

Ewes for the future

→ lambs, wool & profit

trial results →



Final report

Jan 2009 to Nov 2014

Summary

Key cooperating sponsors:



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Note

The Elmore Field Days sheep trials committee need to script read results before they are passed on to the media by participating groups. They are concerned that selected information may be used out of context without presenting the full situation and results. When breed groups use the results in their promotions it is expected the Elmore Field Days will be acknowledged.



The trial is run by the Elmore Field Days in cooperation with the Campaspe Lamb Producers Group. Pictured at lamb marking are Pat Johnson, Roger Kemp, David Lees, Peter Safstrom, Erica Schelfhorst, Frank Oliver, Max Williams, Bill Johnson, Glen Rathjen, Rod Fiedler, Ged McCormick, Kieran Ransom and Rob Williamson.

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Section 1: Summary

Background and method

What's the best sheep type for a combination of prime lamb and wool production? This question has been debated by sheep producers for years.

In January 2009, the Elmore Field Days trial, Ewes for the Future – Lambs, Wool and Profit, began. The trial aims to compare the merits of five alternative sheep types in the Northern Victorian environment at Elmore. The results will assist sheep producers determine the merits of a number of ewe breed alternatives for prime lamb and wool production. The main characters of interest are lambing percentages, lamb growth rates and wool production.

The ewe breed types are:

Border Leicester x Merino cross. The most common prime lamb mother in northern Victoria. Ewes were sourced with the help of the SuperBorder\$ group, a group within the Border Leicester breed society using Australian Sheep Breeding Values (ASBVs) to help breed better Border Leicester rams.

Merino, Loddon Valley. The second most common prime lamb mother in northern Victoria. The sheep are mostly based on Peppin bloodlines with some influence from South Australian bloodlines. Ewes were sourced with the help of the Loddon Valley Stud Merino Breeders Association.

Centre Plus Merino. Centre Plus is a group breeding scheme and registered merino stud and in Central West NSW that aims to produce dual purpose sheep. This Merino strain has achieved a good reputation from the high dual purpose and fine wool index ASBVs on the Sheep Genetics Australia website.

Dohne. The Dohne is a dual-purpose breed developed in South Africa using Peppin-type Merino ewes and German Mutton Merino sires. They have been selected for high fertility, rapid lamb growth rate and fine wool. There is a high level of farmer interest in this dual-purpose breed. Sheep were sourced with the assistance of the Australian Dohne Breeders Association. In 2008 the Dohne breed was in the early stages of introduction to Australia. Two properties supplied F2 ewe lambs while the third property supplied F3s. *See note below.*

SAMM. The Prime SAMM (South African Meat Merino) is a dual-purpose sheep originally bred in South Africa to produce heavy slaughter lambs at a young age as well as good quality wool. The breed society is aiming at 60 per cent meat and 40 per cent wool in members breeding programs. Sheep were sourced with the assistance of the Prime SAMM Breeders' Society of Australia. In 2008 the SAMM breed was in the early stages of introduction to Australia. Two properties supplied F3 ewe lambs while the third property supplied a mix of F2s and F3s.

Note: F1 is the first cross, a F2 is a second cross and a F3 is a third cross when introducing a new breed.

At the start of the trial, a total of 210 ewe lambs were delivered to the site. The five breed-types are each represented by 42 ewes. Each breed type group was randomly selected from three properties, with 14 ewe lambs per property after an allowance for culling.

Ewe lambs, 2008 drop were delivered to the Elmore Field Days by early January 2009. They were fed a high-quality diet to reach a suitable joining weight in late February 2009, when they were joined to White Suffolk rams. They were run together for 6 lambings, the first as ewe lambs, with the exception of lambing in separate paddocks by breed group each year. The table below shows key management dates.

Lambing	Seasonal year	Ewe age at lambing	Join date	Mid lambing date	Date first batch of lambs sold	Shearing date
1 st	2009	15 mths	26 Feb 2009	12 Aug	10 Feb 2010	6-8 Oct
2 nd	2010	2 yrs	28 Dec 2009	13 Jun	5 Nov 2010	5-7 Oct
3 rd	2011	3 yrs	1 Dec 2010	12 May	20 Oct 2011	4-6 Oct
4 th	2012	4 yrs	1 Feb 2012	12 Jul	22 Oct 2012	2-4 Oct
5 th	2013	5 yrs	1 Feb 2013	12 Jul	10 Dec 2013	1-3 Oct
6 th	2014	6 yrs	1 Nov 2014	18 Apr	11 Sep 2014	7-9 Oct

Differences between breeds and teams within breeds

Are the ewes in the trial representative of the breed group? Ewes representing each breed were sourced from 3 properties because of the genetic variability between flocks within a breed. All ewe lambs in this study came from flocks nominated by breed society representatives and in many cases they were present at selection. Sheep breeds are composed of many bloodlines, there are genetic differences between bloodlines, flocks within bloodlines as well as individuals in an individual flock. For example, the Merino breed covers a wide range of types from those with a focus on very fine wool to those with a focus on dual purpose meat and wool characters. These results therefore, only apply to the sheep at Elmore and they may or may not be truly representative of the breeds in general.

There were sometimes significant differences in body weight and wool between teams within a breed group. These results are shown in the 'detail' section of this report.

