.7** |
| **Middle of Month** | 40.5 | 45% | **18.2** |
| **End of Month** | 43.1 | 45% | **19.4** |

## Corriedale/Halfbred EWE Lamb (Terminal)

| | | | | | | | | | | | | | | S/U comsumption | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | | | | | 33.0 | 37.5 | 40.9 | 43.9 | ~~46.1~~ | ~~48.2~~ | ~~50.1~~ | ~~52.3~~ | 6000 S/Us | 500 |
| Maintenance (0.45x MJ ME/kg^0.75) | 0.45 | | | | | 7.9 | 8.7 | 9.3 | 9.8 | ~~10.2~~ | ~~10.5~~ | ~~10.8~~ | ~~11.2~~ | | |
| LWG : at MJ ME/kg LWG: | 45.0 | | | | | 0.150 | 0.109 | 0.097 | 0.079 | ~~0.066~~ | ~~0.066~~ | ~~0.069~~ | ~~0.03~~ | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 0 | | | | | 6.8 | 4.9 | 4.4 | 3.6 | ~~3.0~~ | ~~3.0~~ | ~~3.1~~ | ~~1.4~~ | | |
| TOTAL ME: | | | | | | 14.7 | 13.6 | 13.7 | 13.4 | ~~13.1~~ | ~~13.5~~ | ~~13.9~~ | ~~12.5~~ | | |
| kgDM/hd/day: | | | | | | 1.4 | 1.3 | 1.4 | 1.4 | ~~1.6~~ | ~~1.7~~ | ~~1.7~~ | ~~1.6~~ | | |
| Days | | | | | | 30 | 31 | 31 | 28 | ~~31~~ | ~~30~~ | ~~31~~ | ~~30~~ | | |
| **Monthly Requirements.** | | | | | | **440** | **422** | **424** | **374** | **407** | **404** | **432** | **376** | **3280** | **0.55** |
| Season | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.6 | 8.0 | 8.0 | 8.3 | 7.9 | 9 MJME/kgDM | |

**Terminal Lamb - December Sale**

| | LW | Dressing % | Carcass Weight |
|---|---|---|---|
| **Start of Month** | 37.5 | 45% | **16.9** |
| **1/4 of month** | 38.35 | 45% | **17.3** |
| **Middle of Month** | 39.2 | 45% | **17.6** |
| **End of Month** | 40.9 | 45% | **18.4** |

## Corriedale/Halfbred EWE - HOGGET

S/U comsumption

| | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | 48.10 | 49.03 | 49.96 | 51.31 | 52.71 | 54.06 | 55.30 | 56.47 | 57.45 | 58.38 | 59.43 | 47.50 | 6000 S/Us | 500 |
| Maintenance (0.45x MJ ME/kg^0.75) | 0.45 | 11.3 | 9.6 | 9.7 | 9.9 | 10.1 | 10.3 | 10.5 | 10.7 | 10.8 | 10.9 | 11.1 | 9.4 | | |
| LWG : at MJ ME/kg LWG | 47.50 | 0.03 | 0.03 | 0.05 | 0.05 | 0.05 | 0.04 | 0.04 | 0.04 | 0.03 | 0.04 | 0.03 | 0.02 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 0 | 1.5 | 1.5 | 2.3 | 2.3 | 2.3 | 2.0 | 1.9 | 1.8 | 1.5 | 1.8 | 1.5 | 1.0 | | |
| Pregnancy MJ ME/ ewe | | | | | | | | | | | | | | | |
| Lactation MJ ME/ewe | | | | | | | | | | | | | | | |
| TOTAL ME: | | 12.8 | 11.1 | 12.0 | 12.2 | 12.4 | 12.3 | 12.4 | 12.4 | 12.3 | 12.7 | 12.6 | 10.4 | | |
| kgDM/hd/day: | | 1.2 | 1.0 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.2 | 1.3 | 1.4 | 1.3 | 1.0 | | |
| Days | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | |
| **Monthly Requirements.** | | **398** | **344** | **359** | **377** | **371** | **382** | **384** | **348** | **381** | **380** | **390** | **311** | **4426** | **0.74** |
| **Month** | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM | | 10.8 | 10.8 | 11.2 | 11.5 | 11.7 | 11.3 | 11 | 10.1 | 9.2 | 8.8 | 9.6 | 10.5 | 10.5417 | |

Assume July shearing

| Corriedale/Halfbred Shearing | 40% of maintenance added per week for 2 weeks after shearing |
|---|---|


## Corriedale/Halfbred EWE -2th

S/U comsumption

| | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | 60.0 | 60.0 | 60.0 | 60.3 | 60.6 | 61.1 | 61.7 | 62.4 | 63.1 | 64.1 | 65.0 | 60.0 | 6000 S/Us | 500 |
| Maintenance (0.56x MJ ME/kg^0.75) | 0.56 | 17.9 | 12.9 | 12.9 | 13.0 | 13.0 | 13.1 | 13.2 | 13.3 | 13.4 | 13.6 | 13.7 | 12.9 | | |
| LWG : at MJ ME/kg LWG | 50.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.02 | 0.00 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 30 | 0.0 | 0.0 | 0.5 | 0.5 | 0.8 | 1.0 | 1.1 | 1.4 | 1.5 | 1.5 | 1.0 | 0.0 | | |
| Pregnancy MJ ME/ ewe | | **1.85** | **3.97** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | |
| Lactation MJ ME/ewe Weaning Weight = | 30.0 | 0.00 | 0.00 | **13.00** | **17.00** | **20.50** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | |
| TOTAL ME: | | 19.8 | 16.9 | 26.4 | 30.5 | 34.3 | 14.1 | 14.3 | 14.7 | 14.9 | 15.1 | 14.7 | 12.9 | | |
| kgDM/hd/day: | | 2.3 | 1.8 | 2.5 | 2.9 | 3.3 | 1.4 | 1.5 | 1.5 | 1.9 | 1.9 | 1.8 | 1.8 | | |
| Days | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | |
| **Monthly Requirements.** | | **613** | **523** | **793** | **944** | **1028** | **437** | **443** | **412** | **463** | **452** | **456** | **388** | **6951** | **1.16** |
| **Month** | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | |

Assume July Shearing

LAMBING: 27 August

WEANING: 5 November

### Corriedale/Halfbred Pregnancy

| | LAMBS | s before Lambing | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Birthweight (kg) | -6 | -4 | -2 | 0 | | Month 2 | Month 1 |
| 106% | **3.18** | **1.6** | **2.1** | **3.2** | **4.8** | | **1.85** | **3.97** |
| | 3.0 | 1.5 | 2.0 | 3.0 | 4.5 | | 1.8 | 3.8 |
| | 4.0 | 2.0 | 3.0 | 4.0 | 6.0 | | 2.5 | 5.0 |
| | 5.0 | 2.5 | 3.5 | 5.0 | 7.0 | | 3.0 | 6.0 |
| | 6.0 | 3.0 | 4.5 | 6.0 | 8.5 | | 3.8 | 7.3 |

### Corriedale/Halfbred Lactation

| LAMBS | s after Lambing | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Weaning Weight (kg | 2 | 4 | 6 | 8 | 10 | 12 | | | | |
| | | | | | | | | Month 3 | Month 2 | Month 1 |
| **20.0** | 8.5 | 9.50 | 10.5 | 11.5 | 12.5 | 13.0 | | 12.8 | 11.0 | 9.0 |
| **25.0** | 10.5 | 11.75 | 13.0 | 14.25 | 16.0 | 17.0 | | 16.5 | 13.6 | 11.1 |
| **30.0** | 12.0 | 14.0 | 16.0 | 18.0 | 20.0 | 21.0 | | **20.5** | **17.0** | **13.0** |
| **35.0** | 14.5 | 17.0 | 19.5 | 22.0 | 24.5 | 26.0 | | 25.3 | 20.8 | 15.8 |

