CROSS BREEDING IN SHEEP

Issues and Options

With a focus on early-lamb systems

Jane Mitchell

CROSSBREEDING IN SHEEP – ISSUES AND OPTIONS

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Jane Mitchell

Kellogg Project
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Section 1: INTRODUCTION

A QUESTION

Why is the topic of crossbreeding relevant for 2000 and beyond?

1. Interest in crossbreeding is increasing particularly since the introduction of 'exotic' sheepbreeds to New Zealand.

2. Crossbreeding provides the opportunity for quantum leaps in performance.

3. Farmers often find it difficult to decide which breeds and systems are suitable for them.

AIMS OF THIS REPORT

1. To assess the **significance** of crossbreeding to sheepfarming.

2. To investigate **options** for crossbreeding for early lamb production.

3. To provide a **resource** for farmers considering crossbreeding.

4. To highlight important **issues** for farmers considering crossbreeding.

5. To include **practical** information, relevant to on-farm use.

6. To **focus** on early lamb systems.

SECTIONS of this report cover:

- Introduction and Key Findings
- Definitions
- Methods of crossbreeding
- Decision-making
- Other key factors – wool, hogget mating
- Breeds
- A focus on three highlights – seminar, database and case-study
- The Future
- References

Section 2: KEY FINDINGS

1. Crossbreeding is useful for early lamb systems targeting the chilled trade, particularly when ewes with good milk production are used
2. Quality genetics are crucial. Whether crossbreeding or selecting within a breed, the quality of rams remains paramount.
3. Crossbreeding has significant potential to increase lamb growth rates prior to weaning.
4. It is important to select the right combination of breeds and the right crossbreeding system.
5. Every farm and farmer will select a different system and breed that is right for them.
6. Base flock, in-line, and composite systems all have advantages and disadvantages.
7. Crossbreeding takes advantage of hybrid vigour, but whether this effect is maintained depends on the system used.
8. Crossbreeding is an effective technique for quickly lifting production and bottom-line returns, particularly if your base breed is showing pretty ordinary performance.
9. Crossbreeding is not a 'magic bullet'. Significant changes in management are required to realise the potential improvement in production. If high performance management systems are put in place in conjunction with crossbreeding, a quantum leap in production levels is possible.
10. There is a lot of information available on crossbreeding, but it is not easily accessible to your average farmer. (A lot of information is anecdotal.)
11. Anecdotal information can be very important in selecting the right breed.

CONCLUSIONS:

- **Farmers should be seriously considering the crossbreeding option.**
- **Farmers targeting the early lamb trade should be using crossbreeding techniques.**
- **In-line crossbreeding is the preferred technique when supplying the early lamb trade as it maximises hybrid vigour.**
- **Composites will increase in popularity due to their simplicity for farmers.**

Section 3: DEFINITIONS

WHAT IS CROSSBREEDING?

Crossbreeding provides new combinations of ewe and ram traits from different breeds to meet special needs and may increase overall productivity. The generation of hybrid vigour or heterosis in the initial cross when two or more breeds are crossed is an added bonus.

Purebreds are the raw material of crossbreeding and good crossbreds only come from good purebreds. In other words the higher the genetic merit or breeding value of the purebreds the higher the expected performance of the crossbreds.

The benefits are the exploitation of hybrid vigour, rapid short-term gains and flexibility to meet changing economic conditions and markets.[1]

Why crossbreed?

- Crossbreeding can introduce traits, which are not present in your existing breed. E.g. improved milking, lamb survival, lamb growth rates.
- Crossbreeding can allow rapid gains in production

However:

- Crossbreeding can also introduce unwanted traits and increase variation.
- To take advantage of the increased potential improved management is required.

What's New? Not crossbreeding.

- Perendales, Coopworths, Corriedales etc are all the result of crossbreeding and **stabilizing** of a breed.
- Halfbreds, and Borderdales, are classic examples of **first-cross** (F1) rams.
- **F1 progeny,** that are common place, are the Border/Romney cross.

[1] Definition quoted from "A guide to Genetic Improvement in Sheep" see bibliography

HYBRID VIGOUR

Hybrid vigour means that crossbreds are generally more productive than the mean of the two parents. Levels of hybrid vigour are highest for reproductive and survival traits compared with growth and fleece traits. If you continue crossing the first cross (F1) males and females heterosis will gradually be lost. If you use a first cross ewe with a third breed as the sire, hybrid vigour will increase again. Heterosis is greatest when very different breeds are crossed.

Examples of hybrid vigour for different traits: [2]

Growth and composition	0-15%
Lamb production	10-40%
Wool production	0-15%
Overall productivity	5-25%

An example for LWG in lambs[2]

- Dam breed 35kg 150 days
- Sire breed 45kg 150days
- 10% hybrid vigour for slaughter wgt
- cross bred progeny = (35+45)/2 x110% = **44kg**
- a gain of 25% on the base breed

Different systems of crossbreeding will maintain greater or lesser levels of heterosis. Maintaining a flock of first-cross females and using a third breed as sire will provide the greatest level of hybrid vigour. Two-tier flocks will maintain a high level of hybrid vigour in the crossbreds, but there will be none within the purebred base. The levels of hybrid vigour within composite flocks will depend on the system used by the ram breeder and how the new genetics are applied to the flock. The result is not as clear-cut and hybrid vigour will be at a significantly lower level than for first-cross systems.

Hybrid vigour will not make up for poor quality stock. The right breeds for the traits you wish to enhance and good examples of these breeds are still essential. With the right base stock, heterosis will be an added bonus.

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[2] from "A guide to Genetic Improvement in Sheep"
[2] *J. McEwan AgResearch* 400 g/day Seminar

Making the most of crossbreeding is a combination of enhancing hybrid vigour and also selecting breeds that provide traits that maximise production within the farming system. For example, in an early-lamb system, milk, growth rates until weaning and reproductive levels are the traits to put at the top of the list. Carcass traits and wool production have less importance.

EARLY LAMB SYSTEMS

- Early lamb systems provide lambs for the UK chilled trade pre-Christmas.
- The peak of kill for this trade in NZ is Oct/Nov. The cut-off date is mid November (depending on ships) to reach the UK in time.
- Premiums in these months are substantial and are generally in the range $5-10/head for the 15-17kg carcass weight (CW) range.
- Specialist systems are required which achieve carcass weights in the 15-17kg range during Oct/Nov. Fast growth rates in lambs, particularly twins are required to get them to these weights in time.
- Crossbreeding can significantly contribute to achieving high growth rates in lambs.
- The term 'early lamb system' in this report means lambs that sold early in the season. They are not necessarily born early.
- The ultimate aim with an early lamb system is to draft lambs as twins at 10-12 weeks of age and 15-17 kg CW.