Comparing lambing percentages in ewe trials

Trials at Trangie by the NSW Dept Agriculture found big differences between Merino bloodlines in lambing percentages when all ewes were reared together from conception to the end of the trial. Similar differences no doubt exist in other breeds. However issues arising from ewe trials comparing lambing percentages include:

- (i) Does the level of nutrition in early life as a foetus, as young lamb up to weaning and from weaning until entry to this trial, affect mature body size, wool production and lambing percentages later in life? Overall, Australian and New Zealand research, in four trials with merino sheep, indicate the nutrition of the young merino ewe, from a foetus to weaning has zero or at most small long term effects on subsequent reproduction under commercial farm conditions. However, two trials in Britain with local breeds indicated that under nutrition as a young lamb lowered lambs born per ewe joined by around 4 to 5%. It was suggested this was due to a higher rate of embryo or foetal mortality during pregnancy rather than differences in dry ewes or number of eggs shed per ewe.
- (ii) How does hybrid vigour affect lambing percentage. Hybrid vigour is well known in Border Leicester x Merino cross ewes. What is less known is the hybrid vigour when Merino strains are crossed. NSW Dept Agriculture research conducted from 1975 to 2000 indicated when Merino bloodlines were crossed the average values of ewe or maternal hybrid vigour, expressed through a ewe being a pure bloodline or cross bloodline, were 1.2% for fertility (wet versus dry ewes), 2.9% for litter size (singles, twins or triplets), 6.8% for lamb survival and 8.2% for lambs weaned. These NSW Dept Agriculture merinos were initially purchased in the early 1970s when merino bloodlines were more defined than present day merino studs as artificial insemination and the use of rams from other studs may have reduced differences between these traditional bloodlines. Reviews of research worldwide indicate average hybrid vigour of 14% in number of lambs weaned when any two breeds are crossed. This may have implications for Loddon Valley Merinos and Centre Plus Merinos where the studs have used rams from diverse sources for many years. It may also have effects when South African origin breeds are crossed with Australian Merinos. The F1 cross would be expected to have the most hybrid vigour in reproduction. The hybrid vigour component of extra reproduction would be expected to halve in the F2 generation and halve again in the F3 generation.
- (iii) Some breeds, especially Border Leicester x Merino cross are regarded to be more seasonal breeders than say Merinos. The choice of lambing time may thus put some breeds at an advantage or disadvantage to others.
- (iv) Lambing management, for example not separating singles or twins after pregnancy scanning within each breed group, might disadvantage breeds with a higher percentage of twins. Overall the standard of lambing management in this trial was very high; lambing ewes were usually inspected twice per day.
- (v) The ewes in the trial were first joined as ewe lambs. The question then arises: What effect did lambing as a ewe lamb have on lambing in the following years? Did lambing as ewe lambs penalise those ewes so they had a lower lambing percentage the following year? An analysis of this trial indicated that lambing as a ewe lamb had no deleterious effects on lambing percentages in subsequent years. Several other trials have given similar results.

The Elmore environment

The ewes were run on the Elmore Field Days site 3 km east of Elmore in northern Victoria. The long term average rainfall is 466 mm. The rain is winter dominant. Most sheep grazing is on annual pastures growing between late autumn and spring and dry pasture residues and crop stubbles over the summer. Annual crops of cereals, oilseeds and grain legumes are normally sown in late autumn and harvested in early summer. Summer storms in some years provide extra green feed from dry-land lucerne and green summer weeds. The trial sheep mostly grazed annual green pasture in the winter – spring growing season and dry pasture and crop residues in the summer. There was some dry-land lucerne that provided additional summer feed. An area of irrigated annual winter pasture was watered up each autumn. This provided some extra feed in the difficult late autumn period. The wet summers, especially the 2010-11 summer provided additional summer green feed from weeds. At times of feed scarcity sheep were provided with a grain supplement or silage. The rainfall over the trial period is shown below.

Rain at Elmore during the trial period													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
2009	0	0	22	31	12	50	52	29	36	29	50	13	325
2010	33	83	60	51	48	32	55	103	47	92	88	84	777
2011	134	110	54	49	14	18	41	64	40	16	63	18	620
2012	28	88	104	18	15	38	52	30	23	22	7	14	438
2013	3	36	17	2	25	46	59	55	51	17	9	38	358
2014	6	14	49	78	35	86	29	5	52	9	40	27	429
Long term average	31	28	31	33	44	48	47	47	44	45	37	32	466

Statistical analyses

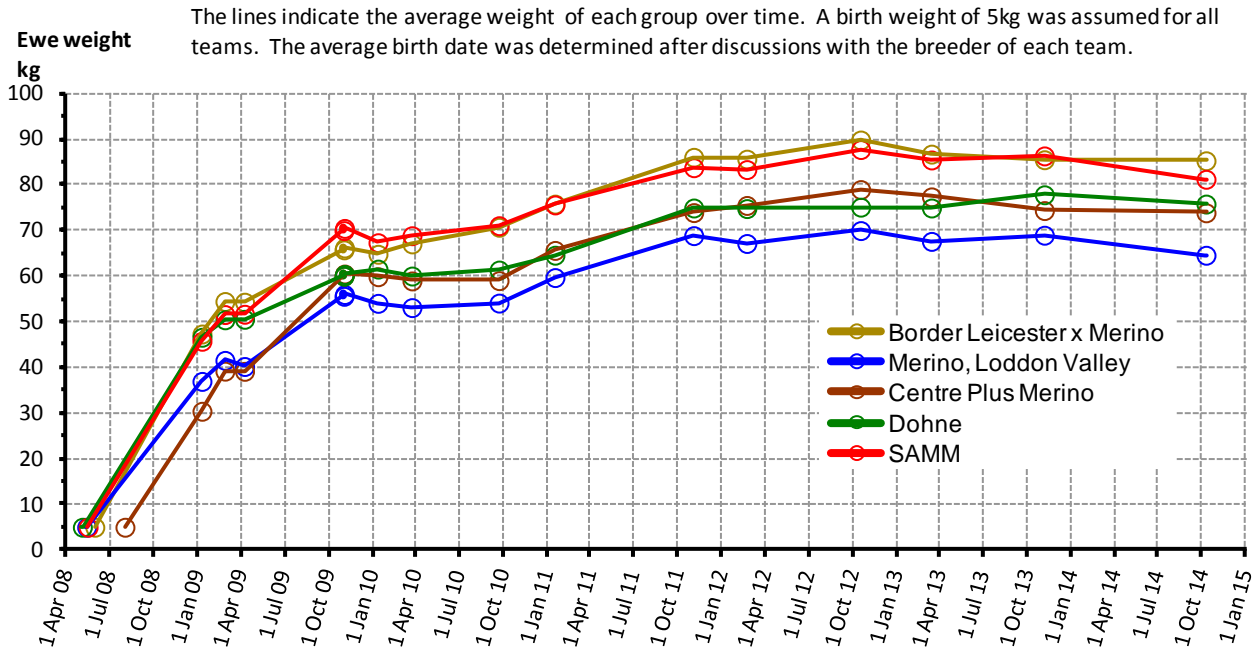
Statistical analyses of these results were conducted by Forbes Brien and Wayne Pitchford from the University of Adelaide with financial support from Australian Wool Innovation. These averages are shown with 'Least Significant Difference' where appropriate.