### Corriedale/Halfbred Shearing

| Date | s After Shearing | | | | | |
|---|---|---|---|---|---|---|
| | 1 | | 2 | | | Month 1 |
| August | 5 | | 5 | | MJME/ew Cover comb assumed | 5.0 |
| October | 4 | | 4 | | MJME/ew Cover comb assumed | 4.0 |
| July | 5 | | 5 | | MJME/ew Cover comb assumed | 5.0 |
| January | 2 | | 2 | | MJME/ewe/day | 2.0 |

## Corriedale/Halfbred EWE Lamb

| | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | S/U comsumption | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | | | | | 30.0 | 33.9 | 36.6 | 39.1 | 41.3 | 43.3 | 45.3 | 47.5 | 6000 S/Us | | 500 |
| Maintenance (0.45x MJ ME/kg^0.75) | 0.45 | | | | | 7.4 | 8.1 | 8.6 | 9.0 | 9.4 | 9.7 | 10.0 | 10.4 | | | |
| LWG : at MJ ME/kg LWG: | 45.0 | | | | | 0.125 | 0.091 | 0.081 | 0.079 | 0.066 | 0.066 | 0.069 | 0.03 | | | |
| ME for weight gain | | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 0 | | | | | 5.6 | 4.1 | 3.6 | 3.6 | 3.0 | 3.0 | 3.1 | 1.4 | | | |
| TOTAL ME: | | | | | | 13.0 | 12.1 | 12.2 | 12.5 | 12.3 | 12.7 | 13.1 | 11.7 | | | |
| kgDM/hd/day: | | | | | | 1.2 | 1.2 | 1.2 | 1.3 | 1.5 | 1.6 | 1.6 | 1.5 | | | |
| Days | | | | | | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | | |
| **Monthly Requirements.** | | | | | | **390** | **377** | **378** | **351** | **382** | **380** | **408** | **352** | **3019** | **0.50** | |
| **Month** | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | | |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | | |
| MJ ME/kgDM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | | |

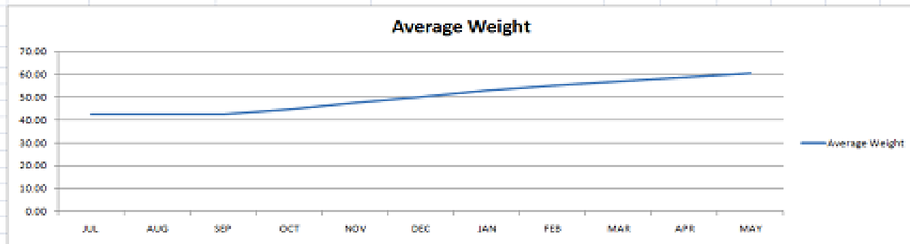
## Corriedale/Halfbred RAM - HOGGET

| | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | S/U comsumption | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | 48.16 | 49.18 | 50.21 | 51.69 | 53.23 | 54.71 | 56.07 | 57.37 | 58.45 | 59.47 | 60.63 | 47.50 | 6000 S/Us | | 500 |
| Maintenance (0.50x MJ ME/kg^0.75) | 0.50 | 12.6 | 10.7 | 10.8 | 11.1 | 11.3 | 11.6 | 11.8 | 12.0 | 12.2 | 12.3 | 12.5 | 10.4 | | | |
| LWG : at MJ ME/kg LWG: | 28.00 | 0.03 | 0.03 | 0.05 | 0.05 | 0.05 | 0.04 | 0.04 | 0.04 | 0.03 | 0.04 | 0.03 | 0.02 | | | |
| ME for weight gain | | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 0 | 0.9 | 0.9 | 1.4 | 1.4 | 1.4 | 1.2 | 1.2 | 1.1 | 0.9 | 1.1 | 0.9 | 0.6 | | | |
| TOTAL ME: | | 13.5 | 11.6 | 12.2 | 12.5 | 12.7 | 12.8 | 13.0 | 13.1 | 13.1 | 13.4 | 13.4 | 11.0 | | | |
| kgDM/hd/day: | | 1.6 | 1.3 | 1.2 | 1.2 | 1.2 | 1.3 | 1.3 | 1.4 | 1.6 | 1.7 | 1.6 | 1.4 | | | |
| Days | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | | |
| **Monthly Requirements.** | | **420** | **360** | **367** | **387** | **382** | **397** | **402** | **366** | **405** | **402** | **416** | **331** | **4632** | **0.77** | |
| **Month** | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | | |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | | |
| MJ ME/kgDM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | | |

Assume July shearing

| | |
|---|---|
| **Growth Rate Factor above ewe growth rate** | **110%** |

Corriedale/Halfbred Shearing — **40% of maintenance added per week for 2 weeks after shearing**



# Corriedale/Halfbred M.A. EWE

| | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | S/U comsumption | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Weight | | 65.0 | 64.7 | 64.4 | 64.7 | 65.0 | 65.2 | 65.3 | 65.4 | 65.5 | 65.6 | 65.6 | 65.0 | 6000 S/Us | 500 |
| Maintenance (0.56x MJ ME/kg^0.75) | 0.56 | 18.7 | 13.7 | 13.6 | 13.7 | 13.7 | 13.7 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.7 | | |
| LWG : at MJ ME/kg LWG: | 50.00 | -0.010 | -0.010 | 0.010 | 0.009 | 0.007 | 0.005 | 0.003 | 0.002 | 0.005 | 0.000 | 0.000 | 0.000 | | |
| ME for weight gain | | | | | | | | | | | | | | | |
| LWG : at MJ ME/kg LW Loss | 30 | -0.3 | -0.3 | 0.5 | 0.5 | 0.4 | 0.3 | 0.2 | 0.1 | 0.3 | 0.0 | 0.0 | 0.0 | | |
| Pregnancy MJ ME/ ewe | | **2.0** | **4.3** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| Lactation MJ ME/ewe. Weaning Weight = | 30.0 | 0.0 | 0.0 | **13.0** | **17.0** | **20.5** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | |
| TOTAL ME | | 20.4 | 17.7 | 27.1 | 31.1 | 34.6 | 14.0 | 13.9 | 13.9 | 14.0 | 13.8 | 13.8 | 13.7 | | |
| kgDM/hd/day: | | 2.4 | 1.9 | 2.6 | 3.0 | 3.3 | 1.4 | 1.4 | 1.5 | 1.8 | 1.7 | 1.7 | 1.7 | | |
| Days | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 | | |
| **Monthly Requirements.** | | **633** | **548** | **814** | **965** | **1037** | **434** | **431** | **389** | **435** | **414** | **428** | **412** | **6940** | **1.16** |
| **Month** | | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | | |
| **Season** | | Winter | Winter | Spring | Spring | Spring | Summer | Summer | Summer | Autumn | Autumn | Autumn | Winter | | |
| MJ ME/kgDM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.5 | 8 | 8 | 8.3 | 7.9 | 9.2 MJME/kgDM | |

Assume July Shearing

LAMBING: 27 August

WEANING: 5 November

Corriedale/Halfbred Pregnancy

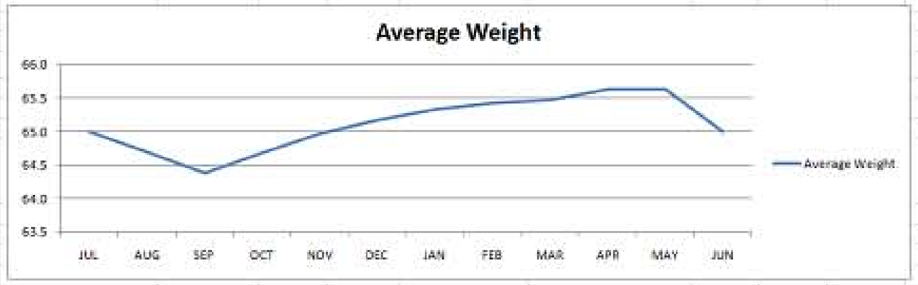
| LAMBS | | Weeks before Lambing | | | | Month 2 | Month 1 |
|---|---|---|---|---|---|---|---|
| | Birthweight (kg) | -6 | -4 | -2 | 0 | | |
| 115% | **3.45** | **1.73** | **2.30** | **3.45** | **5.18** | **2.0** | **4.3** |
| | 3.0 | 1.5 | 2.0 | 3.0 | 4.5 | 1.8 | 3.8 |
| | 4.0 | 2.0 | 3.0 | 4.0 | 6.0 | 2.5 | 5.0 |
| | 5.0 | 2.5 | 3.5 | 5.0 | 7.0 | 3.0 | 6.0 |
| | 6.0 | 3.0 | 4.5 | 6.0 | 8.5 | 3.8 | 7.3 |

