

S98/W01



## Producer Research Support

### Prime Lamb Production and Marketing

WA Q Lamb Inc.



### The project

Traditionally treated as a bi-product of the Merino wool industry, the Western Australian prime lamb industry has experienced poor conception and lamb survival rates and a spate of imbalanced slaughter.

The majority of prime lambs slaughtered in WA are first cross lambs from Merino ewes. The recent introduction of the new meat, milk and dual-purpose sheep breeds has provided producers with the option to produce prime lambs from first cross ewes. Proponents of the new ewe breeds claim the growth and carcass characteristics of the second cross progeny are superior to the first cross lambs from Merino ewes. It is important to understand the quality and quantity of wool produced by first cross ewes as the value of the wool clip from prime lamb dams can contribute significantly to the income of a prime lamb enterprise.

To open new world lamb markets, WA requires consistent availability of more large lean prime lambs (including suckers). This requires ewes with good mothering ability, high milk yields and persistent lactation. It is intended that this project will provide producers with an objective demonstration of the value of new and current maternal genetics to produce the large lean sucker lambs now demanded.

The maternal breeds evaluated are the Merino (M) and the first cross progeny from mating of Merino ewes with Border Leicester (BL), Poll Dorset (PD), South African Meat Merino (SAMM) and East Friesian (EF) sires. The PD breed is the most common terminal sire used in the WA industry and therefore large numbers of M x PD ewes could be available as prime lamb dams. The M x PD ewe also has the ability to mate in spring and pure PD ewes are known to be quite fecund and to produce large amounts of milk.

For these reasons the M x PD ewe offers considerable potential for the production of large lean sucker lambs. The SAMMs have only recently been introduced to WA. In South Africa they have mainly been selected for meat, wool and reproduction traits and apart from an apparent better carcass conformation, the ewes are considered to be better mothers than the Australian Merino ewe. The East Friesian is a highly fecund dairy breed with a large lean frame suitable for producing the large and lean carcasses demanded by American markets.

WA Q Lamb Inc. investigated the hypothesis that the production of prime lambs is more profitable using first cross dams over Merino dams.

The project demonstrated that SAMM first crosses generally performed better - with lower micron wool, lower faecal egg count, and slightly higher feed conversion than the other breeds studied.

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## Key points

- The micron of the SAMM first cross ewe was consistently finer than the micron of the BL, EF and PD first cross ewes.
- It seems that it isn't milk yield or milk composition alone but also genetics that influence the growth rate of the progeny.
- Although ewe genotypes were of similar live weight there were differences in their potential to mate at 12 months old.
- SAMMs were found to be the most profitable genotype on both \$/ewe or \$/ewe equal stocking rate basis.

## Objectives

1. provide WA Q Lamb Inc. members with an objective demonstration of the value of new and current maternal genetics, among maternal breeds, to produce quality heavy weight sucker lambs;
2. evaluate ewe breeds as mothers of sucker lambs in Western Australia;
3. conduct an independent evaluation of two new sheep breeds in WA – the EF and SAMM; and
4. demonstrate the financial benefits of using first cross rams over Merino ewes to produce second cross sucker lambs.

## What was done?

All fieldwork was conducted at Maplestead in the Pingelly Shire in Western Australia.

Six hundred and sixty-five Merino ewes were synchronised on December 19 and 22 in 1997 with Chronogest 30 sponges. The sponges were pulled from January 1 to 5 in 1998 to spread the work load on the rams for the paddock mating and ensure that lambing would occur over 10 days to cover for any inclement weather that could cause stock losses.

One hundred and twenty-six Merino ewes were paddock mated to five rams each of BL, Merino, PD and SAMM genotypes with a further 161 Merino ewes laparoscopically inseminated with frozen semen from four EF sires. The ewes were artificially inseminated with semen from the EF sires, as there were no mature EF rams available in WA to conduct a paddock mating. Where possible the rams used were sourced from some of Western Australia's leading LAMBPLAN tested studs.

The ewes were pregnancy scanned and all dry ewes removed from the flock. One week before lambing commenced the pregnant ewes were separated into different paddocks according to the genotype of the sire to which they were mated. Up to day eight of the 12-day lambing period, 313 lambing details (birth date, type, weight and sex) were recorded. Due to the high incidence of multiple births and the high mortality rate of tagged and untagged lambs it was decided not to conduct lambing records during the last four days.