Results

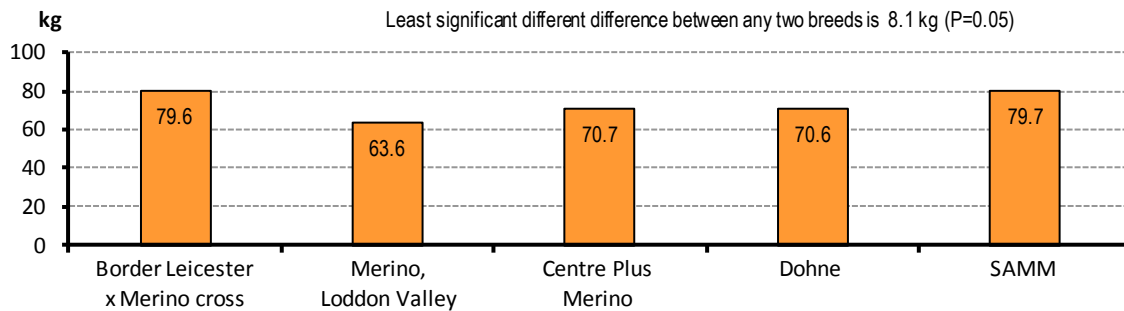
Ewe weight & condition score

Ewe weights from birth (birth weights were assumed at 5kg, birth dates obtained for each group) to current. This graphs indicates the lambs were born over a four month and the early drop lambs were heavier at the first complete weighing on 8th January 2009. The lambs continued to gain weight on their supplements after arrival. The aim of feeding over the first year was to steadily grow all the lambs out to maturity and ensure that there was no permanent disadvantage over the length of the trial.

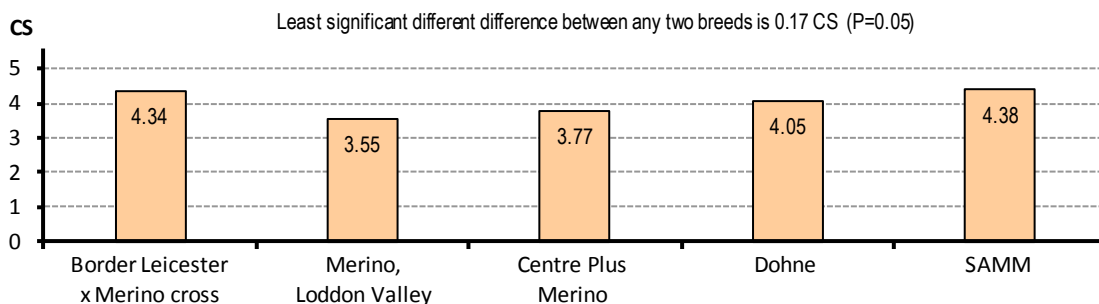
Ewe weights (fleece free) from birth on farms of origin and at Elmore from 8Jan09 to 9Oct14.



Ewe weight at joining, average 5 adult joinings



Ewe condition score at joining, average 5 adult joinings

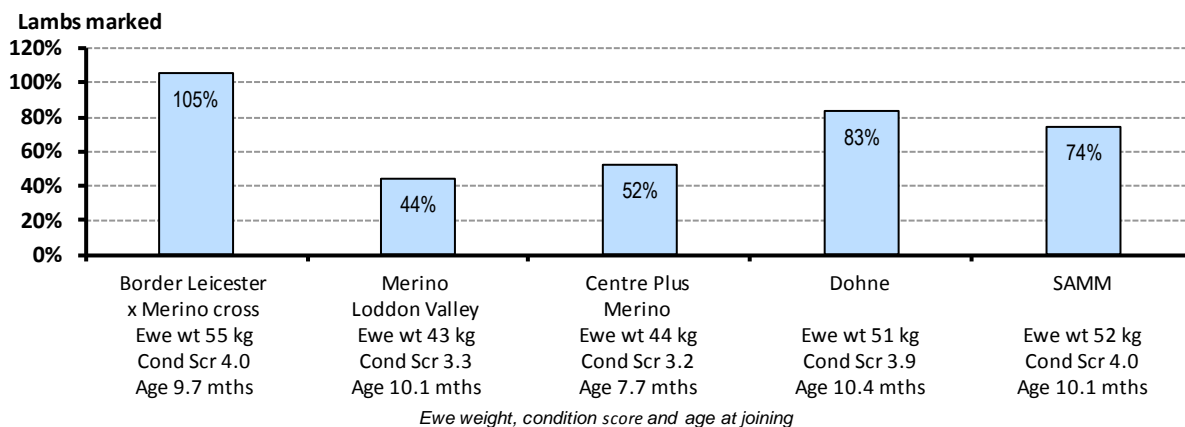


Lamb marking percentage as ewe lambs

The sheep were initially joined as ewe lambs after they had been run together six weeks. Ewe lambs' ability to get in lamb is governed by their age, weight and condition, all a function of their original farm environment. Twenty five lambs were considered too light to join as they weighed under 40 kg (Centre Plus Merino – 19 and Merino Loddon Valley – 6). The lambing results from unjoined lambs are not included in the figure below. This graph indicates that provided ewe lambs can reach a suitable weight, condition score and age, then good lambings are possible.