Corriedale/Halfbred Lactation

| LAMBS | Weeks after Lambing | | | | | | Month 3 | Month 2 | Month 1 |
|---|---|---|---|---|---|---|---|---|---|
| Weaning Weight (kg) | 2 | 4 | 6 | 8 | 10 | 12 | | | |
| **20.0** | 8.5 | 9.50 | 10.5 | 11.5 | 12.5 | 13.0 | 12.8 | 11.0 | 9.0 |
| **25.0** | 10.5 | 11.75 | 13.0 | 14.25 | 16.0 | 17.0 | 16.5 | 13.6 | 11.1 |
| **30.0** | 12.0 | 14.0 | 16.0 | 18.0 | 20.0 | 21.0 | 20.5 | 17.0 | 13.0 |
| **35.0** | 14.5 | 17.0 | 19.5 | 22.0 | 24.5 | 26.0 | 25.3 | 20.8 | 15.8 |

Corriedale/Halfbred Shearing

| Date | Weeks After Shearing | | | | Month 1 |
|---|---|---|---|---|---|
| | 1 | 2 | | | |
| August | 5 | 5 | MJME/ewe/day | Cover comb assumed | 5.0 |
| October | 4 | 4 | MJME/ewe/day | Cover comb assumed | 4.0 |
| July | 5 | 5 | MJME/ewe/day | Cover comb assumed | 5.0 |
| January | 2 | 2 | MJME/ewe/day | | 2.0 |



## Appendix C 8

## Stock Data

### Average Data for Sheep Breeds from CS Data

| | Rams | Ewe lamb | Ram Lamb | Wether Lamb | Ewe Hogget | Ram Hogget | Wether Hogget | 2th Ewe | 4th Ewe | 6th Ewe | 4yr Ewe | 5yr Ewe | 6yr Ewe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Merino** | | | | | | | | | | | | | |
| s.u. | 1.09 | - | - | - | 0.66 | 0.75 | - | 1.03 | 1.03 | 1.03 | 1.03 | 1.03 | 1.03 |
| Live Weight @ June | 74.75 | | | | 30 | 35 | 0 | 52.5 | 57.5 | 57.5 | 57.5 | 51.75 | 48.875 |
| Fleece Weight kg | 6.7 | | | | 2.85 | 3.33 | - | 4.58 | 5.00 | 5.00 | 5.00 | 4.50 | 4.25 |
| Lambing Percentage | | | | | | | | 106% | 108% | 108% | 108% | 108% | 108% |
| Lamb Birth Weight | | | | | | | | 2.71 | 2.71 | 2.71 | 2.71 | 2.71 | 2.71 |
| Weaning Percentage | | | | | | | | 97% | 99% | 99% | 99% | 99% | 99% |
| Weaning Weight | | | | | | | | 25 | 25 | 25 | 25 | 25 | 25 |
| Shearing Date | Assumed July | | | | | | | Assumed July | Assumed July | Assumed July | Assumed July | Assumed July | Assumed July |
| Mating Date | 1-Apr | | | | | | | 1-Apr | 1-Apr | 1-Apr | 1-Apr | 1-Apr | 1-Apr |
| Lambing Date | | | | | | | | 28-Aug | 28-Aug | 28-Aug | 28-Aug | 28-Aug | 28-Aug |
| Weaning Date | | | | | | | | 6-Nov | 6-Nov | 6-Nov | 6-Nov | 6-Nov | 6-Nov |
| Death Rate | 4% | 2% | 2% | - | 1% | 1% | - | 2% | 4% | 4% | 4% | 4% | 3% |
| **Corriedale/Halfbred** | | | | | | | | | | | | | |
| | Rams | Ewe lamb | Ram Lamb | Wether Lamb | Ewe Hogget | Ram Hogget | Wether Hogget | 2th Ewe | 4th Ewe | 6th Ewe | 4yr Ewe | 5yr Ewe | 6yr Ewe |
| s.u. | 1.20 | - | - | - | 0.74 | 0.77 | - | 1.16 | 1.16 | 1.16 | 1.16 | 1.16 | 1.16 |
| Live Weight | 84.5 | | | | 35 | 45 | 0 | 60 | 65 | 65 | 65 | 58.5 | 55.25 |
| Fleece Weight | 7.6 | | | | 4.0 | 2.8 | - | 4.4 | 4.4 | 4.4 | 4.4 | 4.0 | 3.7 |
| Lambing Percentage | | | | | | | | 124% | 124% | 124% | 124% | 124% | 124% |
| Lamb Birth Weight | | | | | | | | 4.62 | 4.62 | 4.62 | 4.62 | 4.62 | 4.62 |
| Weaning Percentage | | | | | | | | 119% | 119% | 119% | 119% | 119% | 126% |
| Weaning Weight | | | | | | | | 30 | 30 | 30 | 30 | 30 | 30 |
| Shearing Date | Assumed July | | | | | | | Assumed July | Assumed July | Assumed July | Assumed July | Assumed July | Assumed July |
| Mating Date | 31-Mar | | | | | | | 31-Mar | 31-Mar | 31-Mar | 31-Mar | 31-Mar | 31-Mar |
| Lambing Date | | | | | | | | 27-Aug | 27-Aug | 27-Aug | 27-Aug | 27-Aug | 27-Aug |
| Weaning Date | | | | | | | | 5-Nov | 5-Nov | 5-Nov | 5-Nov | 5-Nov | 5-Nov |
| Death Rate | 5% | 2% | 2% | 0% | 4% | 2% | 0% | 4% | 5% | 5% | 5% | 5% | 5% |