At weaning, the number of pure Merino and M x SAMM ewe weaners was below the desired minimum of 50 per genotype. It was discovered later that the low conception rate of the Merino ewes mated to the Merino and SAMM rams was due to all of the rams loaned to the project working on other properties prior to the mating at Maplestead. To ensure the required number of ewes were available to the project an additional 20 Merino ewe weaners were purchased from the same closed bloodline of the same age and similar live weight to those bred in the project. The additional 20 M x SAMM ewe weaners obtained were the same age and of similar live weight to those bred in the project. Their SAMM sires were from the same gene pool as the sires used in the trial but unfortunately the Merino dams of the ewe weaners were not of the existing bloodline, although they were of a similar large conformation type with similar quality wool.



## Producer Research Support

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- More Beef from Pastures demonstration trials
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The project examined the productivity of each genotype over three seasons. Ewe fleece quality, quantity and value, and reproductive performance were monitored annually. Growth rates, carcass attributes and value of the progeny were also monitored.

Secondary studies included measuring ewe temperament at lambing, ewe lactation and milk quality, feed efficiency and meat eating quality of the progeny, the ability of the ewe weaner to receive a mate, faecal egg count monitoring, and cost benefit analyses of producing prime lambs from Merino or first cross ewes.

Merinos have a reputation for producing high quality wool, but producing a relatively low number of lambs weaned per breeding season. To test this concept, Merino and first cross ewes were mated to the same White Suffolk sires over three seasons 1999/2000, 2000/2001 and 2001/2002. The White Suffolk rams were from a LAMBPLAN tested stud and were born as two sets of twins with common grand sires. These closely related rams were used so that any differences in the performance of the progeny could be attributed to the differences in their mothers.

A high burden of intestinal worms limits a ewe's ability to produce wool and milk. The Western Australian Department of Agriculture believe that 300 – 500 eggs/g damage intestinal villi and reduce the ewe's ability to absorb nutrients, thereby reducing its productivity. Some South African literature indicates that SAMM can withstand intestinal worm challenges. SAMM first cross ewes were run together with Merino and first cross BL, EF and PD ewes, and faecal egg counts measured.

Researchers have shown that progeny of ewes with a high maternal behaviour score (MBS) located the udder in less time after birth, thereby increasing the immunoglobulin concentration in lamb plasma 24 hours after birth and enhancing its chances of survival. A high MBS is also positively correlated with faster lamb growth rates to weaning. As part of the lamb identification and birth weighing process in 2002, all ewes were tested for MBS. The MBS used was based on a six-point scale measuring the flight response of the ewe to the handling and tagging of its progeny by an observer.

## What happened?

### Wool

The Merino ewe averaged the heaviest greasy fleece over the four annual shearings (4.14kg), while the PD first cross ewes averaged the lightest greasy fleece at only 2.99kg. In all except their first shearing as hoggets, the Merino ewes grew at least a 0.7kg heavier greasy fleece than the next heaviest producing genotype. Over the four shearings the Merino ewes also cut 340gm of belly wool, more than the other first cross ewes – and 120gm more than the lightest SAMM first cross ewes cutting 220gm.

As hoggets the Merino ewes produced finer wool than SAMM first cross ewes. At each subsequent shearing the SAMM first cross ewes produced wool of similar micron to the Merino ewes. Both genotypes grew finer micron wool than the BL, EF and PD first cross ewes.



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The SAMM first cross ewes had the lowest CV of micron in each of the four shearings indicating less variation in the fibre diameter of the SAMM first cross wool. The BL, EF and PD first cross ewes consistently yielded higher than both the Merino and SAMM first cross wools. The strength of the fleeces varied each year due to harsh seasons. Only in 2000 did all five genotypes produce sound wool. The BL and EF first cross ewes consistently produced the longest staple length wool, while the SAMM first cross ewes produced the shortest. The Merino and SAMM first cross ewes produced wool of equal comfort factor, significantly more comfortable than the wool produced by the BL, EF and PD first cross ewes.

On average wool from the Merino ewes averaged \$0.28 more per kilogram and \$5.02 more per head than the next best, the SAMM first cross ewe. The small difference in price per kilogram is due to the difference in micron between the two genotypes. The difference in value per head was a result of the Merino ewes cutting heavier fleeces.