Section 4: CROSSBREEDING METHODS:

Three Simple Methods:

1 **Two-Tier Flocks**
2 **In-Line Systems**
3 **Composites**

TWO-TIER FLOCKS

In a two-tier system the original purebreds are retained and breed the replacements for the crossbreed flock. This has the advantage of retaining the genetics of the purebred flock while also taking advantage of the crossbreeding option. This type of system will take maximum advantage of the hybrid vigour effect.

However, a relatively large flock and property is required for this type of system. High lambing percentages are required in the base flock to allow adequate selection of replacements. An alternative is to buy in replacements e.g. annual draft (AD) ewes for the purebred flock.

IN-LINE SYSTEMS

An in-line system would typically involve farmer A who has a base flock of purebred maternal type ewes. Another sire breed is used over all or some of these to produce first-cross lambs. These are then sold as ewe replacements at weaning, hogget or two-tooth stage to Farmer B. Farmer B uses these first cross ewes as their base flock and uses a terminal sire over all producing a three-way cross lamb.

This type of system provides maximum hybrid vigour, with a simple system, but depends on a good relationship between the two farmers. Continued genetic improvement is dependent on gains made by Farmer A who is doing all the ram selection for breeding stock.

In-line systems can be seen in action around the countryside and have been promoted by farm-advisers. However the key requirement of farmer B finding farmer A and maintaining a good relationship seems to be easier said than done. *See Te Hau case-study.*

Section 5: COMPOSITES

Composites are created by crossing suitable base breeds to give a 'new' composite ram. The new ram contains a proportion of several different breeds. E.g. 1/8 Finn, 1/8 Texel, ¼ East Friesian, ½ Romney. The combinations are endless. Breeders of these rams should maintain pure performance-recorded flocks of each of the base breeds. Alternatively composites can be used to form the basis of a new breed. Just as Coopworths were 25 years ago. As each generation passes the effect of heterosis will decline.

The big advantage of using composites for crossbreeding programmes is simplicity. The ram breeder does the work for the client. If a ram breeder can provide rams with the combination of breeds and traits that the farmer requires, all the client has to do is roll up each year and select their rams.

Using composite rams means a closed flock can be maintained, reducing the risk of introducing drench resistance, footrot or other diseases.

It is important that the particular composite suits your system. Reliable breeding behind the composite is essential. Quality purebreds must be the basis of the breeding programme.

COMPOSITES: FASHION V. FACT

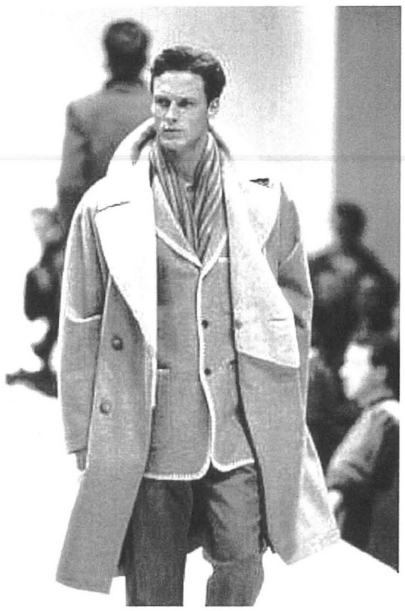
Composite breeds provide a great marketing tool for stud breeders. If the first rule of business is 'providing what the customer wants' composites can certainly do that. Endless variations can be formulated and new names, brands and marketing campaigns can be created. Customer client relationships become all important.

Composites have the ability to be marketed aggressively as 'new' and 'special'. This is leading to positioning of a few big players in the stud industry who are strongly into composite breeding. There is a lot of money to be made in genetics with the right branding.

It can also be argued that we have far too many small stud breeders in New Zealand and that the way of the future is big studs with real

horsepower behind them in terms of investment in developing quality genetics.

If all this sounds like a new style of clothing, don't lose sight of the analogy. Fashion is definitely the name of the game. We are all influenced by fashions and composite sheep breeding is certainly no different. However at the end of the day it will be performance that counts.



<u>BIG IS BEAUTIFUL</u>: Composite Breeders –two examples

1. Breedline Technology Limited

Breedline Technology Limited is the most recent and one of the biggest players in the composite sire breeding industry.

This new company will provide both maternal and terminal composite sires. Behind its establishment is the belief that: "It's time in the industry to simplify crossbreeding for farmers and put some real selection pressure and new recording systems behind these programmes" (Andy Ramsden).

The venture will eventually record 10,000 ewes. The aim is to simplify crossbreeding and provide opportunities to rapidly increase performance. The approach includes a total management package for clients and in the future the opportunity to supply specific overseas contracts.

Breedline markets a maternal composite sire – the 'Highlander' – a Romney/Finn/Texel cross. Romney provides the base, Finn gives fertility and the Texel means a quality carcass.

Highlander flock – to illustrate the type of lamb that is produced through the Highlander programme

The 'Primera' is designed as a Terminal Sire. It should produce, when mated with the Highlander, 15-17 kg CW twins at weaning.

Breedline explains that to combat decline in hybrid vigour when breeding on from F1 animals detailed records of bloodlines are maintained and from time to time new blood may be introduced. They claim that in theory 70% of hybrid vigour can be maintained with a 3-5 breed cross.

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- Perendale/Texel • Romney/Finn/Texel
- East Friesian/Romney/Texel

profit

Rams available this season

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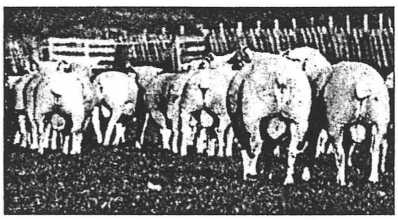