# Merino

| | | Rams | Ewe lamb | Ram Lamb | Wether Lamb | Ewe Hogget | Ram Hogget | Wether Hogget | 2th Ewe | 4th Ewe | 6th Ewe | 4yr Ewe | 5yr Ewe | 6yr Ewe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Liveweight** | | | | | | | | | | | | | | |
| | Farmer B | | 30 kg February | 30 kg February | 27kg Weaning weight in Novmeber | 35kg August. 40 Kg November | | 35kg August. 40 Kg November | 55kg April (average weight) | 60kg April (average weight) | 60kg April (average weight) | 60kg April (average weight) | 60kg April (average weight) | 60kg April (average weight) |
| | Farmer F | | | | | | | | Ewes @ April mating = 56kg | Ewes @ April mating = 56kg | Ewes @ April mating = 56kg | Ewes @ April mating = 56kg | Ewes @ April mating = 56kg | Ewes @ April mating = 56kg |
| | Farmer C | | | | | | | | Ewes @ mating = 65kg. **Jun 60kg**, Sept 65kg, Jan 60kg | Ewes @ April mating = 65kg. **Jun 60kg**, Sept 65kg, Jan 60kg | Ewes @ mating = 65kg. **Jun 60kg**, Sept 65kg, Jan 60kg | Ewes @ mating = 65kg. **Jun 60kg**, Sept 65kg, Jan 60kg | Ewes @ mating = 65kg. **Jun 60kg**, Sept 65kg, Jan 60kg | Ewes @ mating = 65kg. **Jun 60kg**, Sept 65kg, Jan 60kg |
| | Farmer D | | 26kg January | | 26kg January | 38kg October | 38kg October | 40kg December | 45kg April | 45kgJuly-Feb/ 50kg April **55kg July.** 45 kg Jan | 45kgJuly-Feb/ 50kg April | 45kgJuly-Feb/ 50kg April | 45kgJuly-Feb/ 50kg April | 45kgJuly-Feb/ 50kg April |
| **June Weight Range Assumed** | | 53-73** also aligns with assumption of 20% larger than M.A. Ewe av. Weight | | | | 30-38 | 30-39 | | 50-55 kg | 55-60kg | 55-60kg | 55-60kg | 55-60kg | 55-60kg |
| **June Weight Utilised** | | 74.75 | | | | 35 | 35 | | 52.5 | 57.5 | 57.5 | 57.5 | 57.5 | 57.5 |
| **Fleece Weight (greasy) as a percentage of Liveweight** | | | | | | | | | | | | | | |
| | Farmer B | 11% | | | | 10% | 10% | 10% | 9% | 9% | 9% | 9% | 9% | 9% |
| | Farmer F | | | | | | | | | | | | | |
| | Farmer C | | | | | | | | 9% | 9% | 9% | 9% | 9% | 9% |
| | Farmer D | | | | | 7% | 7% | | 8% | 8% | 8% | 8% | 8% | 8% |
| **June Weight Range Assumed** | | | | | | 7-12% | 7-12% | | % | 8-9% | | | | |
| **Average** | | 9% | | | | 9.5% | 9.5% | 10% | 9% | 9% | 9% | 9% | 9% | 9% |
| **Lambing Percentage** | | | | | | | | | | | | | | |
| | Farmer B | | | | | | | | 90% | 100% | 100% | 100% | 100% | 100% |
| | Farmer F | | | | | | | | 120% | 120% | 120% | 120% | 120% | 120% |
| | Farmer C | | | | | | | | 137% | 137% | 137% | 137% | 137% | 137% |
| | Farmer D | | | | | | | | 75% | 75% | 75% | 75% | 75% | 75% |
| **Average** | | | | | | | | | 106% | 108% | 108% | 108% | 108% | 108% |
| **Weaning Percentage** | | | | | | | | | | | | | | |
| | Farmer B | | | | | | | | 90% | 100% | 100% | 100% | 100% | 100% |
| | Farmer F | | | | | | | | 85% | 85% | 85% | 85% | 85% | 85% |
| | Farmer C | | | | | | | | 136% | 136% | 136% | 136% | 136% | 136% |
| | Farmer D | | | | | | | | 75% | 75% | 75% | 75% | 75% | 75% |
| **Average** | | | | | | | | | 97% | 99% | 99% | 99% | 99% | 99% |
| **Shearing Date** | | | | | | | | | | | | | | |
| | Farmer B | 20-Aug | | | | 20-Aug | | 20-Aug | 10-Aug | 10-Aug | 10-Aug | 10-Aug | 10-Aug | 10-Aug |
| | Farmer F | Dec | Dec | | | August | | | May | June | July | August | September | October |
| | Farmer C | Oct | | | | Late August | Late August | | July | July | July | July | July | July |
| | Farmer D | 25-Jan | | | | 15-Nov | 15-Nov | | 20-Jan | 20-Jan | 20-Jan | 20-Jan | 20-Jan | 20-Jan |
| **Average** | | | | | | | | | | | | | | |
| **Mating Date** | | | | | | | | | | | | | | |
| | Farmer B | 17-May | | | | | | | 17-May | 17-May | 17-May | 17-May | 17-May | 17-May |
| | Farmer F | 15-Apr | | | | | | | 15-Apr | 15-Apr | 15-Apr | 15-Apr | 15-Apr | 15-Apr |
| | Farmer C | 15-Apr | | | | | | | 15-Apr | 15-Apr | 15-Apr | 15-Apr | 15-Apr | n/a |
| | Farmer D | 12-May | | | | | | | 12-May | 12-May | 12-May | 12-May | 12-May | 12-May |
| **Average** | | 1-Apr | | | | | | | 1-Apr | 1-Apr | 1-Apr | 1-Apr | 1-Apr | 1-Apr |
| **Lambing Date*** | | | | | | | | | | | | | | |
| | Farmer B | 13-Oct | | | | | | | 13-Oct | 13-Oct | 13-Oct | 13-Oct | 13-Oct | 13-Oct |
| | Farmer F | 11-Sep | | | | | | | 11-Sep | 11-Sep | 11-Sep | 11-Sep | 11-Sep | 11-Sep |
| | Farmer C | 11-Sep | | | | | | | 11-Sep | 11-Sep | 11-Sep | 11-Sep | 11-Sep | n/a |
| | Farmer D | 8-Oct | | | | | | | 8-Oct | 8-Oct | 8-Oct | 8-Oct | 8-Oct | 8-Oct |
| **Average** | | | | | | | | | 28-Aug | 28-Aug | 28-Aug | 28-Aug | 28-Aug | 28-Aug |
| **Weaning Date*** | | | | | | | | | | | | | | |
| | Farmer B | 22-Dec | | | | | | | 22-Dec | 22-Dec | 22-Dec | 22-Dec | 22-Dec | 22-Dec |
| | Farmer F | 20-Nov | | | | | | | 20-Nov | 20-Nov | 20-Nov | 20-Nov | 20-Nov | 20-Nov |
| | Farmer C | 20-Nov | | | | | | | 20-Nov | 20-Nov | 20-Nov | 20-Nov | 20-Nov | n/a |
| | Farmer D | 17-Dec | | | | | | | 17-Dec | 17-Dec | 17-Dec | 17-Dec | 17-Dec | 17-Dec |
| **Average** | | | | | | | | | 6-Nov | 6-Nov | 6-Nov | 6-Nov | 6-Nov | 6-Nov |
| **Death Rate** | | | | | | | | | | | | | | |
| | Farmer B | | | | | | | | | 4% | 4% | 4% | 4% | 4% |
| | Farmer F | | | | | 1% | | | 2% | 4% | 4% | 4% | 4% | 4% |
| | Farmer C | | 2% | 2% | | 1% | 1% | | 1% | 4% | 4% | 4% | 4% | 4% |
| | Farmer D | | | | | | | | | | | | | |
| **Average** | | 4% | 2% | 2% | - | 0.01 | 1% | - | 2% | 4% | 4% | 4% | 4% | 3% |

** Lambing Date & Weaning Date (10 weeks) *is assumed from 'Breeding Dates and Periods' Section in Lincoln Universoty Form technical Manual. Page A-174 & Page A-17 respectively. Edited By P. Fleming 2003*

