finalreport

IMPROVING PRODUCTIVITY

Project code: **SHGEN.032/ B.SGN.032**

Prepared by: **Euan Roberts. David B. Croft**

Fowlers Gap Research Station
University of New South Wales

Date published: **October 2006**

ISBN: **9781741911039**

PUBLISHED BY
Meat & Livestock Australia
Locked Bag 991
NORTH SYDNEY NSW 2059

Evaluation of alternative ram types for lamb breeder: finisher systems in the low rainfall zone

Abstract

Pastoralists of the West Darling region of NSW are predominantly Merino breeders producing 23-24µ wool and surplus store wether lambs. This study compared the production from 3 Merino strains in order to maximise breeder returns following a finishing 'lot feeding' programme. Rams were sourced from CentrePlus and Leahcim studs which MLA rates highly on the dual purpose 8% MP index. Production from these stud rams was compared to locally bred rams which had dual purpose traits of large body frame and high fecundity. The study was conducted at the University of NSW field station at Fowlers Gap in far north-western NSW. The trial sheep foraged on saltbush pastures with mixed winter herbs and summer grasses associated with the terminal reaches of Fowlers Creek. Wether lambs were finished at Pollville in the sheep-wheat belt in the mid-north of South Australia. There were few differences in production but Leachim-sired lambs had superior carcass traits. Estimates of significant differences in genetic response to such a programme must be tempered by the possible heterosis (hybrid vigour) in the two MLA selected 'dual purpose' merino strains used and mated to Fowlers Gap ewes, compared with the Fowlers Gap rams mated to their own strain of ewes.

Executive Summary

There is significant interest in the low rainfall pastoral zone in the production of both meat and fibre from 'dual-purpose' sheep breeds. However, although the low rainfall pastoral zone may allow the breeding of significant numbers of lambs, the unpredictable rainfall will frequently result in seasons where there is insufficient fodder to turn-off marketable prime lambs. Thus producers in the pastoral zone may best operate as breeders and form partnerships with producers in the higher rainfall wheat-sheep zone to act as finishers of their lambs. However, such a system needs evaluation through an appropriately constructed trial. Therefore, this project has compared sire types and examined a breeder and finisher system for producers in the low rainfall zone.

Pastoralists of the West Darling region of NSW are predominantly Merino breeders producing 23-24μ wool and surplus store wether lambs Thus traditional Merino types were compared for breeding of lambs from Merino ewes on the University of NSW arid zone field station at Fowlers Gap 110 km north of Broken Hill, and the lambs were weaned and then grown out on a property with suitable pasture in the wheat-sheep belt of South Australia.

The three objectives were:

1. To generate lambs by three sources from Merino ewes bred and run under normal pastoral zone management. The sires were rams from two studs, CentrePlus and Leahcim, ranked highly in the production of Merinos with dual-purpose traits, and a 'control' group of locally bred Collinsville-type rams of large body frame. The sires were mated to locally produced ewes of large frame and high fecundity.
2. To wean the lambs at an appropriate age and transfer to a finishing property, Pollville, at Mt Bryant in South Australia.
3. To obtain grow-out data on the lambs, allowing evaluation of the alternative sire types.

Productivity of the wether lambs produced by the three sire types was evaluated from a comparison of (1) growth rates in grams per day to a profitable killable weight and (2) carcass attributes of the lambs by the Falkirk System. The local Fowlers Gap rams were the most productive sires in terms of lambs marked but weaning rates were similar amongst the sire types. The body weights of wether lambs at weaning were also similar: CentrePlus mean weight = 37.0 kg (range 23.6-48.2, n = 42), Leahcim mean weight = 37.6 kg (range 27.8-28.5, n= 56), Fowlers Gap mean weight = 36.0 kg (range 25.7-47.4, n = 85)

Growth in body weight expressed as grams per day was similar for wether lambs from the three sire groups at the finisher, Pollville and from weaning at Fowlers Gap to slaughter. The growth rate is higher for Pollville because the wether lambs lost between 2 and 5% of body weight in transport.

Growth rate (grams per day) of wether lambs from three sire groups.

