Reproductive performance of commercial Merino, Dohne Merino and SA Mutton Merino flocks in the Southern Cape

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Data of 23 189 Merino ewes (8 farms), 7 692 Dohne Merino ewes (3 farms) and 2 399 SA Mutton Merino ewes (1 farm) were recorded for the 1988—1991 lambing seasons. The udders of ewes present at lamb marking were inspected to differentiate between barren (unlambed), lambed and lost (lambed ewes suckling no progeny), and wet (lambed and suckling ≥1 lamb) ewes, using the 'wet and dry' technique. The lambs present at lamb marking were counted, and information regarding number of ewes mated and managerial inputs was recorded. The mean number of lambs marked as a percentage of ewes joined (Lm/Ej) was 87.7% for Merino flocks, ranging between 62.8—103.3%. Figures for Dohne Merino flocks were found to be similar, ranging between 75.6—113.2% Lm/Ej, with a mean of 92.6%, while Lm/Ej was 112.7% in the SA Mutton Merino flock. Between 72.2% (Merino) and 80.4% (SA Mutton Merino) of joined ewes suckled ≥1 lamb at lamb marking. Mean fecundity (estimated number of lambs born as a percentage of ewes lambed) was estimated at 121.6% for Merino ewes, 122.7% for Dohne Merino ewes and 140.2% for SA Mutton Merino ewes. Significant ($P \leq 0.05$) differences in Lm/Ej occurred between Merino and Dohne Merino ewes stocked on different farms. It was attempted to relate these differences to managerial practices (flock size at mating, mating period, percentage of rams, the use of vasectomized rams, the use of ultrasonic scanning, and management at lambing). Increasing flock sizes tended to be associated with a decline in Lm/Ej. Reproductive efficiency within flocks was independent of the other managerial practices. Ewes which failed to suckle ≥1 lamb to lamb marking during 1988—1990 were ear notched (marked). The mean levels of reproductive failure in marked ewes (groups with < 40 marked ewes were excluded) were compared with those of contemporaries without a history of reproductive failure within lambing years and farms. In 15 groups of Merino ewes where this procedure was followed, the number of ewes dry (the total of the unlambed and lambed and lost categories) as a percentage of ewes present at lamb marking (Ed/Epm) was 33.7% compared to 24.2% for the 15 groups of contemporaries of these ewes ($P \leq 0.05$). In four groups of Dohne Merino ewes, Ed/Epm was 32.8% for marked ewes and 21.5% for their contemporaries ($P = 0.06$). It was concluded that there was scope for the improvement of the reproductive efficiency of local woolled sheep flocks. Selection against reproductive failure by using the simple 'wet and dry' technique appears to be a low-input method for the improvement of reproductive performance in commercial sheep flocks, at least in the current flock. Results from the literature suggest that such selection will also benefit future generations.

Data aangaande 23 189 Merino-ooie (8 plase), 7 692 Dohne Merino-ooie (3 plase) en 2 399 SA Vleismerino-ooie (1 plaas) is tydens die 1988—1991 lamseisoene aangeteken. Die uiers van ooie is by merk van lammers ondersoek om tussen onvrugbare (nie gelam), gelam en alle nageslag verloor (wel gelam, maar laat geen lammers suip nie) en produktiewe (gelam en laat suip ≥1 nageslag) ooie te onderskei, deur die eenvoudige 'soog en droog'-tegniek te gebruik. Die aantal lammers beskikbaar by merk is getel, en inligting oor aantal ooie gepaar en bestuursinsette is aangeteken. Die gemiddelde aantal lammers gemerk as 'n persentasie van ooie gepaar (Lm/Ej) was 87.7% vir Merinokuddes, met variasie tussen 62.8% en 103.3%. Ooreenstemmende syfers vir Dohne Merinokuddes het tussen 75.6 en 113.2% Lm/Ej gevarieer, met 'n gemiddelde van 92.6%, terwyl Lm/Ej vir die SA Vleismerinokudde 112.7% was. Tussen 72.2% (Merino) en 80.4% (SA Vleismerino) van gepaarde ooie het by merk ≥1 lam laat suip. Gemiddelde fekunditeit (beraamde aantal lammers gebore as persentasie van ooie gelam) is op 121.6% vir Merino's, 122.7% vir Dohne Merino's en 140.2% vir SA Vleismerino's beraam. Betekenisvolle ($P \leq 0.05$) verskille in Lm/Ej het tussen Merino- en Dohne Merino-ooie op verskillende plase voorgekom. Daar is gepoog om dié verskille met bestuursinsette op verskillende plase (kuddegrootte by paar, lengte van paring, die persentasie ramme, die gebruik van koggelramme, die gebruik van ultraklankskandering en lambestuur) in verband te bring. 'n Toename in kuddegrootte het geneig om tot 'n afname in Lm/Ej te lei. Reproduksiedoeltreffendheid binne kuddes was onafhanklik van die ander bestuursinsette. Ooie wat geen lammers laat suip het gedurende 1988—1990 nie, is met oorknippe gemerk. Die gemiddelde peile van reproduksie-mislukking in gemerkte ooie (groepe met < 40 gemerkte ooie is uitgesluit) is vergelyk met dié van tydgenote sonder 'n geskiedenis van reproduksieverliese binne jare en plase. In 15 groepe van Merino-ooie waar hierdie prosedure gevolg is, was die gemiddelde aantal 'ooie droog as persentasie van ooie teenwoordig by merk' (Ed/Epm) 33.7%, in vergelyking met 24.2% vir 15 groepe tydgenote van dié ooie ($P \leq 0.05$). In vier groepe Dohne Merino-ooie in vergelyking met hul tydgenote was die ooreenstemmende syfers vir Ed/Epm onderskeidelik 32.8% en 21.5% ($P = 0.06$). Dit blyk dus dat daar ruimte vir die verdere verbetering van reproduksie in plaaslike wolskaapkuddes is. Seleksie teen reproduksie-mislukking deur gebruik te maak van die eenvoudige 'soog en droog'-tegniek blyk 'n lae-insetmetode vir die verbetering van reproduksie in kommersiële skaapkuddes te wees. Volgens resultate uit die literatuur sal sodanige seleksie ook toekomstige generasies bevoordeel.