either not available or not relevant as the system does not include this factor

## Corriedale/Halfbred

| | | Rams | Ewe lamb | Ram Lamb | Wether Lamb | Ewe Hogget | Ram Hogget | Wether Hogget | 2th Ewe | 4th Ewe | 6th Ewe | 4yr Ewe | 5yr Ewe | 6yr Ewe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Liveweight** | | | | | | | | | | | | | | |
| | Farmer A | | Singles @ 38.5kg Nov; Twins @ | Singles @ 38.5kg Nov; | | | | | 60kg Mar | 65-70kg Mar | | | | |
| | Farmer E | 83.2 | | | | | | | assumed 10% less than av. M.a. | 67 kg Apr; 60kg Aug; | | | | |
| | Farmer G | | 25 kg Jan | 26 kg Jan | | | | | 58.5 | assumed 65 kg at 5 April (shearing) | | | | |
| | Farmer F | 83.2 | 33kg Nov; 35kg | | | | | | assumed 10% less than av. M.a. | 60kg-68kg Mar | 60-68kg @ mating | 60-68kg @ mating | 60-68kg @ mating | |
| | Farmer C | | | | | | | | Ewes @ April mating = 70kg, Jun 65kg, Sept 70kg, Jan 65kg | Ewes @ April mating = 70kg, Jun 65kg Sept 70kg, Jan 65kg | Ewes @ April mating = 70kg, Jun 65kg, Sept 70kg, Jan 65kg | Ewes @ April mating = 70kg, Jun 65kg, Sept 70kg, Jan 65kg | Ewes @ April mating = 70kg, Jun 65kg, Sept 70kg, Jan 65kg | |
| | Farmer D | 76.7 | 28 kg Jan | 29 kg Jan | | 37kg Jul | 48 kg Jul | | 54 kg Apr | 55 kg Mar; 58kg-60kg Apr | | | (culled @ 5yr) | |
| **June Weight Range Assumed** | | Assumed at 30% larger than | 35-38 | 32-38 | | | | | 55-65 | 60-70 | 60-70 | 60-70 | 60-70 | 60-70 |
| **Average** | | **84.5** | **36.5** | **34** | | **35** | **45** | | **60** | **65** | **65** | **65** | **65** | **65** |
| **Fleece Weight (greasy) as a percentage of Liveweight** | | | | | | | | | | | | | | |
| | Farmer A | | | 1.4 | | 11% | | | | 7% | 7% | 7% | 7% | 7% |
| | Farmer E | 5.00 | | | | 7% | 6% | | 6% | 6% | 6% | 6% | 6% | 6% |
| | Farmer G | | 1 | | | 10% | | | 7% | 6% | 6% | 6% | 6% | 6% |
| | Farmer F | 7.00 | | | | | | | 8% | 7% | 7% | 7% | 7% | 7% |
| | Farmer C | | | | | 9% | | 3.5 | 7% | 7% | 7% | 7% | 7% | 7% |
| | Farmer D | 4.50 | | | | 9% | 7% | | 8% | 7% | 7% | 7% | 7% | |
| **Average** | | **9%** | - | - | - | **11%** | **6%** | - | **7%** | **7%** | **7%** | **7%** | **7%** | **7%** |
| **Lambing Percentage** | | | | | | | | | | | | | | |
| | Farmer A | | | | | | | | 125% | 125% | 125% | 125% | 125% | 125% |
| | Farmer E | | | | | | | | 112.5% | 112.5% | 113% | 113% | 113% | 113% |
| | Farmer G | | | | | | | | 110% | 110% | 110% | 110% | 110% | 110% |
| | Farmer F | | | | | | | | 170% | 170% | 170% | 170% | 170% | 170% |
| | Farmer C | | | | | | | | 137% | 137% | 137% | 137% | 137% | 137% |
| | Farmer D | | | | | | | | 88% | 88% | 88% | 88% | 88% | |
| **Average** | | | | | | | | | **124%** | **124%** | **124%** | **124%** | **124%** | **131%** |
| **Weaning Percentage** | | | | | | | | | | | | | | |
| | Farmer A | | | | | | | | 125% | 125% | 125% | 125% | 125% | 125% |
| | Farmer E | | | | | | | | 113% | 113% | 113% | 113% | 113% | 113% |
| | Farmer G | | | | | | | | 110% | 110% | 110% | 110% | 110% | 110% |
| | Farmer F | | | | | | | | 145% | 145% | 145% | 145% | 145% | 145% |
| | Farmer C | | | | | | | | 136% | 136% | 136% | 136% | 136% | 136% |
| | Farmer D | | | | | | | | 88% | 88% | 88% | 88% | 88% | |
| **Average** | | | | | | | | | **119%** | **119%** | **119%** | **119%** | **119%** | **126%** |
| **Shearing Date** | | | | | | | | | | | | | | |
| | Farmer A | 16-Aug | | 7-Jan | | 16-Aug | | | 10-Jul | 10-Jul | 10-Jul | 10-Jul | 10-Jul | 10-Jul |
| | Farmer E | 1-Nov | 15-Jan | 15-Jan | | 15-Sep | 15-Sep | | 15-Aug | 15-Aug | 15-Aug | 15-Aug | 15-Aug | 15-Aug |
| | Farmer G | Oct | Jan | | | Nov | | | July | July | July | July | July | July |
| | Farmer F | Dec | Dec | | | August | | | May | June | July | August | September | October |
| | Farmer C | | | | | Late August | Late August | | July | July | July | July | July | July |
| | Farmer D | 25-Jan | | | | 15-Nov | 2-Sep | | 20-Jan | 20-Jan | 20-Jan | 20-Jan | 20 - Jan (culled @ 5yr) | |
| **Average** | | | | | | | | | | | | | | |
| **Mating Date** | | | | | | | | | | | | | | |
| | Farmer A | 5-Mar | | | | | | | 5-Mar | 5-Mar | 5-Mar | 5-Mar | 5-Mar | 5-Mar |
| | Farmer E | 1 Apr & 20 Apr | | | | | | | 20-Apr | 20-Apr | 20-Apr | 20-Apr | 1-Apr | 1-Apr |
| | Farmer G | 5-Apr | | | | | | | 5-Apr | 5-Apr | 5-Apr | 5-Apr | 5-Apr | 5-Apr |
| | Farmer F | 25-Mar | | | | | | | 25-Mar | 25-Mar | 25-Mar | 25-Mar | 25-Mar | 25-Mar |
| | Farmer C | 15-Apr | | | | | | | 15-Apr | 15-Apr | 15-Apr | 15-Apr | 15-Apr | 15-Apr |
| | Farmer D | 25-Apr | | | | | | | 25-Mar | 25-Mar | 25-Mar | 25-Mar | 25- Mar (culled @ 5yr) | |
| **Range Assumed** | | 5 Mar- 25 Apr | | | | | | | 5 Mar- 25 Apr | 5 Mar- 25 Apr | 5 Mar- 25 Apr | 5 Mar- 25 Apr | 5 Mar- 25 Apr | 5 Mar- 25 Apr |
| **Average** | | **31-Mar** | | | | | | | **31-Mar** | **31-Mar** | **31-Mar** | **31-Mar** | **31-Mar** | **31-Mar** |
| **Lambing Date** | | | | | | | | | | | | | | |
| | Farmer A | 1-Aug | | | | | | | 1-Aug | 1-Aug | 1-Aug | 1-Aug | 1-Aug | 1-Aug |
| | Farmer E | 28-Aug & 16 Sep | | | | | | | 16-Sep | 16-Sep | 16-Sep | 16-Sep | 28-Aug | 28-Aug |
| | Farmer G | 1-Sep | | | | | | | 1-Sep | 1-Sep | 1-Sep | 1-Sep | 1-Sep | 1-Sep |
| | Farmer F | 21-Aug | | | | | | | 21-Aug | 21-Aug | 21-Aug | 21-Aug | 21-Aug | 21-Aug |
| | Farmer C | 11-Sep | | | | | | | 11-Sep | 11-Sep | 11-Sep | 11-Sep | 11-Sep | 11-Sep |
| | Farmer D | 21-Sep | | | | | | | 21-Aug | 21-Aug | 21-Aug | 21-Aug | culled @ | |
| **Range Assumed** | | 1- Aug - 28 Sept | | | | | | | | | | | | |
| **Average** | | **27-Aug** | | | | | | | **27-Aug** | **27-Aug** | **27-Aug** | **27-Aug** | **27-Aug** | **27-Aug** |
| **Weaning Date** | | | | | | | | | | | | | | |
| | Farmer A | 10-Oct | | | | | | | 10-Oct | 10-Oct | 10-Oct | 10-Oct | 10-Oct | 10-Oct |
| | Farmer E | 6 Nov & 25 Nov | | | | | | | 25-Nov | 25-Nov | 25-Nov | 25-Nov | 6-Nov | 6-Nov |
| | Farmer G | 10-Nov | | | | | | | 10-Nov | 10-Nov | 10-Nov | 10-Nov | 10-Nov | 10-Nov |
| | Farmer F | 30-Oct | | | | | | | 30-Oct | 30-Oct | 30-Oct | 30-Oct | 30-Oct | 30-Oct |
| | Farmer C | 20-Nov | | | | | | | 20-Nov | 20-Nov | 20-Nov | 20-Nov | 20-Nov | 20-Nov |
| | Farmer D | 30-Nov | | | | | | | 30-Oct | 30-Oct | 30-Oct | 30-Oct | culled @ | |
| **Average** | | **5-Nov** | | | | | | | **5-Nov** | **5-Nov** | **5-Nov** | **5-Nov** | **5-Nov** | **5-Nov** |
| **Death Rate** | | | | | | | | | | | | | | |
| | Farmer A | | | | | 8% | | | 8% | 8% | 8% | 8% | 8% | 8% |
| | Farmer E | 7.5% | | | | 2% | 2% | | 3% | 4% | 4% | 4% | 4% | 4% |
| | Farmer G | | | | | 5% | | | 5% | 5% | 5% | 5% | 5% | 5% |
| | Farmer F | | | | | 1.5% | | | 2% | 4% | 4% | 4% | 4% | 4% |
| | Farmer C | | 2% | 2% | | 1% | 1% | | 1% | 2% | 2% | 2% | 2% | 2% |
| | Farmer D | | | | | | | | | | | | culled @ 5yr | |
| **Average** | | **5%** | **2%** | **2%** | | **4%** | **2%** | | **4%** | **5%** | **5%** | **5%** | **5%** | **5%** |