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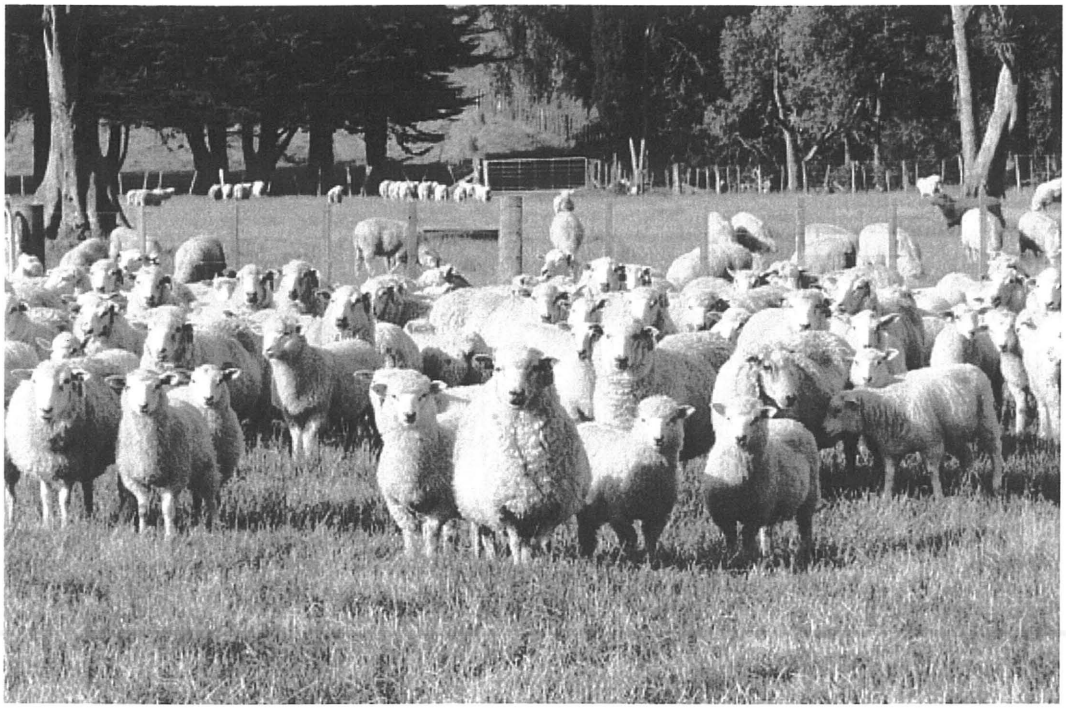


Highlander Flock – weaned 225% with lamb weights averaging 30 kilograms at 95 days of age

2. Wairere

Wairere is a well established; large scale Romney stud with a strong marketing programme. It took up the new East Friesian genetics providing Romney/East Friesian rams (Wairere Breakthru and Wairere Stabiliser). Wairere has now expanded to provide composite rams aimed at particular market segments – the Wairere Hardy, Wairere Multiplier and Wairere EarlyLamb.

They have listened to client demand and provided the product to meet the market. Once original Romney clients have started crossbreeding Wairere has needed to continue developing new ram types to stay one step ahead of its clients.

Section 6: DECISION-MAKING

OBJECTIVES

Once the decision has been made to crossbreed the next stage is to decide how. The key to these decisions will be keeping your **objectives** in mind and coming up with a plan. What production traits are you wanting to improve on and which breeds will help improve these? Which breeders have quality rams and quality information for these breeds? A plan is important, but keep in mind that change can be made at any point. The main thing is keeping it simple and working out what suits you and your farm. Your first crossbred may not be the right one, but there will be plenty of other options.

METHODS

1. **Other farmers experience** is invaluable, as they will tend to put more emphasis on non-measurable traits such as handling, performance under pressure, feed preferences, health status. Other traits such as mothering ability and dagginess are measurable, but information is hard to find.

2. **Information.** There is a lot of good information out there ranging from very technical to very anecdotal. Make use of it all. Some sources of information are listed at the end of this report.

3. **Trial and Error.** How any new breeds perform under your conditions will be critical. Any animals used for 'trial' purposes will need to be good examples of their breed and over good quality ewes (not culls) if your want to use the progeny as replacements. Using new breed rams over a portion of the flock will allow comparison with your current breed, but it will also slow down any gains made from the new cross.

4. **Measurements** that will be important to compare different crosses in early-lamb systems will include scanning %, lamb survival, lambing %, weaning weights, % sold at weaning, hogget mating results.

PRACTICAL DECISIONS

Farmers will find that different characteristics and breeds work best for them. It is important to talk to farmers who have experience with breeds you may be considering. It is also very worthwhile to do on-farm trials of different breeds and combinations to find what suits your system.

A lot may come down to personal preferences and the way your farm is set up e.g. if the new breed is hard to handle; whether you do a lambing beat and how the breed reacts; whether your fences and your temperament are compatible with the breed. This is where to maximise your return it is important to have the right crossbred for you and your farm. In the end basic on-farm trials may give you many more answers than all the information, opinion or glossy brochures you look at.

Once a farmer has started along the path of crossbreeding there will be many decisions to make. One decision can be made at a time i.e. which ram to use this year to which ewes. There are infinite options and while it is comforting to know where you are heading it is not necessary before starting along the path. Farmers should not be put off from trying the option, if it seems appropriate, by perceived complications.

SYSTEMS

The crossbreeding system used will also often come down to individual farm situations and personal preference. Composites have the advantage of simplicity and a 'one stop shop'. Selecting the right ram breeder for you will be the most important decision.

In-line systems require more groundwork to set up and continued management, but the rewards can be high for all parties. This system can work particularly well for smaller, more specialist flocks such as suppliers of early-lambs. The trick can be buying replacement ewe lambs that are born early enough to mate as hoggets in their first year. Other alternatives could be a regular source of AD ewes or two-tooth ewes.

Base flock systems have the advantage of maintaining a quality genetic line, which may become increasingly valuable, but require a reasonable sized operation to maintain. Any heterosis effect will be confined to the portion of the flock that is crossbred. Wool will be retained as an important income stream.

QUALITY

The **quality of your rams** and background breeding will remain just as important with crossbreeding. The crossbreeding result will always be better if good representatives of each breed are used. It is important not to introduce major faults e.g. poor feet, especially when using breeds that are relatively new to New Zealand.

Crossbreeding will have a more dramatic impact on productivity if base flock performance is poor prior to commencement i.e. a high producing purebred flock may experience a lower % of increase in return by crossbreeding.

MANAGEMENT

When looking at bottom-line returns for high production early-lamb crossbreeding systems it is crucial to remember that stocking rates will probably need to be adjusted downwards. Maximising the bottom-line will occur, when any downward adjustment in stocking rate is more than offset by increased meat production/ha. The key to this is minimising the reduction needed.

High performance production systems are required and particularly in early-lamb systems a very good match of the lambing date with the pasture growth curve is essential. The trick is to have the maximum number of ewes lambing over a short period of time when they can most efficiently use high quality spring pasture. Potential for high milk production and availability of quality feed for both ewe and lamb are essential to reap the potential of crossbreeding.

Section 7: FUTURE INFORMATION SOURCES

DECISION SUPPORT SOFTWARE

Woolpro is currently funding Terry Reid at WRONZ who is developing a decision support system to assist farmers deciding whether to cross breed and with what. He is gathering comparative animal production information from the literature and from any other source he can find. This is being built into a database, which will provide the source data on animal performance and heterosis to be analysed by two computer programmes to give predictions of relative economic value.

This database will be accessed alongside the SIL system. It should be available in July 2001. A variety of traits (see appendix I) are given a **relative economic value.** These values can be added together to give a total increase in economic value for any combination of breeds including two or three way crosses and composites. The system can be used to assess the economic advantage of different breed options and crossing systems. It is hoped to include a component that provides an allowance for different environments based on farm class.