### Reproduction and carcass quality

Ewe conception rates were similar in all genotypes over the three seasons and only as hoggets did the PD and SAMM first cross ewes have more potential lambs per ewe joined than the Merino hoggets. Although the 2000/2001 season was one of the harshest on record, the fecundity and the conception rate of each genotype improved as the ewes matured.

Only in the 2002 lambing season were there any differences in lamb birth weights, with the progeny of the BL and SAMM first cross ewes being heavier than those from the Merino and PD first cross ewes.

Lamb growth was closely monitored each year and by marking, the first cross ewe progeny were heavier than the Merino progeny. In general, progeny of the BL, EF and PD ewes remained heavier than the Merino progeny through to slaughter.

The average slaughter age of the 2001 born progeny was similar for all genotypes although the final live weight and carcass weight of the first cross ewe progeny were significantly heavier at slaughter than the Merino progeny. The progeny of EF first cross ewes grew faster than Merino progeny. The dressing percentage of the BL, EF and PD first cross ewe progeny was higher than the dressing percentage of the Merino progeny. The progeny of the SAMM and EF first cross ewes were significantly leaner at the GR site than the PD first cross and Merino progeny. The meat "L" colour (relative lightness) for all progeny was above the industry standard of 34, however the SAMM first cross progeny was significantly lighter than the progeny of the BL and EF first cross and Merino ewes. All first cross ewe progeny returned higher meat values per head when marketed as suckers than the Merino progeny. The PD first cross genotype recorded the highest percentage of lambs turned off as suckers (88 percent), whereas the BL first cross ewes turned off 72 percent, EF first cross ewes 70 percent, SAMM first cross ewes 63 percent and Merinos 50 percent.

S98/W01



In 2002, three drafts of trial lambs were consigned to slaughter. The average age of the first line was 105 days, the second 115 days and the third 137 days. Carcasses in the first two consignments were measured for hot carcass weight (HCW), GR tissue depth, C site fat depth, eye muscle area and meat colour. Due to a shortage of quality lambs when the third line was slaughtered, only HCW and GR tissue depth measurements could be obtained.

The 2002 born progeny of the BL first cross ewes were significantly younger at slaughter than the Merino progeny. The final live weight of the slaughtered lambs of all genotypes was similar due to Q Lamb, with premium weights and grades. The HCWs of progeny from first cross ewes were significantly heavier and the dressing percentages significantly higher than the Merino progeny. Like in 2001, the progeny of SAMM and EF first cross ewes were leaner at the GR site than the progeny of BL and PD first cross and Merino ewes. The progeny from PD first cross ewes were significantly fatter at the C site than progeny from EF and SAMM first cross and Merino ewes. The eye muscle area of the BL first cross progeny was significantly smaller than the eye muscle area of progeny of the PD and EF first cross and Merino ewes. The meat colour of the progeny from the PD first cross ewes was significantly lighter than meat from the EF first cross and Merino progeny. The financial returns for meat value were similar for all genotypes. The percentage of lambs turned off as suckers was similar among the genotypes with the PD first cross ewes at 79 percent, BL first cross ewes 73 percent, EF first cross ewes 73 percent, SAMM first cross ewes 73 percent and Merino 70 percent.

The average slaughter age of all genotypes in 2001 was similar, however in 2002 only the BL progeny reached slaughter weight and fat requirements faster than the Merino ewe progeny. In both seasons, the carcass weight of Merino progeny was lighter than that of the first cross ewe progeny. The carcass fatness of the SAMM and EF progeny were leaner than the Merino progeny in each season.

In 2002 the financial returns from second cross progeny was higher in 2001, but in 2002 all genotypes was similar.

### **Lactation duration and milk quality**

Ninety ewes scanned bearing single lambs were offered the same level of nutrition (white clover / grass annual pasture plus supplementary grain) and were all on their third lactation to minimise any external factors influencing milk production.

Lamb birth dates, weights and sex were recorded against each ewe. The ewes were split into two milking mobs depending on the birth date of their lambs.

The daily milk yield for all genotypes increased until a mean maximum of 1900 – 2200 ml/day was attained between weeks one and five post partum. It then declined at an average of 18 ml/day across all genotypes until week 12.



For all genotypes, more than half the total milk yield was produced by the end of the fifth week of lactation. The percentage of milk fat fluctuated depending on genotype but the concentration increased towards the end of lactation. The percentage of milk protein declined to their lowest levels at week three and then increased to their highest levels at the end of lactation. The percentage of milk lactose increased slightly up to week five before declining at the end of the lactation.