* Lambing Date & Weaning Date (10 weeks) *is assumed from 'Breeding Dates and Periods' Section in Lincoln University Farm technical Manual. Page A-174 & Page A-17 respectively. Edited By P. Fleming 2003*

(grey) either not available or not relevant as the system does not include this factor

## Sheep Stock Numbers/ Flock Composition

| | | Rams | Ewe lamb | Ram Lamb | Wether Lamb | Ewe Hogget | Ram Hogget | Wether Hogget | 2th Ewe | M.A. Ewes | M.A. Wethers | Effective Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Merino | Farmer B | 35 | 0 | 0 | 0 | 1300 | 1000 | 0 | 1000 | 4000 | | 2001 |
| No./ effective ha | | 0.017491254 | 0 | 0 | 0 | 0.649675162 | 0.499750125 | 0 | 0.499750125 | 1.9990005 | 0 | |
| | Farmer F | 12 | 0 | 0 | 0 | 290 | 0 | 200 | 275 | 500 | 820 | 2300 |
| No./ effective ha | | 0.005217391 | 0 | 0 | 0 | 0.126086957 | 0 | 0.086956522 | 0.119565217 | 0.217391304 | 0.356521739 | |
| | Farmer C | 0 | 0 | 0 | 0 | 300 | 165 | 0 | 50 | 400 | | 906 |
| No./ effective ha | | 0 | 0 | 0 | 0 | 0.331125828 | 0.182119205 | 0 | 0.055187638 | 0.441501104 | 0 | |
| | Farmer D | 10 | | | | 250 | | 260 | 150 | 600 | 600 | 3300 |
| No./ effective ha | | 0.004997501 | 0 | 0 | 0 | 0.124937531 | 0 | 0.129935032 | 0.074962519 | 0.299850075 | 0.299850075 | |
| Av. No. / effective ha | | 0.006926537 | 0 | 0 | 0 | 0.307956369 | 0.170467333 | 0.054222889 | 0.187366375 | 0.739435746 | 0.164092954 | |
| **No. On Simulated Merino Property** | | **11** | **0** | **0** | **0** | **501** | **277** | **88** | **305** | **1202** | **267** | **1626** |
| Corrie/Halfbred | Farmer A | 22 | 0 | 0 | 0 | 450 | 0 | 0 | 367 | 1055 | | 775 |
| No./ effective ha | | 0.028387097 | 0 | 0 | 0 | 0.224887556 | 0 | 0 | 0.183408296 | 0.527236382 | 0 | |
| | Farmer E | 40 | | | | 950 | 50 | | 650 | 2350 | | 1300 |
| No./ effective ha | | 0.030769231 | 0 | 0 | 0 | 0.730769231 | 0.038461538 | 0 | 0.5 | 1.807692308 | 0 | |
| | Farmer G | 35 | 0 | 0 | 0 | 450 | 0 | 0 | 400 | 1000 | | 800 |
| No./ effective ha | | 0.04375 | 0 | 0 | 0 | 0.5625 | 0 | 0 | 0.5 | 1.25 | 0 | |
| | Farmer F | 20 | 0 | 0 | 0 | 320 | 0 | 0 | 280 | 1400 | | 2300 |
| No./ effective ha | | 0.008695652 | | | | | | | | | | |
| | Farmer C (1/2brd commercial and terminal hill flocks | 3 | 0 | 0 | 0 | 238 | 251 | 0 | 100+285 | 256+840 | | 906 |
| No./ effective ha | | 0.003311258 | | | | | | | | | | |
| | Farmer D | 20 | | | | 600 | 415 | | 400 | 1250 | | 3300 |
| | | 0.006060606 | 0 | 0 | 0 | 0.181818182 | 0.125757576 | 0 | 0.121212121 | 0.378787879 | 0 | |
| Av. No. / effective ha | | 0.022982648 | 0 | 0 | 0 | 0.303631357 | 0.007692308 | 0 | 0.236681659 | 0.716985738 | 0 | |
| **No. On Simulated Corrie/1/2bred Property** | | **37** | **0** | **0** | **0** | **494** | **13** | **0** | **385** | **1166** | **0** | **1626** |

### Cattle Stock Data

| | | Bulls | steer) | Heifers | Steers | M.A.Cows | (ha) |
|---|---|---|---|---|---|---|---|
| | Farmer B | 12 | 60 | 100 | 0 | 200 | 2001 |
| No./ effective ha | | 0.005997001 | 0.029985007 | 0.049975012 | 0 | 0.099950025 | |
| | Farmer A | 2 | 67 | 19 | 35 | 71 | 775 |
| No./ effective ha | | 0.002580645 | 0.086451613 | 0.024516129 | 0.04516129 | 0.091612903 | |
| | Farmer E | 4 | 90 | 45 | 45 | 100 | 1300 |
| No./ effective ha | | 0.003076923 | 0.069230769 | 0.034615385 | 0.034615385 | 0.076923077 | |
| | Farmer G | 7 | 52 | 29 | 0 | 129 | 800 |
| No./ effective ha | | 0.00875 | 0.065 | 0.03625 | 0 | 0.16125 | |
| | Farmer F | 9 | 288 | 140 | 130 | 310 | 2300 |
| No./ effective ha | | 0.003913043 | 0.125217391 | 0.060869565 | 0.056521739 | 0.134782609 | |
| | Farmer C | - | 0 | 27 | 22 | 109 | 906 |
| No./ effective ha | | 0 | 0 | 0.029801325 | 0.024282561 | 0.120309051 | |
| | Farmer D | 4 | 85 | 80 | 85 | 100 | 3300 |
| No./ effective ha | | 0.001212121 | 0.025757576 | 0.024242424 | 0.025757576 | 0.03030303 | |
| Av. No. / effective ha | | 0.004254956 | 0.05737748 | 0.037181406 | 0.026619793 | 0.102161528 | |
| **No. On Simulated Properties** | | **7** | **93** | **60** | **43** | **166** | **1626** |
| | | Farmer C did not communicate how many bulls he had | | | | | |

**Appendix C 9**

**Supplementary Feed Costs**

# SUPPLEMENTARY FEED COSTS

*Source: Marvin Pangborn, personal communication, 2010. and Meat & Wool Monitor Farm: Roger and Jude Henderson 6 May 2009 Farm Discussion Handout*