Farmers will be able to use this system to look at options for 'where to from here'. However, it will not assess intangibles e.g. handling, respect for fences, and other such subjective, but important issues.

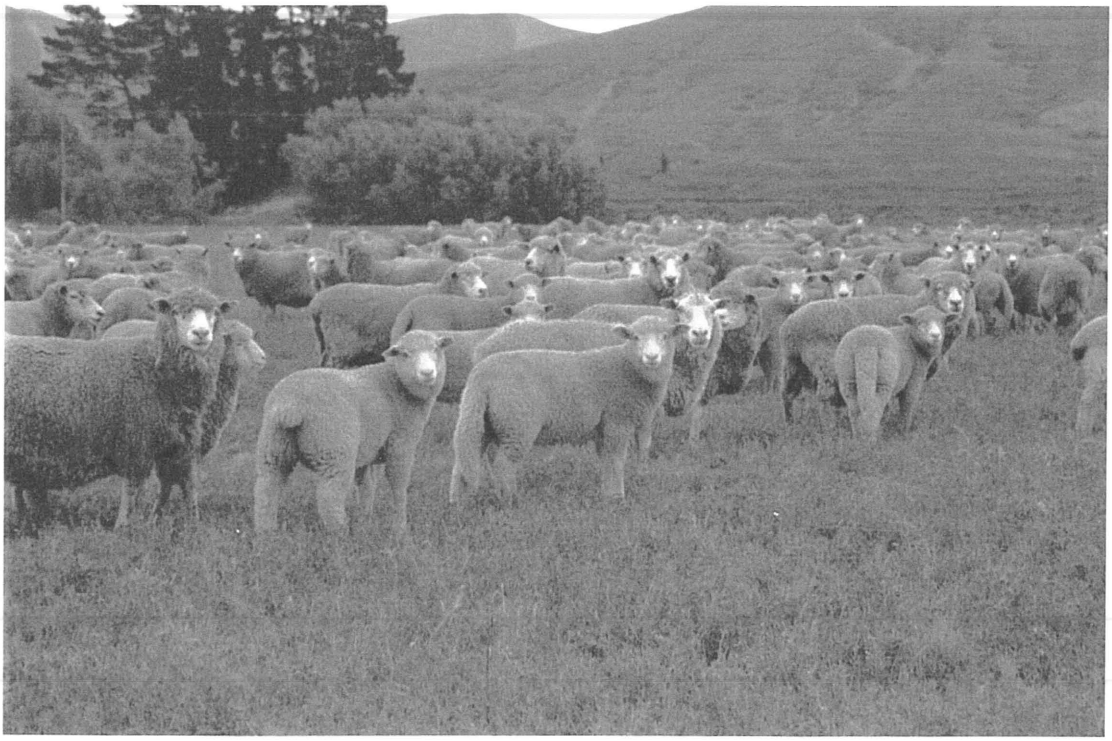
SIL

Sheep Improvement Ltd is a limited liability company formed by the Meat and Wool Boards for the purpose of providing state of the art genetic information to ram breeders. It aims to achieve a 2% annual genetic productivity gain across 50% of the sheep industry.

SIL will provide centralised performance recording and breeding services available to all New Zealand ram breeders. Current sheep recording schemes will all come under the one umbrella. Standard Breeding Values (known as estimated breeding values or EBVs) will allow comparisons of rams in different flocks using Best Linear Unbiased prediction (BLUP) analysis. The results can be plotted on a genetic gains graph and will show the average change in genetic value over time. Both ram breeders and commercial farmers will access the new database via the Internet.

SIL provides the ability to pick up the rate of genetic progress in sheepfarming. Improvements in management techniques and use of crossbreeding are lifting the productive base of sheepfarming, but we need the baseline genetics to improve every year maintain this momentum.

SIL should lead to faster genetic improvement. Breeders will be able to accelerate their rate of genetic improvement and ram buyers will be able to use the new breeding values to make better-informed decisions.



Section 8: WOOL

It is easy to forget wool when looking at crossbreeding for early lambs as the focus of crossbred ewes is maximising lamb production. Gross farm income is a sum of all production elements not just lambs. Crossbreeding for lamb production certainly compromises wool production. However, there are pluses and minuses and every crossbreeding scenario will affect the wool cheque differently.

One of the main differences between crossbreeding today and in the past (e.g. Coopworth, Perendale) is that there is less emphasis placed on wool. This allows farmers to select more intensively for meat production and make faster genetic gain.

Many crossbred systems involve an increase in the 'bulk' of wool. Bulk is seen as a desirable characteristic, but the reality in the marketplace at present is only a small premium, not large enough to compensate for losses in wool weight. An increase in the premium for bulk would go a long way towards reducing the affect on wool income of crossbreeding

There are two main negative effects on wool of crossbreeding. They are a reduction in volume and a possible reduction in quality. There is also a risk of black fibre contamination with some crosses. Individual breeds will affect wool production differently. Poll Dorset and Texel breeds will add bulk.

RANKINGS

TRAIT	**Highest**			**Lowest**
Wool Weight	East Friesian	Poll Dorset	Texel	Finn
Bulk	Texel & Poll Dorset		Finn	East Friesian
Micron (Strong/Fine)	East Friesian	Poll Dorset	Texel	Finn

MARKETING

Another issue for crossbreeding and wool is the increased emphasis on breed types. The McKinsey report suggests breed type to define growers' place in the new wool industry structures. Which marketing company will the breeders of crossbreds be aligned with? Crossbreed wool often falls in terms of micron between medium and strong wools. Breed type is also being used as a brand label for marketing purposes. Pure breeds are being marketed as brands within the wool world. Current examples are Merino NZ and Romney NZ. Crossbred sheep are inclined to fall into the cracks between the convenient definitions of mid-micron and strong wools. They are not quite Perendales, not quite Romneys and not quite Corriedales. Where will they fit? The regional approach of StrongWools NZ in Southland provides an alternative with the emphasis on marketing Southland qualities rather than breed type.

With more and more crossbreeding happening within New Zealand there must be a place for crossbred wool, but it certainly can be seen that the current push to marketing through branding strategies does not favour crossbreds.

Section 9: HOGGET MATING

How is hogget mating affected by crossbreeding?

Successfully lambing hoggets can make a very worthwhile contribution to a farmer's profitability. Crossbreeding has a very positive effect on the success of hogget mating because as hybrid vigour assists growth rate so more hoggets reach acceptable autumn weights of 40kg plus.

The crossbreds of Finn, Texel, East Friesian and Poll Dorset are earlier maturing than our traditional breeds so a higher proportion of hoggets take the ram and they also do it earlier. [3]

Crossbred hoggets as mothers seem to have good milking ability and mothering skills under the right management.