The PD first cross ewes (1.92l/ewe/day) produced similar milk levels to the EF first cross ewes (1.84 l/ewe/d). The EF first cross ewes only produced more milk than the SAMM first cross and Merino ewes. The EF breed has been traditionally farmed in the cooler climatic regions of the world (areas of high rainfall and an abundance of feed) and it is possible that it was not able to express its full milking potential due to the tight feed season. The breed is naturally lean but at the end of the lactation study the EF first cross ewes were in poorer body condition than all other genotypes. Because they are a specialist dairy breed, it may indicate that the EF first cross ewes were mobilising more of their body reserves to produce the milk due to the limited paddock feed available.

The percentage of milk fat of the EF first cross ewes was significantly lower than all genotypes examined. There was no difference in the percentage of milk protein and milk lactose between genotypes. The total milk solids of the EF first cross ewe was significantly lower than the other genotypes tested. The mean daily fat yield of the EF first cross ewes was significantly lower than the PD and BL first cross ewes. The higher milk yield made up for the lower percentage of milk fat to produce similar milk fat yields as the SAMM first cross and Merino ewes. The EF first cross ewes also produced significantly higher milk protein and milk lactose yields than the SAMM first cross and Merino ewes.

### **Feed efficiency and meat eating quality**

Lot feeding is often used by WA farmers to finish weaned prime lambs. Feed efficiency must be optimised to ensure this is a profitable exercise. Live weight gain must be realised, as a carcass that meets market specifications, for lot feeding to be profitable. This study used the wether progeny from the initial mating of Merino ewes with BL, EF, M, PD and SAMM sires.

The differences in feed efficiency for the five genotypes were not significant. The SAMM cross lambs were most efficient converting feed to live weight and required 690g fewer pellets for each kilogram of live weight gain than the next closest breed. SAMM cross lambs required 1.06kg fewer pellets per kilogram of live weight gain than the EF cross lambs.

The sensory panel did not detect any differences between the genotypes for the juiciness of the meat, although numerically the EF lambs had the driest meat (0 = dry, 10 = juicy) and the PD lambs the juiciest. All genotypes exceeded the desired flavour intensity value (>5, where 0 = bland, 10 = intense) with meat samples from the Merino and SAMMs having a significantly more intense flavour than meat from the BL and EF ewes.



### Oestrus behaviour of ewe weaners

Puberty in ewes is described as the first oestrus when mating is possible and generally occurs between 6-18 months. Age, live weight, breed and nutrition influence the timing of puberty in the ewe. The weight of the ewe at first oestrus is generally between 30-50kg (50-70 percent of the ewe's mature body weight). Ewes that attain puberty and conceive at an early age should produce more lambs in their lifetime and therefore be more profitable as prime lamb mothers.

First cross ewes will generally display their first oestrus before purebred ewes due to their hybrid vigour promoting faster growth.

This study compared the number of maiden first cross ewes against the number of Merino ewes that displayed their first oestrus around 12 months old and 40kg live weight.

There was no difference in the initial and final live weight of the genotypes. Eighty four percent of the EF cross ewes were marked over two consecutive cycles while only 5 percent of Merino ewes were marked. Although the PD ewes were numerically heavier than the EF ewes, at the end of the study only 26 percent of the PD ewes displayed oestrus. Forty one percent of the BL ewes and only 10 percent of the SAMM ewes were marked over two consecutive cycles despite both breeds of ewes being a similar live weight during the study.

### Faecal egg counts

Although the results possibly indicate that the SAMM first cross ewes had lower faecal egg counts, these results were inconclusive because all the ewes were run together. SAMMs may have ingested larvae dropped by the other genotypes, which impacted their own count negatively. In a future study, all genotypes would be run separately. The larval differentiation of gastrointestinal parasites (based on a percentage) conducted in 2000/2001 indicated similar proportions of *Ostertagia*, *Trichostrongylus* and *Chabertia* intestinal worms were found in the Merino and first cross ewes.

### Ewe Maternal Behaviour Score

The MBS of the BL and PD first cross ewes was higher than the MBS of SAMM first cross and Merino ewes. This indicates that the BL and PD first cross ewes remained closer to their progeny when approached and handled by an observer. The growth rates of the lambs to 12 weeks supports the theory that ewes that remain closer to their progeny in the initial hours after birth enhance the progeny's chances of survival and increase the lamb's productivity up to weaning. The live weight of the BL and PD first cross ewe progeny was heavier than the Merino progeny at 12 weeks. The progeny of the SAMM first cross ewes were also similar in live weight to the BL and PD first cross progeny and heavier than the Merino progeny.