Period	CentrePlus	Leahcim	Fowlers Gap
At Pollville (178 d)	102	106	99
Wean-slaughter (181 d)	97	94	91

There were no significant differences between eye muscle scores for wether lambs at slaughter for the three sire types. However, slaughter weights were significantly different with a trend for the stud rams, CentrePlus and Leahcim, to produce heavier progeny. Likewise fat scores were significantly

different with CentrePlus sired wethers scoring significantly higher than Leahcim and Fowlers Gap sired wethers falling intermediate between these extremes.

Mean (± SEM) slaughter weights and fat and eye muscle scores for wether lambs grown out at Pollville from three sire types. Results of statistical comparison by one-way anova are shown.

	CentrePlus	**Leahcim**	**Fowlers Gap**	**$F_{2,208}$**	***P***
No.slaughtered	52	71	88		
Live weight (kg)	55.0±7.2	54.2±5.5	52.3±5.5	3.96	0.02
Fat score	3.8±1.0	3.2±0.9	3.5±0.9	4.99	0.008
Eye Muscle Depth	25.5±2.4	25.0±2.7	24.7±2.4	2.08	0.13
Eye Muscle Width	69.3±5.1	69.9±5.0	68.1±8.5	1.36	0.26

Carcass composition based on the Falkirk Index System ranked Leahcim sired wether lambs highest amongst the three sire types.

Carcass composition analysis based on the Falkirk Index System for wether lambs grown out at Pollville from three sire types.

	Super Elite (%)	Elite (%)	Standard (%)	Sub-standard (%)	Retention (%)	Rank
Leahcim	20	52.3	27.7	0	72.3	1
CentrePlus	13.2	52.8	34.0	0	66.0	2
Fowlers Gap	9.6	50.7	39.7	0	60.3	3

The trial was conducted under relatively poor conditions with many months of serious rainfall deficiencies which must temper the conclusions. Even so these are the conditions frequently experienced in the arid pastoral zone and those where the pastoralist will gain an advantage in collaborating with a finisher with good quality pasture. The locally produced rams fared well in the trial with few large differences in the values of wether lambs produced by the three sire groups. The stud rams acclimatised well to the arid zone and some benefit was shown by infusion of their genetics into a typical Merino ewe flock. Wether lambs were heavier and carcasses of better quality from the stud-ram sired progeny.

The results will benefit producers in the low rainfall pastoral zone in making decisions about investment in dual purpose sheep strains in the context of a Merino flock. Store wether production may be improved by using sires with desirable traits like the CentrePlus and Leahcim rams in this trial. Returns may be better if the lambs are finished with a collaborator in the higher rainfall zone especially during extended dry periods when lambs would otherwise be of poor marketable quality.

Further research is needed to determine if heterosis (hybrid vigour) accounts for most of the qualities leveraged from the stud rams. This would determine the optimal strategy for ram purchases in a dual-purpose operation. Measurement of carcass quality needs to be associated with eating qualities of lot fed lamb in Metropolitan markets from various feeds. Saltbush fed lamb meat has some attraction to the consumer and so eating quality from a finisher needs to be followed to avoid a Metropolitan consumer rejection of grain fed lamb.

Contents

Page

1 Background 6

2 Project Objectives 6

3 Methodology 6

3.1 Selection of ram sources 6
3.2 Delivery, acclimatization and mating of rams 7
3.3 Handling of lambs 7

4 Results and Discussion 8

4.1 Climatic conditions 8
4.2 Lambing 8
4.3 Weaning and body weight characteristics 9
4.4 Growth and carcass production at finisher 10

5 Success in Achieving Objectives 11

6 Impact on Meat and Livestock Industry – now & in five years time 11

7 Conclusions and Recommendations 12

8 Bibliography 13

1 Background

There is significant interest in the low rainfall pastoral zone in the production of both meat and fibre from 'dual-purpose' sheep breeds. Some producers have opted to introduce alternative breeds to the traditional Australian Merino like South African Mutton Merinos (SAMM) or Dohne. Others have introduced sires from Merino studs that may improve the 'dual-purpose' qualities of their Merino flocks through maintenance of a good quality wool, increase in fecundity and production of large-bodied wether lambs. However, although the low rainfall pastoral zone may allow the breeding of significant numbers of lambs, the unpredictable rainfall will frequently result in seasons where there is insufficient fodder to turn-off marketable prime lambs. Thus producers in the pastoral zone may best operate as breeders and form partnerships with producers in the higher rainfall wheat-sheep zone to act as finishers of their lambs. It is therefore timely to evaluate such a system through an appropriately constructed trial.