Hogget scanning percentages in excess of 100% are achievable with crossbreds. Good management skills are needed to ensure high survival rates and to prevent any affect on two-tooth performance.

Crossbreeding and hogget mating/ don't appear to have any affect of the longevity of ewes.[4]

Trials such as the ones at Poukawa comparing ewe breeds do not take into account the affect of successful hogget mating on the bottomline. Producing a lamb from every hogget means that every sheep carried on the farm produces a lamb. If a crossbred flock gives a 50-100% lift in hogget lambing % the affect on profitability will be significant.

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[3] Poukawa Research Station is currently doing trial work on hogget oestrus in crossbreds.
[4] Poukawa research and personal communications.

Section 10: BREEDS FOR EARLY LAMBS

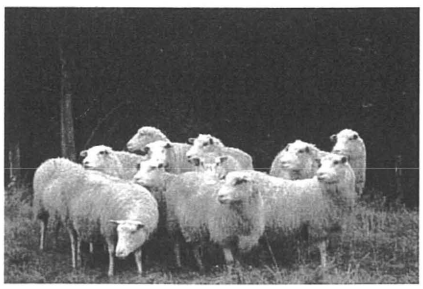
Crossbreeding for early lambs is all about maximising the weight of lambs sold at weaning. This is a combination of weaning % and weaning weight. Premiums available during October and November for lambs in the 15-17kg range can be substantial. High lamb growth rates while on the ewe are the basis of a successful early-lamb system.

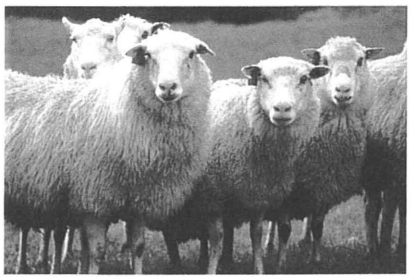
Fertility is still the most important factor that influences gross farm income. However in an early-lamb system ewes that can wean multiples at heavy weights are a must. This means it is preferable to have on the dam side a ewe with a high milking ability with quality milk, great mothering ability and easy lambing of high birth weight lambs. On the sire side it is preferable to have high lamb survivability genetics, vigour and growth rate within acceptable carcass conformation criteria.

When looking at crossbreeding for early lamb systems, the breeds selected will have the greatest impact on the results. At present in New Zealand most early-lamb systems have a base dual-purpose breed e.g. Coopworth, Romney, Corriedale. The **maternal crosses** commonly used are listed below.

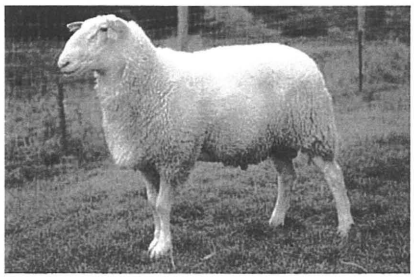
MATERNAL CROSSES

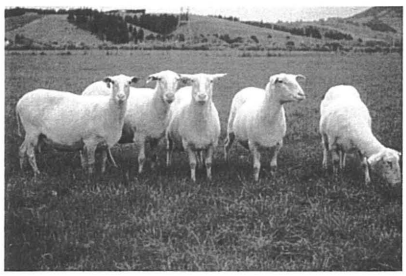
Finn – extremely high fertility, high quality milk, low wool weight, good mothering ability, lean, facial eczema resistance, hardy, dislikes handling at lambing, relatively small size increases efficiency.



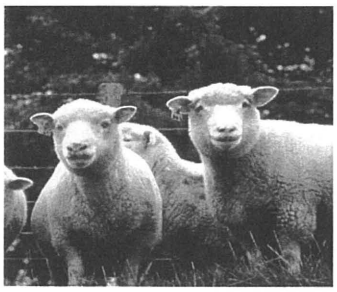


East Friesian – very high fertility, high milk volume, free of wool on crutch, lean, heavy ewe bodyweight reduces efficiency, needs good nutrition to maximise production.

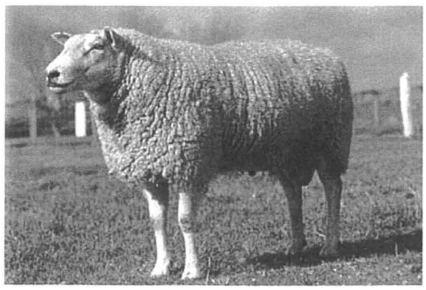




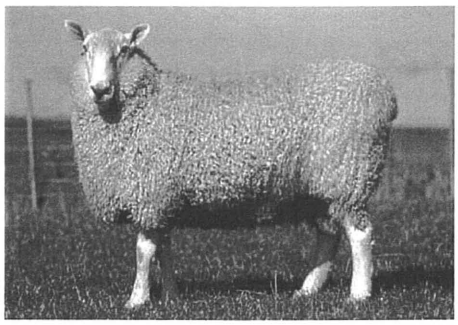
Poll Dorset – good milk production, good mothering ability, good carcass, fast lamb growth rates, also early maturing, high fertility, does well in dry conditions, ability to lamb out-of-season, but heavy ewe bodyweight reduces efficiency, white feet may increase foot problems.



Texel – high lamb survival, heavy, good carcass, hardy, fast growth rates, but less prolific, dark fibres, watch for poor feet.



Border Leicester – high fertility, reasonable milk, high wool weight, a dual -purpose breed.



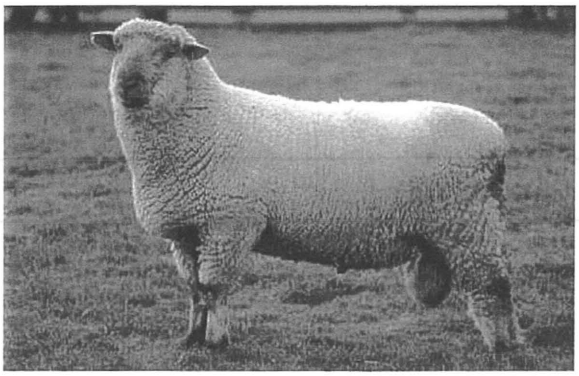
High milk producing breeds will be more prone to mastitis and udder problems.

All of these breeds will challenge your fences, your patience, your shearers and possibly your body.

TERMINAL CROSSES

- Traditional Breeds include Suffolk, South Suffolk, Dorset Down, Southdown, Hampshire, and Poll Dorset.
- Newer breeds include Texel, Suffolk variations and composites such as Landcorp Lamb Supreme and Breedline's Primera.

Line of Primera lambs



Dorset Down Ram

Section 11: A FOCUS ON THREE HIGHLIGHTS

This section selects three highlights from my research into crossbreeding that are particularly relevant to early lamb systems.