Lambing details 2009, joined as ewe lambs

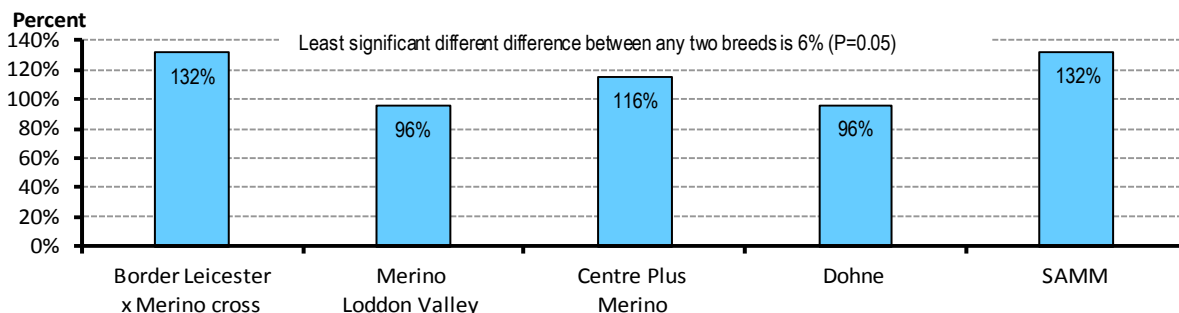
Joining 26 Feb, Preg scan 27 May, Mid lambing 12 Aug.



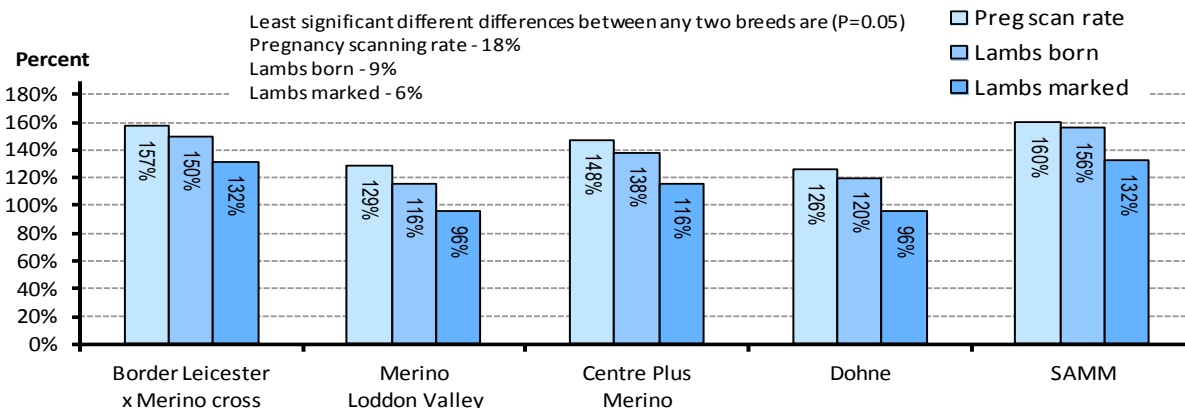
Lambing as adults

The figure below averages the 5 years of adult lamb marking percentages, but does not include the first year when ewe lambs were joined six weeks after arrival at Elmore. As discussed elsewhere; the nutrition in early life and lambing as ewe lambs probably had minimal effects on lambing performance after one year of running together.

Lambs marked, percent, average over 5 adult lambings



The average (i) pregnancy scanning rate, (ii) lambs born and (iii) lambs marked over five adult lambings

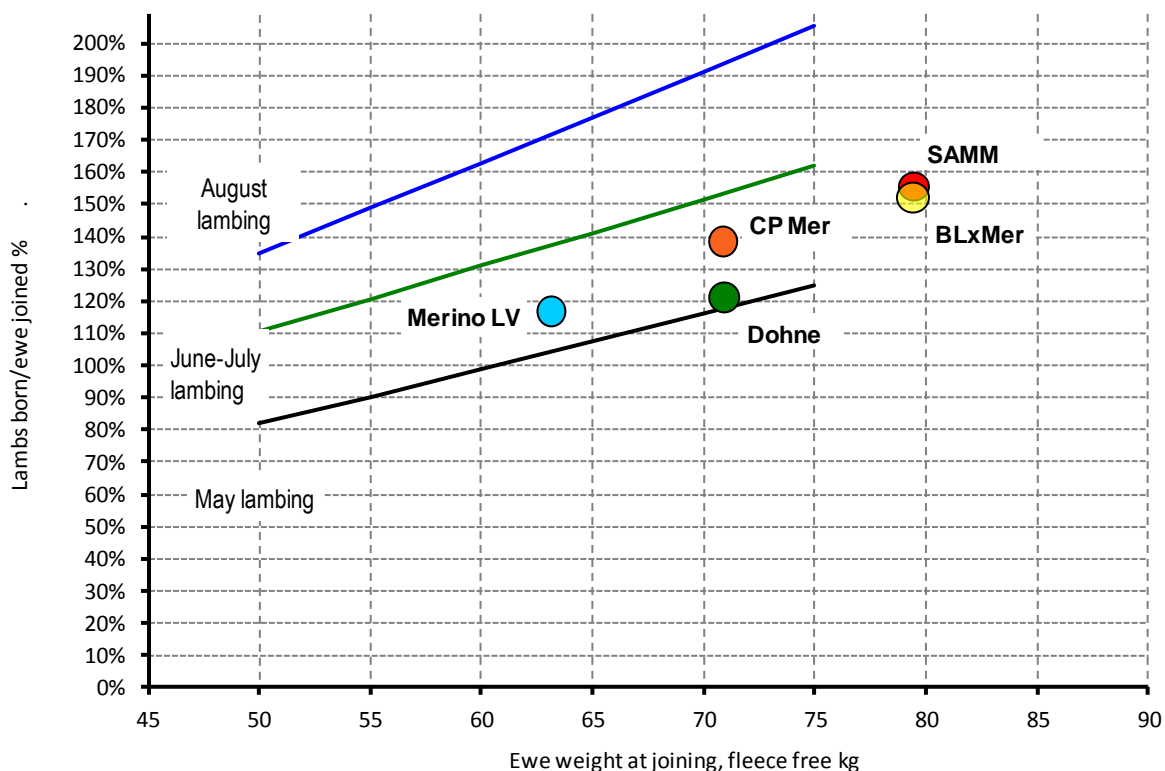


Number of lambs born and its relation to ewe weight at joining

The lines indicate the relationship between the number of lambs born and ewe weight at joining for three lambing times for Border Leicester x Merino ewes in an experiment at Rutherglen in the 1970s.