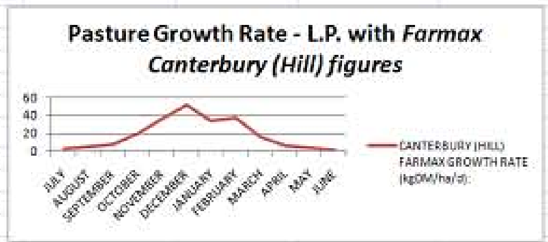
Source: MAF Drought Recovery Strategies

| **Raw Cost** | **$/kg DM** | **MJME/kg DM** | **kg DM/ha** | **Assumed MJME/kg DM** | **$/MJME** |
|---|---|---|---|---|---|
| **Make Baleage (contractor)** | $ 0.15 | 9-12.5 | 2,400 | 11 | -$0.014 |
| **Buy Baleage** | $ 0.36 | 9-12.5 | 2,400 | 11 | -$0.033 |
| **Purchased Barley grain** | $ 0.41 | 13.0 | 4,000 | 13 | -$0.032 |
| **Grown Kale** | $ 0.20 | 12.5 | 6,500 | 12.5 | -$0.016 |
| | | | | | |
| **Feeding Out Cost** | | | | | |
| **Baleage** | **/ kg DM** | **MJME / kg DM** | **Feed out cost / MJME** | | |
| Feed Out Wagon | $ 0.060 | 10.75 | -$0.0056 | | |
| Tractor & Trailer Manual Feed | $ 0.040 | 10.75 | -$0.0037 | | |
| **Barley** | $ 0.010 | 13.0 | -$0.0008 | | |
| **Kale** | $ 0.005 | 12.5 | -$0.0004 | | |

# Appendix C 10
## Feed Supply

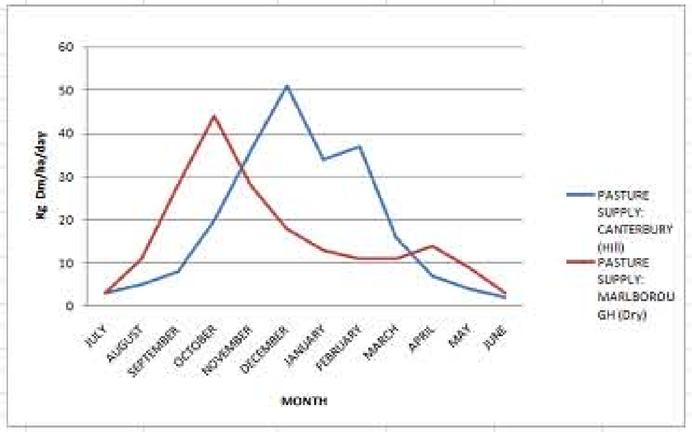
**PASTURE SUPPLY: *CANTERBURY (Hill)***

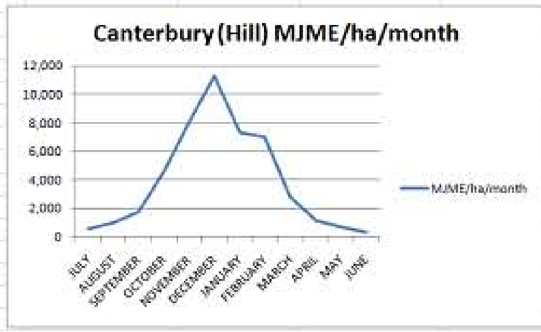
| GROWTH | | JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER | JANUARY | FEBRUARY | MARCH | APRIL | MAY | JUNE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Season | | WINTER | WINTER | SPRING | SPRING | SPRING | SUMMER | SUMMER | SUMMER | AUTUMN | AUTUMN | AUTUMN | WINTER |
| Days in Month | | 31 | 31 | 30 | 31 | 30 | 31 | 31 | 28 | 31 | 30 | 31 | 30 |
| CANTERBURY (HILL) FARMAX GROWTH RATE (kgDM/ha/d): | | 3 | 5 | 8 | 20 | 36 | 51 | 34 | 37 | 16 | 7 | 4 | 2 |
| Av. MJME/kgDM | 9.3 | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.6 | 8 | 8 | 8.3 | 7.9 |
| **FLATS** | | | | | | | | | | | | | |
| Area (ha) | | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 |
| Pasture growth rate kgDM/ha/day | | 3.6 | 6.0 | 9.6 | 24.0 | 43.2 | 61.2 | 40.8 | 44.4 | 19.2 | 8.4 | 4.8 | 2.4 |
| Utilisation (%) | | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% | 80% |
| MJ ME/kg DM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.6 | 8 | 8 | 8.3 | 7.9 |
| Monthly growth | 1,947,183 | 26,832 | 44,720 | 69,243 | 178,879 | 311,595 | 456,141 | 304,094 | 298,901 | 143,103 | 60,588 | 35,776 | 17,311 |
| kg DM/ha/month | 8,099 | 112 | 186 | 288 | 744 | 1,296 | 1,897 | 1,265 | 1,243 | 595 | 252 | 149 | 72 |
| MJ ME/ha/month | 63,350 | 768 | 1,369 | 2,419 | 6,250 | 10,886 | 15,329 | 9,916 | 9,548 | 3,809 | 1,613 | 988 | 455 |
| **CULTIVATABLE HILL** | | | | | | | | | | | | | |
| Area | | 167 | 167 | 167 | 167 | 167 | 167 | 167 | 167 | 167 | 167 | 167 | 167 |
| Pasture growth rate kgDM/ha/day | | 3.3 | 5.5 | 8.8 | 22.0 | 39.6 | 56.1 | 37.4 | 40.7 | 17.6 | 7.7 | 4.4 | 2.2 |
| Utilisation | | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% |
| MJ ME/kg DM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.6 | 8 | 8 | 8.3 | 7.9 |
| Monthly growth | 1,239,791 | 17,084 | 28,474 | 44,088 | 113,894 | 198,396 | 290,430 | 193,620 | 190,313 | 91,115 | 38,577 | 22,779 | 11,022 |
| kg DM/ha/month | 7,424 | 102 | 171 | 264 | 682 | 1,188 | 1,739 | 1,159 | 1,140 | 546 | 231 | 136 | 66 |
| MJ ME/ha/month | 54,442 | 660 | 1,176 | 2,079 | 5,371 | 9,356 | 13,174 | 8,522 | 8,205 | 3,274 | 1,386 | 849 | 391 |
| **STEEP HILL** | | | | | | | | | | | | | |
| Area | | 872 | 872 | 872 | 872 | 872 | 872 | 872 | 872 | 872 | 872 | 872 | 872 |
| Pasture growth rate kgDM/ha/day | | 3 | 5 | 8 | 20 | 36 | 51 | 34 | 37 | 16 | 7 | 4 | 2 |
| Utilisation | | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% |
| MJ ME/kg DM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.6 | 8 | 8 | 8.3 | 7.9 |
| Monthly growth | 5,886,092 | 81,109 | 135,182 | 209,314 | 540,729 | 941,914 | 1,378,858 | 919,239 | 903,540 | 432,583 | 183,150 | 108,146 | 52,329 |
| kg DM/ha/month | 6,749 | 93 | 155 | 240 | 620 | 1,080 | 1,581 | 1,054 | 1,036 | 496 | 210 | 124 | 60 |
| MJ ME/ha/month | 46,193 | 560 | 998 | 1,764 | 4,557 | 7,938 | 11,178 | 7,230 | 6,962 | 2,778 | 1,176 | 720 | 332 |
| **VERY STEEP HILL** | | | | | | | | | | | | | |
| Area | | 346 | 346 | 346 | 346 | 346 | 346 | 346 | 346 | 346 | 346 | 346 | 346 |
| Pasture growth rate kgDM/ha/day | | 2 | 4 | 6 | 16 | 29 | 41 | 27 | 30 | 13 | 6 | 3 | 2 |
| Utilisation | | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% | 60% |
| MJ ME/kg DM | | 8.6 | 9.2 | 10.5 | 10.5 | 10.5 | 10.1 | 9.8 | 9.6 | 8 | 8 | 8.3 | 7.9 |
| Monthly Growth | 1,870,437 | 25,774 | 42,957 | 66,514 | 171,829 | 299,314 | 438,163 | 292,109 | 287,120 | 137,463 | 58,200 | 34,366 | 16,629 |
| kg DM/ha/month | 5,399 | 74 | 124 | 192 | 496 | 864 | 1,265 | 843 | 829 | 397 | 168 | 99 | 48 |
| MJ ME/ha/month | 31,675 | 384 | 684 | 1,210 | 3,125 | 5,443 | 7,665 | 4,958 | 4,774 | 1,905 | 806 | 494 | 228 |
| **MJME/ha/month** | | **564** | **1,006** | **1,777** | **4,592** | **7,998** | **11,262** | **7,285** | **7,015** | **2,799** | **1,185** | **726** | **334** |
| **TOTAL kgDM/ha/day** | | **12.3** | **20.5** | **32.8** | **82.0** | **147.6** | **209.1** | **139.4** | **151.7** | **65.6** | **28.7** | **16.4** | **8.2** |
| **TOTAL kgDM/ha/month** | | **381** | **636** | **984** | **2,542** | **4,428** | **6,482** | **4,321** | **4,248** | **2,034** | **861** | **508** | **246** |
| **Total EFFECTIVE AREA (ha)** | | **1,626** | **1,626** | **1,626** | **1,626** | **1,626** | **1,626** | **1,626** | **1,626** | **1,626** | **1,626** | **1,626** | **1,626** |