2 Project Objectives

This project has compared sire types and examined a breeder and finisher system for producers in the low rainfall zone. Traditional Merino types were compared for breeding of lambs from Merino ewes in the pastoral zone of far-western NSW, and the lambs were weaned and then grown out on a property with suitable pasture in the wheat-sheep belt of South Australia. The three objectives were:

4. To generate lambs by three sources from Merino ewes bred and run under normal pastoral zone management at the Fowlers Gap Research Station north of Broken Hill in far-western NSW.
5. To wean the lambs at an appropriate age and transfer to a finishing property, Polville, at Mt Bryant in South Australia.
6. To obtain grow-out data on the lambs, allowing evaluation of the alternative sire types.

3 Methodology

3.1 Selection of ram sources

Rams were sourced from Centre Plus and Leahcim studs. The rationale for the selection of these studs for pastoral lamb production studies is explained by Richard Apps (MLA) as follows:

"Centre Plus have many years' data on a range of traits including body weight, fleece traits, FEC and scrotal circumference, and more recently scan data on carcass traits. By Merino standards they also have a significant volume of full pedigree, hence enabling better handling of maternal traits for dual purpose selection. Most sires used in recent years rate in the top 15 - 20% of our analysis on the dual purpose 8% MP index. Leahcim have a shorter recording history but are also recording a full range of traits, not just wool traits, and recent sire teams have rated well on the 8% MP index."

Rams were identified by tag number (Table 1). Representative photographs of each ram type are shown in Appendix 1.

Table 1. Ram sources and identities

Syndicate	Tag numbers
Fowlers Gap (controls)	01-419, 01-367, 00-200, 99-222
Centre Plus	107445, 107647, 107216, 107366
Leahcim	20663, 20178, 20436, 20790

3.2 Delivery, acclimatization and mating of rams

Rams were collected from Centre Plus on 15 November 2003 and Leahcim on 18 November 2003 in separate journeys to avoid stress. Rams had a period of around one month to acclimate to conditions in far west NSW where temperatures were moderate to high and feed levels were sound.

Estimated breeding values (EBVs) for Centre Plus and Leahcim as a percentage on 8% MP Dual Purpose Index are listed in Table 2. For the Fowlers Gap controls they are presented as Fibre Diameter (FD) and Clean Fleece Weight (CFW) % deviation [they may be converted to EBV's by multiplying by respective heritabilities] (Table 3). Fowlers Gap rams have all been processed by fleece measurement only

Table 2. Estimated Breeding Values for Centre Plus and Leahcim rams.

Source	Tag	Dual purpose 8% MP index (%)
Centre Plus	107445	128
	107647	117
	107216	113
	107366	112
Leahcim	20663	99
	20178	101
	20436	106
	20790	105

Table 3. Estimated breeding values for Fowlers Gap control rams.

Source	Tag	% deviation CFW	% deviation FD
Fowlers Gap	01-419	93	98
	01-367	101	117
	00-200	114	104
	99-222	124	101

All rams were paddock joined in syndicates of 4 rams to 200 Fowlers Gap Merino ewes on 16/12/03. Mating mobs were kept separate for 56 days for joining. The ewes were then ultra-sounded (with assistance from Dr Greg Curran and Trudie Atkinson, NSW DPI) to assess those still not pregnant and late conceptions due to late cycling in a summer joining. This procedure tested the adequacy of 6-week versus 8-week joining in the pastoral zone under typically variable seasons.

3.3 Handling of lambs

Lambing commenced in mid-May in 2004. At lambing, ewes were put back into their joining paddocks for 42 + 17 days. All ewes were boxed after lambing to avoid paddock effects.

Weaning occurred in mid-October 2004 at shearing. The lambs were shorn and held in yards without food for 24 hours prior to weighing. Weights were recorded to the nearest 100 g using a conventional crush mounted on weigh bars. The apparatus was zeroed (tared) prior to entry of each lamb. Ear tags were read visually and tag colour and number, and lamb weights recorded manually. In this manner, the number of lambs per sire group and the weaning weight of all lambs were recorded.