The dots are Elmore data and indicate the average ewe weight and average number of lambs born for each breed over the five adult lambings.

The least significant difference of lambs born is 9%, thus if the dots overlap there is no significant difference between the measurements, if the dots do not overlap then the differences are real or significant.



Seasonality of breeding season

Most sheep in Australia are seasonal breeders. They join more readily in the autumn than late spring to early summer. However the breeds differ in their seasonality of breeding. Border Leicester x Merino (BL x M) cross ewes are well known to be more seasonal breeders than merinos. For example in a trial at Rutherglen in the 1970s ewes at 70 kg weight and lambing in May would be expected to lamb down at 115% lambs born per ewe joined. Ewes lambing 4 months later in August at the same weight would be expected to lamb at 190%, an increase of 75% (see graph below). This conclusion was reached by a six year trial with ewes running at several stocking rates with three times of lambing over a 6 year.

This Elmore trial was not designed to compare the seasonality of breeding season between the ewe groups. Lambing percentages are influenced by many factors including ewe condition score, live weight, nutrition around joining time, nutrition 4 to 6 months before joining as well as the seasonality of the breeding season. In this trial the numbers of ewes is also limited. Statistical analyses of this trial are thus unable to reach conclusions, but we can still look for trends that indicate BL x M ewes might be more seasonal breeders than the other breeds. In the table below the BL x M cross ewes had a 35% increase in lambs born. They were joined late (26 Feb) once as ewe lambs with 105% lambs marked, however comparisons are not possible as the ewe lambs were only together 6 weeks prior to this joining. However there seems to be a trend that confirms other research that indicates BL x M ewes reach their full potential with a March – April joining.

The figure below shows the average lambs born and ewe weight relationship of the ewes in this trial sorted by the three early and two later adult joinings.

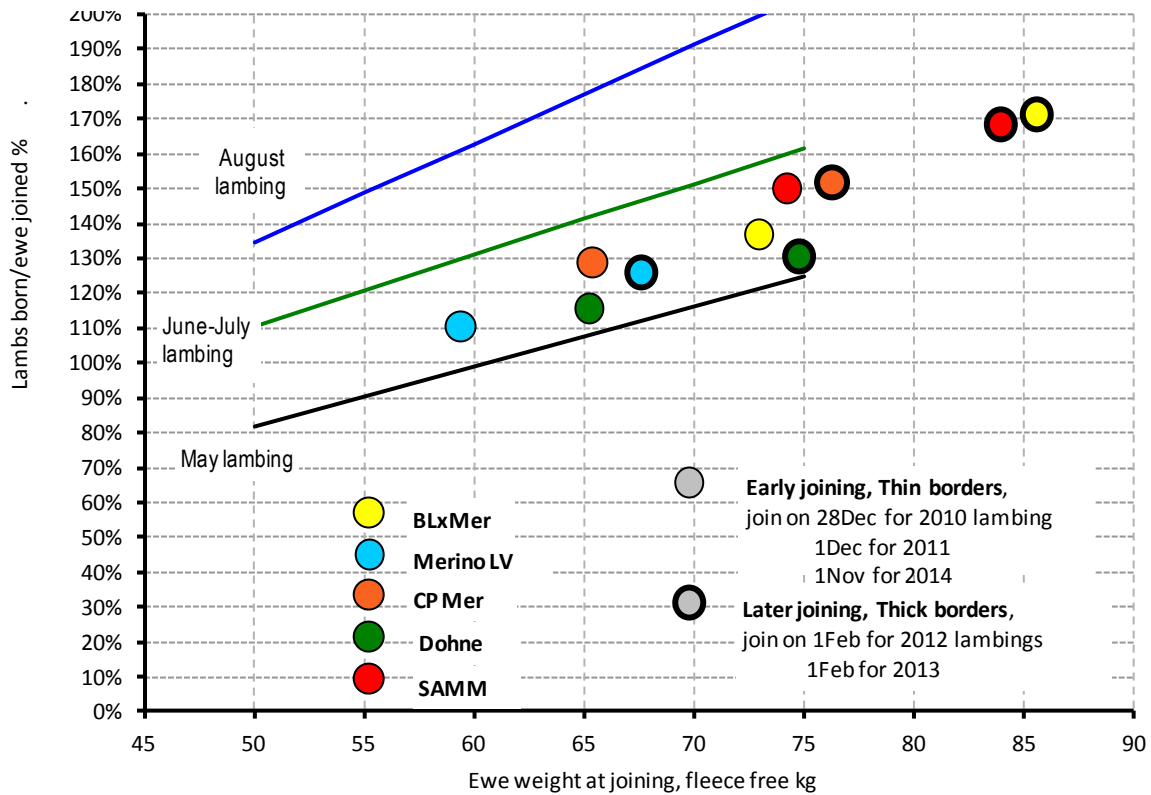
Table indicating the lambs born per ewe joined for three earlier joinings and two later joinings. Ewes were on average about 10 kg heavier as well as being older at the later joinings, see graph below.

Breed	Three earlier joinings	Two later joinings	Increase in lambs born from the early to later joinings
Border Leicester x Merino cross	136%	171%	35%
Merino, Loddon Valley	110%	125%	15%
Centre Plus Merino	129%	153%	24%
Dohne	114%	129%	14%
SAMM	148%	167%	18%

Number of lambs born and its relation to ewe weight at joining for 'early' and 'later' lambings.

The lines indicate the relationship between lambs born and ewe weight at joining for three lambing times for Border Leicester x Merino ewes in an experiment at Rutherglen in the 1970s.