1. 400 grams/day Seminar

The Northern South Island Sheep Council held this seminar in Christchurch in February 2000. The focus was the challenge of aiming for 400 grams/day growth rates in lambs from birth to slaughter. Speakers made presentations covering issues, practical examples, and methods. A booklet "A guide to Improved Lamb Growth – 400 Plus" has since been published by the New Zealand Sheep Council.

2. Poukawa Early Lamb Trial.

This trial at Poukawa in Hawkes Bay aims to demonstrate early lamb systems. Dr Paul Muir uses crossbred ewe types with high milk production to provide the high growth rates required for early lambs. The trial seeks to provide a database for this type of system. It uses some of the 'exotic' breeds and compares them with base Romney genetics.

3. Te Hau – a $ example.

Te Hau is my home farm. I kept my first crossbred ewe lambs in 1993. The majority are still on the farm and have this year once again reared twins drafted off Mum at 12 weeks of age. Our management of Te Hau has changed significantly in conjunction with the introduction of crossbreds, but the rewards have certainly been worthwhile. This section provides some $ figures for the bottomline advantage of crossbreeding on our property.

Section 12: 400 GRAMS/DAY – a seminar

The key to maximising profit in early lamb systems

If management allows the expression of genetic potential crossbreeding with quality rams of appropriate breeds can lead to large short-term gains in both lambing percentage and lamb growth rate.

At the sheep council seminar in February 2000 on '400 grams/day' speakers outlined the effects on the **bottom-line** of increasing lamb growth rates to these levels and methods to achieve it.

Andy McFarlane outlined a lift in profitability of 40% by lifting growth rates to 400g/d from baseline industry average lamb growth rates of 228g/d (pre-weaning, South Island, 1982). This puts sheepfarming at a profitability level that is very competitive to alternative landuses.

The potential lift in profit from crossbreeding at even a 20% lift in profit levels is a very good return for a relatively small investment in rams. The percentage change in the bottomline from crossbreeding will depend very much on the current productivity levels of the flock. A top manager with high quality genetics will experience a much smaller lift in production from crossbreeding. For high performers, though, any changes will bring smaller increments of improvement. (*See Poukawa data overleaf*).

It is crucial to these bottom-line returns to set-up management systems which can handle high lambing percentages and which promote high growth rates from birth to weaning. This maximises the efficiency of feed consumption and also optimises the potential of using crossbred ewes.

John McEwan explained that **hybrid vigour** is the easiest way to take quantum leaps in the weight of lambs weaned. Maximum hybrid vigour will be gained through using purebred ram sires and F1 ewes. However composite ewe breeds will provide about 70% of the hybrid vigour effect. Of course it must never be lost sight of that the performance of your breeder is at least as important as which breed system you choose. QUALITY genetics are the key to progress whether the method is through selection techniques or through crossbreeding.

Section 13: POUKAWA ELITE LAMB TRIAL – a database

BACKGROUND

MeatNZ, Woolpro, and Richmond fund the Poukawa Elite Lamb Project. It is set up at Poukawa Research Station in Hawkes Bay.

The Poukawa Elite Lamb Project was set up in 1998 with the following **objectives:**

- **Demonstrate a high performance early lambing system.**
- Compare the milking ability of East Friesian cross, Finn cross and Romney ewes. Poll Dorset cross ewes were included in 1999.
- Develop selection criteria for milk production.
- Benchmark sire genetics for early lamb production.

An 88ha area is set up at Poukawa for the Elite Lamb Project and comprises a balance of flat and easy rolling contour. In 1998 ewes were given optimum feeding conditions. In 1999 and 2000 the emphasis has been on the "system' approach of combining high performance at a high stocking rate.

In 2000 first-cross ewe hoggets were purchased to investigate breed effects on onset of oestrus and ovarian activity.

HIGHLIGHTS

Some Highlights of the field-day notes (1999 & 2000):

Reproductive Performance

- Finn x ewes produced lambs with significantly lighter birth weights but this had no impact on lamb survival.
- Finn x ewes had the highest reproductive efficiency (lambs scanned/kg ewe mated).
- East Friesians have more often been unable to regain satisfactory condition post weaning.
- Finn and East Friesian x ewes have a higher level of internal fat than other breeds raising the question of the accuracy of condition scoring in these breeds.

Milking Ability

- Udder size is a good indicator of milk volume and also a good mother.
- Ewes rearing twins produced significantly more milk than ewes rearing singles.
- East Friesian x ewes produced 30% more milk, but Finn x milk was significantly higher in fat and total solids.
- Within a breed, lamb growth rate was not well correlated with ewe milk production. This may be because the lamb can substitute grass for milk at an early age. In addition maternal influences (e.g. mothering ability) may influence milk consumption.

Growth Rate

- The highest lamb growth rate achieved in 1999 was 440g/d from birth to 12 weeks. The best ewe performance was an EF x ewe who reared triplets which average 30 kg each at 12 weeks.
- In 2000 the best performing twins (both rams) averaged 42.3 kg at 12 weeks, having grown at 452 g/d from birth.
- Lambing in July will often result in a feed shortage in September requiring grain feeding or Nitrogen application in June to compensate.
- Overall lamb performance has been closely related to average pasture cover during lactation.
- In terms of lamb growth rate, Finn x and Romney ewes have been identical in performance. However lambs reared by Poll Dorset x ewes have been, on average, 1.2 kg heavier at 12 weeks and lambs reared by East Friesian x ewes have been 3.4 kg heavier.
- Dr. Muir believes that the better lamb growth of lambs reared by East Friesian x ewes is due to a combination of increased milk production, larger mature size of the East Friesian breed and a greater degree of hybrid vigour than occurs with other breed crosses.

Sire Effects

- Individual sires had a huge impact on lamb performance. There was a 22% difference between the weight of progeny at 12 weeks depending on the sire.

EWE EFFICIENCY

In Early Lamb systems the weight of lamb weaned will determine profit. The Poukawa Lamb Trial looks at **ewe efficiency** when drafting lambs to meet the premium market. Efficiency figures are dependent on the value put on feed at different times of the year.

Results:

1999 Ewe productivity = kg lamb weaned/kg ewe tupping weight

Breed	Av. Lamb weaning wgt	No. lambs Reared/ewe	Ewe tupping Wgt	Wgt lamb reared/kg ewe tupping wgt
EF x	29.30	1.57	74.9	0.61
Finn x	25.40	1.62	68.5	0.60
Romney	25.45	1.49	68.0	0.55

Lamb Returns (1999)

Ewe Breed	**Wool Value $**	**Lamb Value $**	**Returns /ewe $**	**C/kg DM consumed**	**C/kg winter DM consumed**
EF x	14.55	92.76	107.31 (113)	16.60 (104)	44.76 (100)
Finn x	13.05	88.35	101.40 (107)	16.11 (101)	46.84 (105)
Romney	15.47	79.56	95.03 (100)	15.96 (100)	44.47 (100)

Modelling data in this table refers to a July lambing.
Figures in parentheses indicate relativity.