Lambs were then transported to Polville (Mt Bryant) in one major shipment (16/11/04) and one smaller shipment (2/12/04) to pick up stragglers. At Pollville, electronic ID tags were fitted and tags and weights recorded electronically. Lambs were weighed on 19/11/04 and again on 14/12/04 to include stragglers. Subsequent weights were taken on 12/1/05, 25/3/05 and prior to slaughter (16/5/05). At slaughter carcass composition analysis was conducted with the Falkirk Index System.

Statistical analysis was conducted with SPSS for Windows V13.0.

4 Results and Discussion

4.1 Climatic conditions

Conditions at Fowlers Gap were relatively harsh during the course of the trial. At the end of 2003 rainfall was normal and above average (240 mm) at 272 mm for the year. However, by the Bureau of Meteorology's definitions serious rainfall deficiencies occurred in January, March, April, September and December 2004 and drought extended through February, May, June and July. Rainfall for 2004 was below average at 165 mm.

4.2 Lambing

Highest success at lamb marking was achieved with the Fowlers Gap sires, followed by Leahcim and Centre Plus (Table 4). However, the anomalous poor performance of the Leahcim sires was attributed to an infertile or mal-performing ram and is unlikely to be indicative of this sire type.

Table 4. Paddock characteristics and lambing results for three sire types at Fowlers Gap.

	Centre Plus	Leahcim	Fowlers Gap
Paddock area (ha)	1202	1603	2193
Paddock rating (DSE)	200	200	385
Ewes at lamb-marking	182	211	200
Lambs at lamb-marking	103	211	215
Lamb-marking (%)	56.6	88.2	107.5
'Wet' ewes (%)	42.3	72.0	82.0
'Dry' ewes (%)	57.7	28.0	18.0
Lambs expected from scanning	183	299	303
Lambs lost (estimate)	80	113	88
Lambs lost/expected (%)	44.0*	38.0	29.0

*adjusted for deficient ram effect

Fowlers Gap rams were the best performing sire type for lamb production (Fig. 1).

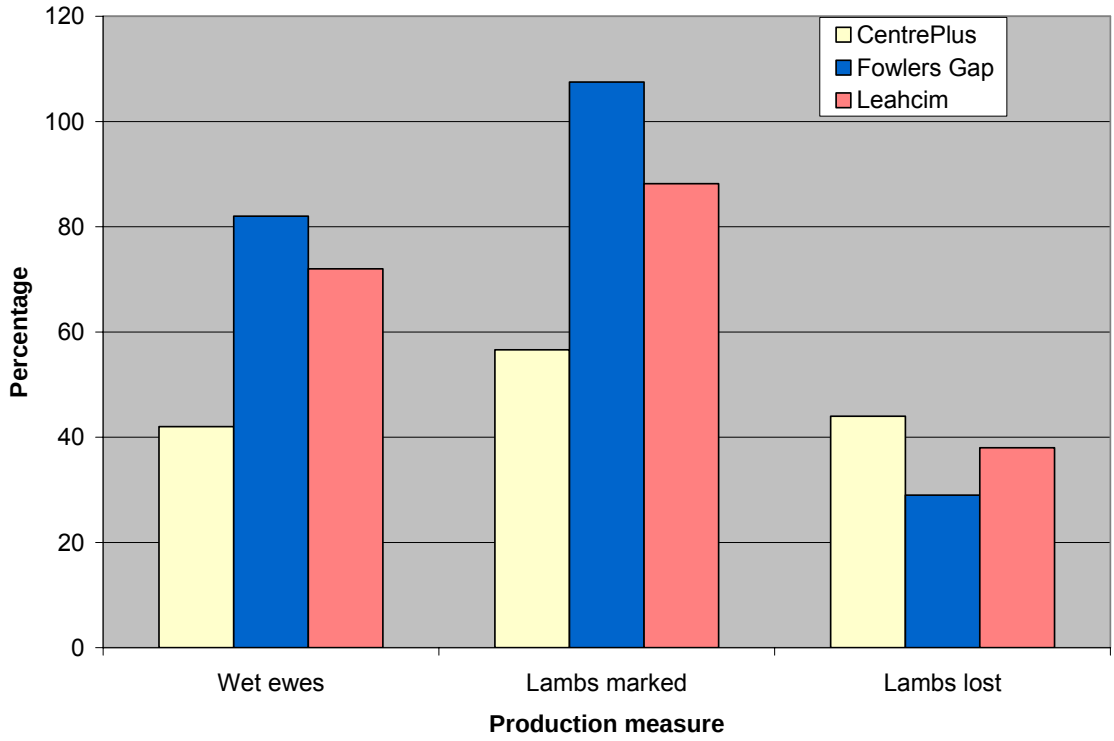

Fig. 1. Comparison of key production indicators across sires.