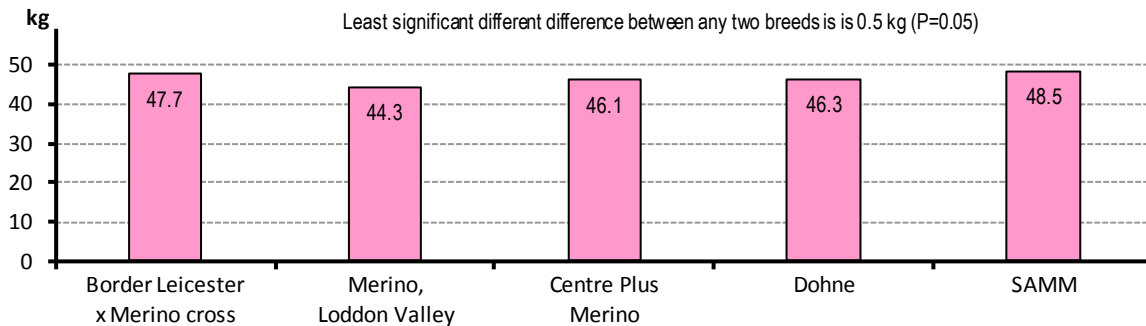
The dots are Elmore data and indicate the ewe weight and number of lambs born for each breed. There were five lambings. Three lambings were 'early' and two lambings were 'later'.



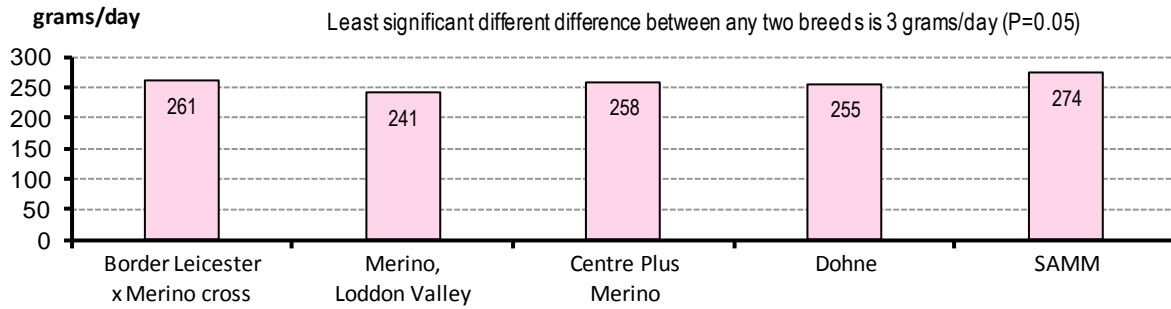
Lamb weight, growth rate and dressing percentage

Lambs reared as singles or twins could not be identified in this trial. Other research indicates twin lambs grow from 12 to 20% slower than single lambs to weaning. Thus breeds with higher lambing percentages and a higher number of twins would have a twin lamb growth penalty.

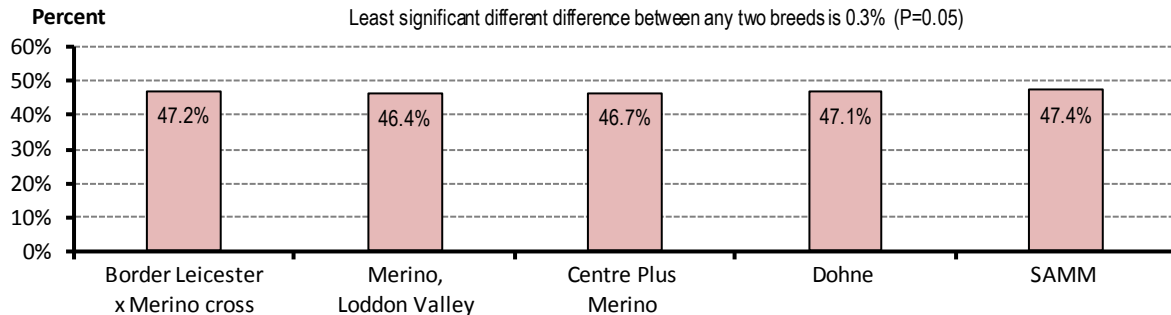
Lamb weight of all lambs before any sales, average over 5 adult lambings



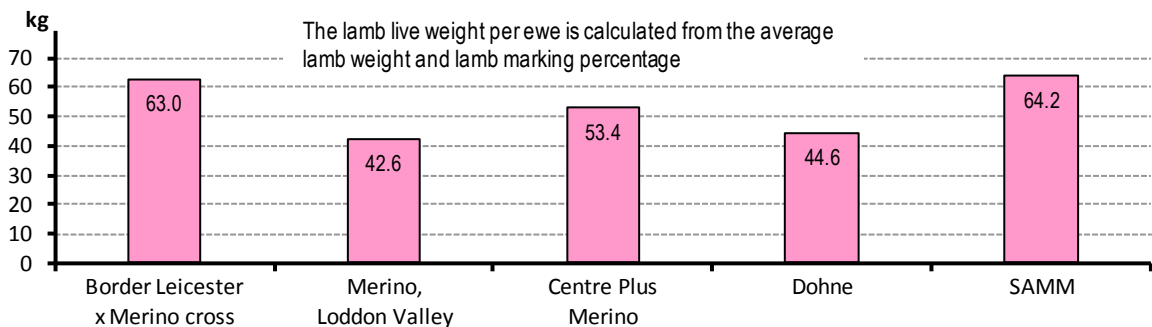
Lamb weight gain from marking until the first lambs were sold, average over 5 adult lambings



Lamb dressing percentage, average of four batches measured



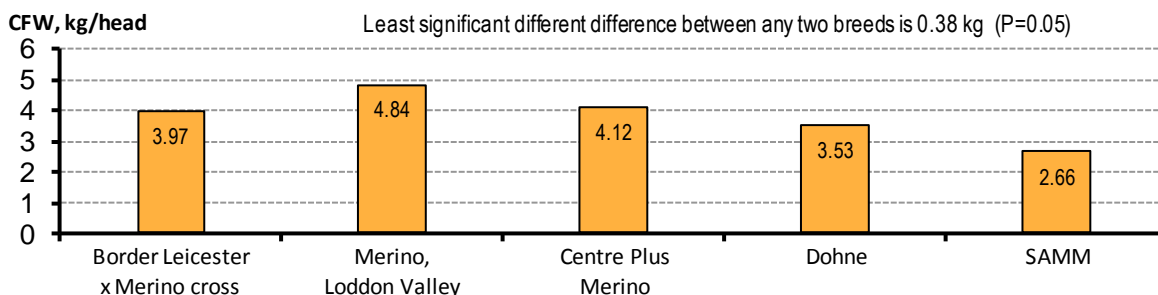
Lamb live weight produced per ewe, average over 5 adult lambings