Conclusions:

- The benefit of faster growth rates from progeny of East Friesian x ewes translated into a 13% benefit in $ returns. However this advantage was reduced by the extra feed required by the heavier ewe bodyweights, particularly when expressed as c/kg winter DM consumed. The increased fecundity of the Finn x ewes led to a 7% benefit in $ returns but their increased milk fat concentration of the

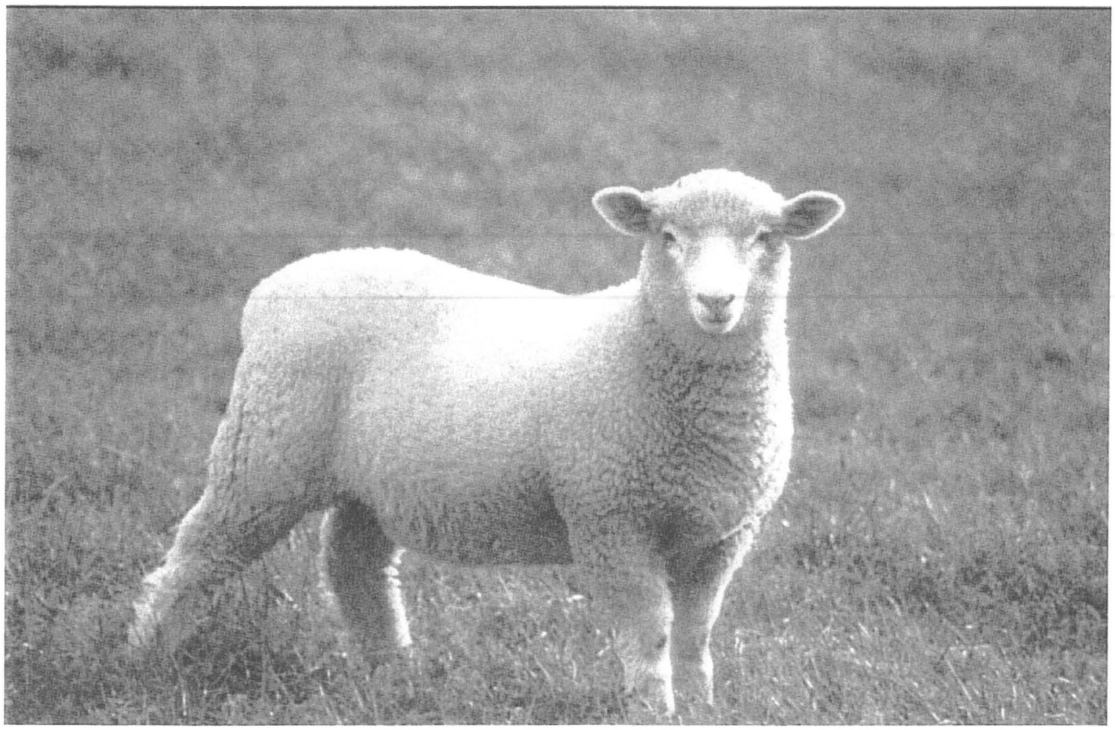
Finn x ewes meant a higher energy cost for lactation, reducing the overall efficiency. On the other hand the lighter bodyweights of the Finn x ewes led to a 5% benefit in terms of c/kg winter DM consumed.

- Increases in ewe liveweight, fecundity, milk production (and composition) and lamb growth rate all increase feed requirements. Changes in sheep policy through crossbreeding need to be considered in the light of these altered feed requirements and their likely impact on stocking rate. In an early lambing situation the winter feed requirement must also be considered.

The efficiency modelling information for 2000 is included in Appendix II.

Poukawa trials do not include hogget lambing increases in the analysis of the $ value gains of crossbreeding.

Good quality Romney ewes were selected for this trial. It is important to bear this in mind when comparing the data between the breeds.



Section 14:

THE $ VALUE AT TE HAU OF CROSS-BREEDING – a case-study

- Te Hau is a 420ha coastal property by **Lake Grassmere** in Marlborough. In conjunction with a 145ha property 5km inland. Rainfall is 550mm/year.
- Te Hau sells 3000 lambs per year. The majority of these are for the **early-lamb trade**. Lambing begins August 1 and drafting begins in mid-late October. Lambs are generally sold in the 15-17kg CW range with hogget lambs finished if the season allows.
- An **in-line breeding system** is used. Corriedale/Poll Dorset first cross ewe lambs are purchased from a nearby property in November. Ewes are mated to Dorset Down rams and 2th and hoggets to Poll Dorset rams. Crossbreeding started in 1993 from a Corriedale base.

Below is a comparison of the increase in **income of Corriedale/Poll Dorset F1 ewes compared with Corriedales run together as one flock.** All ewes are mated to a terminal sire. 1999 values are used.

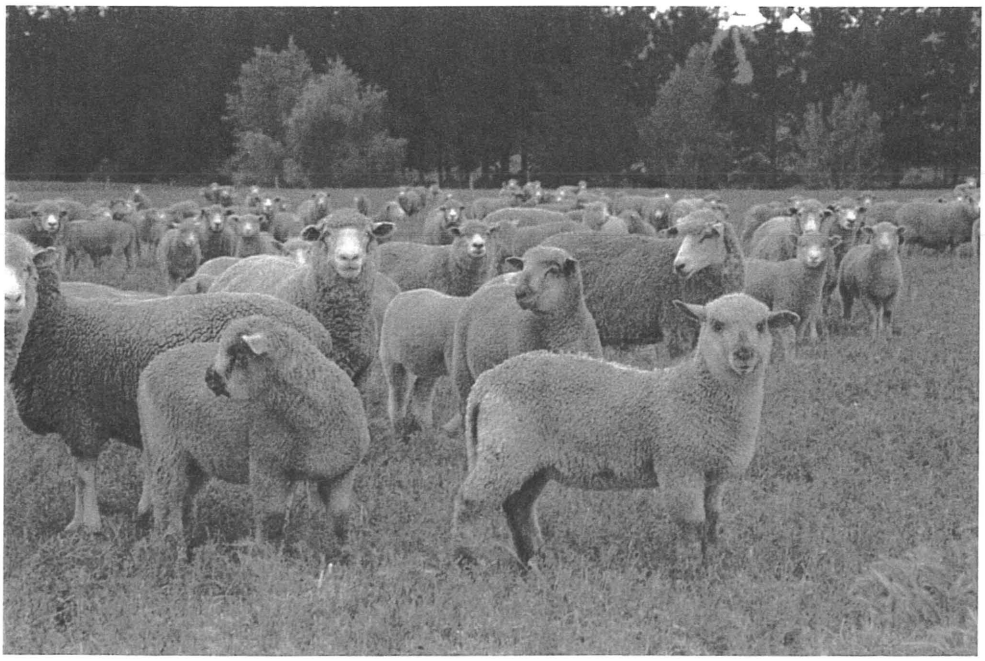
Lambing %	increased by 25% average lamb value $50
Hogget lambing %	crossbred hoggets at 98% average average lamb value $45 pure corriedale hoggets would not be mated
Wool	wool weight reduced by 20% =1kg average wool value $2.50 no significant premium received for bulk
Lamb Growth Rates	crossbred lamb drafted at weaning corriedale lamb drafted one month later premium on lambs falls by $10/month
Opportunity Cost	it is assumed the value of feed consumed by a ewe & her lambs in November is $10. Early drafting means this feed can be used to for example finish steers.