### Financial analysis of prime lamb production using Merino or first cross dams

Financial analysis was conducted utilising real trial data and prices. The following assumptions have been included in the model:

1. The model is based on a mob of 1000 breeding ewes.
2. The lambing percentages are the pregnancy scanning figures that have been averaged over the three years.
3. The meat return is based on the average price received for sucker lambs from two slaughters in 2001 and three slaughters in 2002. This value is multiplied by the average percentage of each genotype sold as suckers determined from the 2000/2001 and 2001/2002 seasons plus the percentage sold as carryover lambs (\$5/hd). The net return (after shearing and feeding costs) of carryover lambs is \$5/head less than the average price received as suckers. Formula used (% sold as suckers x sucker \$) + % not sold as suckers (sucker \$ - \$5).
4. Wool quantity, quality and returns based over four years.

The results are shown in *Table 1*.

**Table 1. Economics of producing prime lambs from Merino and first cross ewes**

	BL	EF	Merino	PD	SAMM
Lambing %	105.7	103.3	93	111.7	109.3
Meat \$	60.22	59.8	56.89	61.58	61.55
Meat \$ / 1000 ewes	63,653	61,773	52,908	68,785	67,274
Greasy fleece	3.47	3.21	4.14	2.99	3.22
Clean fleece	2.55	2.29	2.79	2.13	2.18
Clean price (c)	470	492	731	416	706
Wool \$	11.98	11.26	20.40	9.61	15.39
Wool \$ / 1000 ewes	11,985	1,1267	20,395	9,606	15,391
Total \$ / 1000 ewes	75,638	73,040	73,303	78,391	82,665
\$ / ewe	75.64	73.04	73.30	78.39	82.66

If the Merino ewe was to match the economical performance of the SAMM first cross ewe and we opt to keep the lambing percentage unchanged then:

- the value of the Merino fleece must increase by 336c/kg clean;
- the Merino ewe must cut an additional 1.93kg greasy wool (6.07kg greasy); and
- the Merino ewe must cut an additional 1.28kg clean wool ((4.07kg clean).



S98/W01



There are Merino bloodlines capable of producing at least 6kg of greasy wool however there is some doubt if price premiums would be large enough to make up the shortfall (\$/ewe) between the Merino and SAMM first cross ewe. If wool was left unchanged and only lambing percentage was altered, then the Merino ewes would have to produce 110 percent lambs to be more profitable than SAMM first cross ewes. The high lambing percentage required is due to the lower meat price per head (ie. lower carcass weights) returned by Merinos.

### Discussion

Of the genotypes new to WA, the fleece produced by the SAMM first cross ewes was similar to the Merino fleece in terms of micron, yield, strength, length and comfort factor, but produced less greasy wool and had a significantly lower CV of fibre diameter. The micron of the SAMM first cross ewe was consistently finer than the micron of the BL, EF and PD first cross ewes. The EF first cross ewe performed similarly to the BL first cross ewe for most attributes measured and overall the fleece produced by the EF first cross ewe was inferior to the Merino fleece.

The growth rate of the BL first cross progeny was significantly faster than the EF first cross progeny. The higher yield of total milk solids of the EF first cross ewes compared to the Merino ewes may provide an explanation for the faster growth rate of the EF first cross progeny compared to the progeny of the Merino ewe. It therefore seems that it isn't milk yield or milk composition alone but also the genetics tested that influence the growth rate of the progeny.

From the project results it appears that meat from the SAMM and the Merino lambs may be superior for tenderness. In terms of the other meat eating quality attributes measured, the Merino-cross lambs from the two recently imported breeds are not markedly dissimilar to those of the more established breeds.

The results highlight that although the ewe genotypes were of similar live weight there were differences in their potential to mate at 12 months of age. Given the genetics donated and used in the study, the local environment and farm management practices used at Maplestead, SAMMs were found to be the most profitable genotype on both \$/ewe or \$/ewe equal stocking rate basis. This partially supports the hypothesis that the production of prime lambs is more profitable using first cross dams over Merino dams.

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### Prime Lamb Production and Marketing

November 2005 / PIRD OUTCOMES