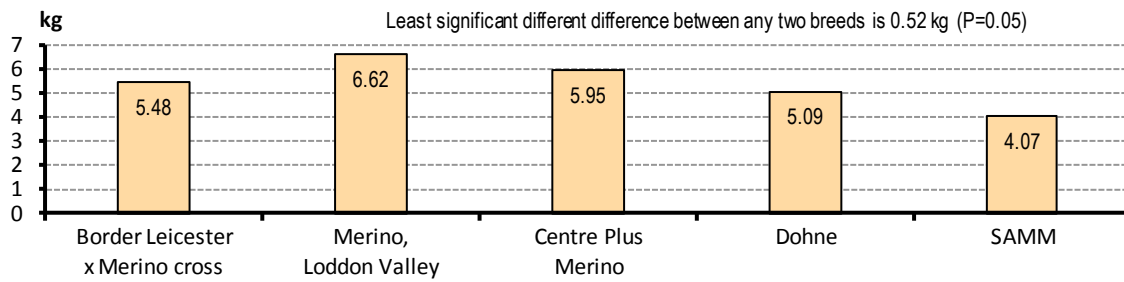
Wool

Growing and rearing a lamb can reduce greasy fleece weight by up to one kg. It will also affect fibre diameter and wool tensile strength. Thus ewes with higher lambing percentages will have a larger fleece weight penalty and other wool changes. Some breeds will also put more energy into their milk supply and growing the lamb, thus ewes rearing faster growing lambs will also have a larger wool penalty.

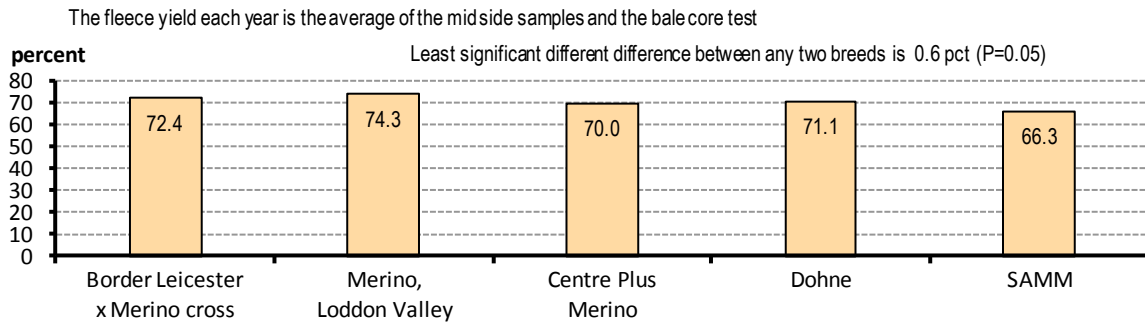
Clean fleece weight, average of 5 adult shearings



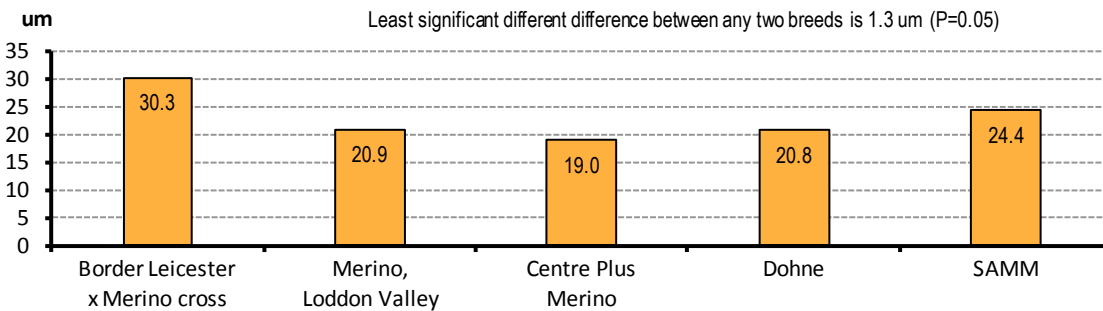
Greasy fleece weight, average 5 adult shearings



Fleece wool yield, average 5 adult shearings



Fibre diameter, average 5 adult shearings

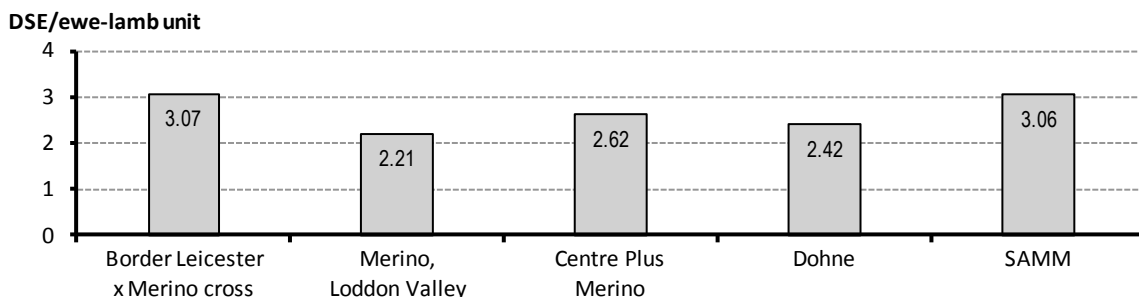


DSE estimate

Sheep feed needs are converted to Dry Sheep Equivalent (DSE) to account for the weight of the ewe and lambing percentage. Larger sheep with higher lambing percentages have higher feed needs.