Stocking Rate crossbred ewes affect the stocking rate by 15%
corriedale ewe at 115% lambing,
5kg wool @$2.50

Assuming a Corriedale flock of 2000 ewes and 500 hoggets

Effects of crossbreeding	Corriedale ($)	Crossbred ($)
Lambs	115000	140000
Hogget lambs	0	22050
Wool	30000	25000
Early drafting	0	20000
Opportunity cost	0	20000
Stocking rate down	0	(21000)
TOTAL	**145000**	**206050**

The difference is **$61050** benefit from crossbreeding.



Section15: THE FUTURE

GENETIC TECHNOLOGY

Over the last 20 years New Zealand sheep flocks have advanced greatly, particularly in selection for ewes producing multiple lambs. Some individual sheep or breeds of sheep are much more prolific than others. AgResearch has already identified major genes for prolificacy. These genes have allowed rapid gains to be made in flocks without changing breed type.

The large effect of these genes means that where they are maintained in a flock there are two benefits – all selection pressure can be directed to other economic traits and there are more offspring from which to select. As well the breeding approach is likely to have greater consumer acceptance than any artificial alternatives.

New techniques of genetic marking and gene identification will mean in the future that rapid gains can be made in flocks without changing breed type. This "genes off the shelf" approach will allow producers to move between the baseline and the limit to a level appropriate for their management.

On a smaller scale, genetic marking techniques will mean parentage can be assigned without manual, inaccurate field tagging. At docking lambs can be weighed, tagged with an electronic tag and a blood sample taken from their tail.

Technology and genetics are the way of the future. I believe every farmer breeding for meat will have to take up the challenge of genetics and crossbreeding in the future. The rewards are huge for the time and energy input.

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The majority of these are available from MeatNZ, WoolPro, freephone or through the Internet. Sites are listed overleaf.

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www.woolpro.co.nz

www.sheepimprovement.co.nz

www.breedline.co.nz

http://nzsap.rsnz.govt.nz

www.agresearch.cri.nz

www.wronz.org.nz

www.maf.govt.nz

APPENDIX I: Decision support system

Breed
Romney
Perendale
Corriedale
East Fresian
Texel
Finn
Poll Dorset
Coopworth
Merino
Border Leicester
HighFleeceWtRomney
Oxford Down
Suffolk
Super Fine Merino

Trait	Description
Brightness	Brightness
Bulk	Wool Bulk (Loose wool at this stage)
BWT	Liveweight at birth
CarcassWt	Carcass Weight
COLM	Colour measured (Y-Z)
Curv	Fibre Curvature
EBrightness	Brightness Adult ewe fleece
EBulk	Wool Bulk (Loose wool) Adult ewe fleece
ECOLM	Colour measured (Y-Z) Adult ewe fleece
ECurv	Fibre Curvature Adult ewe fleece
EFDCV	Fibre diameter variation Adult ewe fleece
EFW	12 month fleece weight for Adult ewe
EMA	Eye muscle area (predicted)
EMAM	Eye muscle area (measured)
EStLgth	Staple Length Adult ewe fleece
EYield	Yield Adult ewe fleece
FDCV	Fibre diameter variation
FDIAM	Laboratory measured fibre diameter
FDIAM12	FDIAM at 12 months old standing hoggets
FEC1	Faecal egg count before 1 March
FEC2	Faecal egg count after 1 March
FootRot	Foot rot

FW12	Fleece weight at 12 months, shorn as lambs
GR	Ultrasonic fat depth (GR)
HNLB	Number of lambs born per ewe hogget joined
HNLW	Number of lambs weaned per ewe hogget joined
LitSize	Litter Size
LW12	Liveweight at 12 months old
LW8	Liveweight at 8 months old
NEM1	Nematode count before 1 March
NEM2	Nematode count after 1 March
NLB	Number of lambs born per adult ewe joined
NLW	Number of lambs weaned per adult ewe joined
StLgth	Staple Length
WWt	Weaning weight at 3 months old
Yield	Yield

Effect of ewe breed, sire performance and lambing date on DM intake, and efficiency of DM use.

Breed	*Lambing date*	*Sire*	*Lambing %*	*% Lambs drafted*	*Lamb income ($)*	*Wool income ($)*	*Total Income ($)*	*$/ T winter DM*	*$/T total DM*	*Total DMI*
Rom	Early	Low growth	128	9.88	56.57	15.47	72.04 (100)	387.58 (100)	126.53 (100)	587
EF x	Early	Low growth	146	39.79	74.58	14.55	89.13 (124)	417.18 (108)	139.37 (110)	657
Finn x	Early	Low growth	149	6.79	63.84	13.05	76.89 (107)	397.05 (102)	128.93 (102)	618
Rom	Late	Low growth	153	8.29	55.13	15.47	70.60 (98)	590.89 (152)	118.63 (94)	588
EF x	Late	Low growth	171	37.13	71.1	14.55	85.65 (119)	640.02 (165)	128.97 (102)	656
Finn x	Late	Low growth	174	6.13	62.13	13.05	75.18 (104)	595.89 (154)	120.42 (95)	617
Rom	Early	High growth	128	73.5	73.33	15.47	88.80 (123)	444.29 (115)	149.33 (118)	564
EF x	Early	High growth	146	90.7	88.94	14.55	103.49 (144)	448.68 (116)	154.84 (122)	632
Finn x	Early	High growth	149	65.6	83.24	13.05	96.29 (134)	459.12 (118)	153.41 (121)	590
Rom	Late	High growth	153	71.8	69.09	15.47	84.56 (117)	706.64 (182)	137.62 (109)	605
EF x	Late	High growth	171	90.54	81.43	14.55	95.98 (133)	715.83 (185)	143.93 (114)	656
Finn x	Late	High growth	174	65.45	78.64	13.05	91.69 (127)	725.17 (187)	140.85 (111)	641