4.3 Weaning and body weight characteristics

Centre Plus wethers had an 11% loss between marking and weaning and shipment whereas Leahcim had a higher 19% loss and Fowlers Gap had a 20% loss (Table 5). Even so there was no significant difference in weaning success between sire groups (χ^2 = 0.19, df =2, *P* = 0.91).

Table 5. Weaning success of wether portion of lambs from CentrePlus, Leahcim and Fowlers Gap sires.

Sire group	Wethers marked	Wethers weaned and sent to finisher	Wean success (%)
CentrePlus	62	55	89
Leahcim	81	66	81
Fowlers Gap	107	86	80

The mean weight of wether lambs from the three sire groups was very similar (Table 6) and not significantly different ($F_{2,182}$ = 1.95, *P* = 0.15).

Table 6. Mean, standard error of mean and range (minimum, maximum) of weights (kg) of wether lambs from three sire groups weaned at Fowlers Gap.

Sire group	Weight (kg)	Standard error	Min (kg)	Max (kg)	Sample size (n)[1]
CentrePlus	37.0	0.8	23.6	48.2	42
Leahcim	37.6	0.7	27.8	48.5	56
Fowlers Gap	36.0	0.5	25.7	47.4	85

[1]Some stragglers were sent in second shipment to Pollville two weeks later and are not included in this sample to avoid a second source of variation.

The wether lambs were received by the finisher, Pollville at Mt Bryant, with minimal mean weight loss of 1.9% CentrePlus, 4.8% Leahcim and 3.6% Fowlers Gap. The weighing at 14/12/2004 (Table 7) included a second shipment of stragglers and provides the best benchmark for growth through to slaughter as will be reported in the final benchmark (5).

Table 7. Mean weight of wether lambs from three sire groups on receipt of main shipment (19/11/2004) and with inclusion of stragglers (14/12/2004) at Pollville, Mt Bryant.

Sire Group	Date	Weight (kg)	Sample size (n)
CentrePlus	*19/11/2004*	36.3	41
Leahcim		35.8	56
Fowlers Gap		34.7	84
CentrePlus	*14/12/2004*	40.9	55
Leahcim		40.7	66
Fowlers Gap		37.9	85

In summary, there were no significant differences in the weaning success, body weight at weaning and body weight at arrival at finisher between the wether lambs from the three sire types. Centre Plus lambs performed best on two of the three criteria – weaning success and weight retention following transport – and were mid-ranked on weaning weight. Due to the failure of one sire from this type, the size of the lamb cohort was smaller but this smaller flock was not obviously advantaged by a lower stocking density as they were held in the smallest of the three paddocks.

4.4 Growth and carcass production at finisher

Growth in body weight expressed as grams per day was similar for wether lambs from the three sire groups at the finisher, Pollville (Table 8) and from weaning at Fowlers Gap to slaughter. The growth rate is higher for Pollville because the wether lambs lost between 2 and 5% of body weight in transport.

Table 8. Growth rate (grams per day) of wether lambs from three sire groups.

Period	CentrePlus	Leahcim	Fowlers Gap
At Pollville (178 d)	102	106	99
Wean-slaughter (181 d)	97	94	91

There were no significant differences between eye muscle scores for wether lambs at slaughter for the three sire types (Table 9). However, slaughter weights were significantly different but a Ryan-Einot-Gabriel-Welsch post-hoc range test failed to resolve any difference between sires. Likewise fat

scores were significantly different with CentrePlus sired wethers scoring significantly higher than Leahcim and Fowlers Gap sired wethers falling intermediate between these extremes.