One DSE is the amount of feed energy needed to maintain a 50 kg dry sheep for one year. It roughly equates to about 350 to 500 kg of pasture eaten by a sheep. The kilogram of feed needed varies with pasture quality. One DSE of high quality pasture, with green for 8 months and dry residues for 4 months may equate to about 380 kg eaten while low quality dry pasture for most of the year may equate to about 500 kg. The DSE per ewe and lamb unit is calculated for each breed considering the average ewe weight, lambing percentage and the lamb growth rate with the help of the CSIRO GrazFeed program. One DSE (1.00 DSE) is assumed to be a 50 kg dry sheep maintaining weight. If a dry sheep weighs 70 kg its DSE rating is 1.28 DSE. If a 50 kg ewe raises a single lamb to 3 months in a normal year its DSE rating is 1.68. A 50 kg dry ewe will have a DSE rating of 1.00 and a ewe rearing twins will have a higher DSE rating. The DSE rating of a lamb from weaning at 3 months to sale is also added. For example if a lamb grows from 33 kg at 3 months to 54 kg at 5.5 months it is growing at 280 grams a day; its DSE rating is 2.15 on a daily basis but on a year average basis it is 0.54 DSE. The DSE for each breed ewe-lamb combination, assuming all lambs are sold at 5.5 months, is shown below.

DSE per ewe-lamb unit, average 5 adult lambings



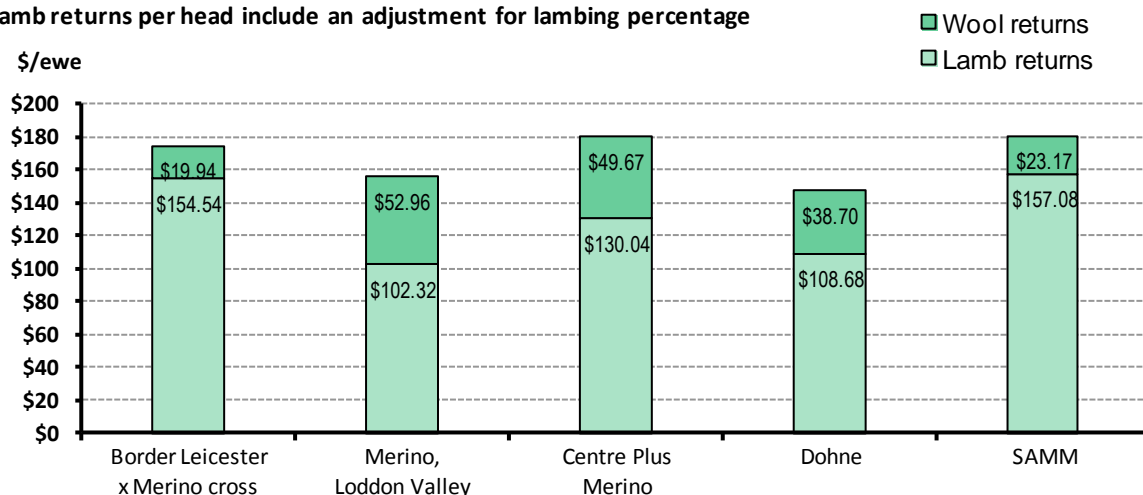
Lamb, wool & skin returns

Wool returns were calculated each year using average wool prices for each diameter and type over the previous 12 months.

Lamb returns are calculated each year from the live weight, dressing percentage and skin value. Skins were priced using average values from the MLA Weekly Price Report. No discount has been applied to the possibly slightly more wrinkled skins from the terminal sire x merino type lambs. Discounts for more wrinkled merino cross skins could be in the region from nil to \$2 per skin. The 5 year average is shown in the graph below

Lamb and wool returns, average 5 years as adults

Lamb returns per head include an adjustment for lambing percentage



Profitability of breed alternatives

Profitability comparisons of terminal sires joined to alternative ewe breeds are complex.

It is invalid to estimate the relative profitability of breed groups by dividing the total returns per ewe by the DSE rating as it does not take into account the monthly pasture growth, feed available on a monthly basis, stocking rate, the feed needs of the sheep and the ability of alternative systems to manage droughts and unpredictable prices. Gross margins analyses of these systems will be done using the CSIRO GrassGro computer program – a program that can better estimate the profitability of these dynamic systems over a range of years of variable rainfall, prices, stocking rates and management systems. For example at lower stocking rates there may be little feed stress penalty from large framed ewes with high lambing percentages; while at higher stocking rates lamb growth may be penalised. The higher wool returns from merinos will also be important when drought affected young lambs are sold at low weights and drought prices.

In this Elmore trial all sheep enterprises have the same structure;- purchased ewes joined to terminal sires. But not all sheep farms buy in replacement ewes. Farms with self replacing flocks often have three alternative meat and wool combinations of income. These are:

- (i) Ewes joined to terminal sires
- (ii) Replacement ewes rearing wether lambs
- (iii) Replacement ewes rearing replacement ewe lambs

These three sub-enterprises will have different contributions to the profitability of the whole flock. This trial only compares the first enterprise, ewes joined to terminal sires. Flock structure is affected by lambing percentage. The higher the lambing percentage the higher the proportion joined to terminal sires. Farms with average lambing percentages can only join up to 25% of their ewes to terminals, while farms with high lambing percentages can join over 50% to terminals.

The next question is; what is the profitability of a ewe rearing a wether lamb? In a merino flock this will depend on (i) the wether lambs ability to grow quickly, (ii) the wool returns when it is shorn just prior to the lamb sale and (iii) the discount per kilo for merino wether lambs (or pure other breeds) relative to terminal sire prime lambs. Other demonstration-trials, such as the Peter Westblade Memorial Meat Challenge in southern NSW can help show between bloodline differences in wether lamb growth. Farmer observations in North Central Victoria indicate large framed dual purpose Merinos can reach market weights of 54 kg at about 11 months of age on lucerne pasture in normal years, while wool focused Merinos will take 14 to 15 months to reach a similar weight.