**Land Use (ha)**

| Land Use (ha) | | Utilisation Factor |
|---|---|---|
| Flats | 240 | 80% |
| Cultivatable Hill | 167 | 75% |
| Steep Hill | 872 | 70% |
| Very Steep Hill | 346 | 60% |
| Ineffective | 692 | |
| Total Farm Size | 2318 | |
| Effective Farm Size | 1626 | |




| ADJUSTMENTS | |
|---|---|
| More assumed for flat areas | 1.20 |
| Cultivatable hill and steep hill | 1.10 |
| Steep hill | 1.00 |
| Very steep hill | 0.80 |

# Appendix C 11

## Land Use

| LAND USE | Farmer B | Farmer A | Farmer E | Farmer G | Farmer F | Farmer C | Farmer D | AVERAGE |
|---|---|---|---|---|---|---|---|---|
| **TOTAL AREA** | 3418 | 815 | 1400 | 875 | 4800 | 920 | 4000 | |
| **Flats** | | | | | | | | |
| **Area (ha)** | 700 | 220 | 280 | 60 | 138 | 158 | 127 | 240 |
| Lucerne | 100 | | 25 | 5 | | 25 | 26 | |
| Permanent Pasture | 525 | 190 | | | | | | |
| Kale | 15 | 10 | | | | | 2.5 | |
| Oats | 20 | | | | | | | |
| Rape | 40 | 10 | 25 | | 40 | | 18.5 | |
| Improved pasture | | | 230 | | | 113 | 80 | |
| Crop-Barley Rotation | | | | | 98 | | | |
| Native | | | | 55 | | | | |
| ***Additional Comments*** | All lucerne into baleage in mid to late November. Very secure and used as grasses are unable to handle the dry as well. Oats for baleage then into rye-corn for winter feed crop. | *10 'Hunter' & Barley* | | *sub cover combined with native* | *Rape to market barley* | | | |
| **Cultivatable Hill** | | | | | | | | |
| **Area (ha)** | | 150 | 420 | 202 | 0 | 317 | 80 | 167 |
| | | 10 ha Winter feed (dependent upon autumn conditions): have put in, Kale, Oats & Italian Ryegrass, Turnips (haven't grown Turnips for many years). | Partially developed. (Scrub raked and seeded). | Native grasses. Oversown and topdressed yearly for past 40 years. | | Partially Improved Pasture | This land has been fertilised in the past 40 years. Imporved pasture is ryegrass and prairie grass | |
| | | 10ha Summer crop: 'Winifred' rape on hill. | | | | 87 | | |
| | | | | | | improved pasture | | |
| **Steep Hill** | | | | | | | | |
| **Area (ha)** | 815 | 405 | 600 | 538 | 1500 | 431 | 1816 | 872 |
| | Permanent Pasture | Permanent pasture. | 350ha Improved hill country – top dressed and oversown | Native grasses. Oversown and topdressed yearly for past 40 years with ryegrass and sub-clover in mix. | improved pasture | Native Pasture and some clover oversown | -1120ha of this land has been fertilised in the past 40 years. -Through the 1960's and 1970's this was undertaken annually with Sulphur Super, and clover and cocksfoot oversown that are still persisting. This has been reduced due to costs and expansion of the property without increasing stock numbers. | |
| | Oversown and top-dressed. | | 350ha Native grasses, fern and matagouri scrub | | | | | |
| **Very Steep Hill** | | | | | | | | |
| **Area (ha)** | 486 | | | | 662 | | 1277 | 346 |
| | | | | | native pastures | | Native pastures mainly hieracium and browntop. | |
| Land for development | | | | | | | | |
| | Broken in as finances allow for it. 2010 has seen 300ha (of the 486ha) begin to be broken in. There is pressure to do as much as possible in the near future before legislation restricts the area able to be sprayed and eventually the total fire ban. | | | | | | | |
| Ineffective Area (ha) | 1417 | 40 | 100 | 75 | 2500 | 14 | 700 | 692 |
| **EFFECTIVE FARM Farm Size** | 2001 | 775 | 1300 | 800 | 2300 | 906 | 3300 | 1626 |
| *Effective Farm size check* | *2001* | *775* | *1300* | *800* | *2300* | *906* | *3300* | |

| Supplementary Feed: Purchased | Farmer B | Farmer A | Farmer E | Farmer G | Farmer F | Farmer C | Farmer D | AVERAGE |
|---|---|---|---|---|---|---|---|---|
| **Type** | **Barley** | **-** | **Barley** | **Barley** | **Baleage** | **Barley** | **Hay** | 4/7 buy barley, 1/7 buys baleage, 1/7 buys hay and 1/7 buys sheep nuts |
| Quantity | 70tonnes | - | 10 tonnes | 10 tonnes | 200 bales | 15 tonnes | 50 big bales | |
| Price | 250-280 | - | Unknown | Unknown | $55/bale | Av. $300/t | Unknown | |
| Frequency | Annually | - | 1 in 5 years | Purchased 5 years ago | Aim not to purchase any, but in the last two years have had to. | Annually | Unknown | |
| **Type** | | | **Sheep Nuts** | | | | **Ryegrass Hay** | |
| Quantity | | | Unknown | | | | 80 Big Bales | |
| Price | | | Unknown | | | | Unknown | |
| Frequency | | | 1 in 5 years | | | | Unknown | |
| **Type** | | | | | | | **Peas** | |
| Quantity | | | | | | | 20 tonnes | |
| Price | | | | | | | Unknown | |
| Frequency | | | | | | | Mainly fed to the deer | |
| **Supplementary Feed: made on farm** | **Farmer B** | **Farmer A** | **Farmer E** | **Farmer G** | **Farmer F** | **Farmer C** | **Farmer D** | **AVERAGE** |
| **Baleage** | 100ha lucerne baleage and 20ha of oats into baleage | 200 bales | 200 bales | NIL | NIL | Baleage is made on the flats and each year all of this is utilised on farm. | 200-300 mediuam bales | 4/7 make baleage |
| **Hay** | | | 100 bales | | | | 200 big bales | 2/7 make Hay |
| Note: | | | | In an average year no bought in feed. Only in exceptionally dry years in which pea vine hay or lucerne hay was purchased additional to barley. | | | Before the Woodford block was purchased feeding out of supplement was difficult due to the terrain. Recently the farmer has purchased a bale feeder and tractor for this purpose. | |