Table 9. Mean (± SEM) slaughter weights and fat and eye muscle scores for wether lambs grown out at Pollville from three sire types. Results of statistical comparison by one-way anova are shown.

	CentrePlus	**Leahcim**	**Fowlers Gap**	**$F_{2,208}$**	***P***
No.slaughtered	52	71	88		
Live weight (kg)	55.0±7.2	54.2±5.5	52.3±5.5	3.96	0.02
Fat score	3.8±1.0	3.2±0.9	3.5±0.9	4.99	0.008
Eye Muscle Depth	25.5±2.4	25.0±2.7	24.7±2.4	2.08	0.13
Eye Muscle Width	69.3±5.1	69.9±5.0	68.1±8.5	1.36	0.26

Carcass composition based on the Falkirk Index System ranked Leahcim sired wether lambs highest amongst the three sire types (Table 10).

Table 10. Carcass composition analysis based on the Falkirk Index System for wether lambs grown out at Pollville from three sire types.

	Super Elite (%)	Elite (%)	Standard (%)	Sub-standard (%)	Retention (%)	Rank
Leahcim	20	52.3	27.7	0	72.3	1
CentrePlus	13.2	52.8	34.0	0	66.0	2
Fowlers Gap	9.6	50.7	39.7	0	60.3	3

5 Success in Achieving Objectives

The study was conducted during a period with significant rainfall deficiencies but this is not atypical of the unpredictable climate of the low rainfall pastoral zone. Lambing success was reasonable except for one CentrePlus ram which may not have acclimatised to the arid conditions well and had low fertility. The time at the finisher was extended relative to the original trial design to accommodate relatively dry conditions, the availability of contractors to assess carcasses and the opportunities for slaughter at abattoirs. Even so the objectives of the project were successfully achieved.

6 Impact on Meat and Livestock Industry – now & in five years time

The differences in growth rate and carcass traits from the 2 MLA-Nominated strains do not provide sufficient attraction to pastoral zone merino breeders in competition with new RSA imported breeds such as Dorpers, Dohnes and SAMMs now or in 5 years. The major interest in the low rainfall pastoral zone in terms of store lambs is organic meat production from breeds such as Dorpers (e.g. Jessop 2005). Further research should be directed at the forage requirements and production of breeds like Dorpers and Damaras relative to traditional Merinos and rangeland goats. The environmental impact and grazing pressure of imported breeds and production from rather than control of rangeland goats need to be urgently addressed to ensure sustainability and prevent

rangeland degradation, especially under prolonged drought conditions and the likely effects of climate change.

7 Conclusions and Recommendations

The results of this project will benefit producers in the low rainfall pastoral zone in making decisions about investment in dual purpose sheep strains in the context of a Merino flock. Store wether production may be improved by using sires with desirable traits like the CentrePlus and Leahcim rams in this trial. Returns may be better if the lambs are finished with a collaborator in the higher rainfall zone especially during extended dry periods when lambs would otherwise be of poor marketable quality. However, imported breeds from the Republic of South Africa like Dorpers, Dohnes, SAMMS or Damaras are more attractive to producers, especially those interested in organic sheep-meat production. Producers are also evaluating production of meat from rangeland goats in association with or as an alternative to sheep.

Further research is needed to determine if heterosis (hybrid vigour) accounts for most of the qualities leveraged from the stud rams. This would determine the optimal strategy for ram purchases in a dual-purpose operation. Measurement of carcass quality needs to be associated with eating qualities of lot fed lamb in Metropolitan markets from various feeds. Saltbush fed lamb meat has some attraction to the consumer and so eating quality from a finisher needs to be followed to avoid a Metropolitan consumer rejection of grain fed lamb

We recommend no further action on dual-purpose Merino strains but sustainable meat production from the low rainfall pastoral zone requires an evaluation of the foraging behaviour and grazing pressure of imported sheep breeds with or without rangeland goats.

8 Bibliography

Francis, P. 2006. *Australian Farm Journal* 16(3): 6-20.

Jessop, P. (ed.) 2005. Western Division Newsletter No. 107. July/August 2005. Department of Primary Industry, Orange, NSW.

Woolaston, R. B.1975. *Studies on the production characteristics of several sheep breeds and crosses.* PhD thesis, University of NSW, Sydney. Pp. 258.