Keywords: Management, repeated failure, reproductive performance, sheep.

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Introduction

More than two decades ago, Hofmeyr & Boyazuglo (1965) reported that the national sheep population weaned 65 lambs per 100 ewes mated. More recently, De Klerk *et al.* (1983) estimated the proportion of lambs born per ewe mated to be 74% for woolled sheep and 71% for Merinos. Preweaning lamb mortalities will reduce these figures even further, suggesting that high levels of reproductive failure occur in local sheep flocks. Since these studies were based on survey information, the precise level of reproductive failure in commercial flocks remains unknown. Programmes aimed at reducing reproductive failure require aetiological information in order to succeed.

The purpose of this study was to acquire objective information on the reproductive efficiency of commercial Merino, Dohne Merino and SA Mutton Merino ewes in the Bredasdorp district. It was also attempted to relate managerial aids employed by Merino farmers to the level of performance in their flocks. Lastly, the contribution of repeated reproductive failure to flock performance was investigated in a sub-sample of Merino and Dohne Merino ewes. The potential use of selection for ewe rearing performance was assessed in this part of the study. Preliminary conclusions for a sub-sample of Merino ewes were previously published (Fourie & Cloete, 1990).

Material and Methods

Location and climate

The investigation was conducted on 12 commercial farms in the Bredasdorp, Klipdale, Protem and Napier districts and the Strandveld area of the Bredasdorp district in the Southern Cape. The area is situated between latitude 20—21° E, and longitude 34—35°S. The climate is temperate with a mean annual precipitation of 390—450 mm. Most of the rain is recorded in winter, with 58—65% of the total rainfall being recorded from April to September. Occasionally, good summer rains also occur. The mean minimum and maximum temperatures vary between 5—8°C and 16—18°C in winter and between 15—18°C and 26—28°C in summer, respectively (Agrometeorology, 1989). The districts are situated in a cropping/pasture region, and sheep are mainly dependent on dryland lucerne pasture and winter cereal crop residues (mainly wheat and barley stubble lands). Dryland medics, clovers and oats are occasionally produced as winter pastures. Frost seldom causes mentionable damage to pastures and crops.

Animals

Of the 12 farms included, 8 were stocked with Merinos, 3 with Dohne Merinos and 1 with SA Mutton Merinos (see Table 1). In total, the study included joining records of 23 189 Merino ewes, 7 692 Dohne Merino ewes and 2 339 SA Mutton Merino ewes over the period 1988—1991.

Data recorded

Each farm was visited at lamb marking, which took place 4—6 weeks after lambing. The udders of all ewes present at lamb marking were visually appraised and manually palpated, using the simple 'wet and dry' technique (Luff, 1980; Haughey, 1991). Ewes were allocated to three groups, namely ewes which had not lambed (barren ewes), ewes which had lambed but lost all the progeny born (lambed and lost ewes), and ewes which had suckled ≥1 lamb to lamb marking (wet ewes). The number of ewes in each category and lambs present at lamb marking were recorded. Details regarding the number of ewes mated, duration of mating, ram percentage, mating regime, the use of vasectomized rams for synchronization (Signoret, 1990), and flock sizes at mating were recorded for each farm. Management system at lambing, the use of ultrasonic scanning (Herbst, 1990) and flock size at lambing were also recorded. Data were available for all farms over the period 1988—1990, but in 1991 data were not recorded for 5 farms (3 stocked with Merinos and 2 with Dohne Merinos, cf. Table 1).

Table 1 Description of data relative to breed, farm, year, lambing season and number of ewes joined

Breed	Farm	District	No. of times recorded	Lambing season and year	Number of ewes joined / season	
					Mean	Range
Merino	1	Bredasdorp	4	March '88, May '89, July '90—'91	972	920—1 006
	2	Bredasdorp	4	March '88—'91	1 453	1 351—1 528
	3	Bredasdorp	3	March '88—'90	1 221	1 119—1 401
	4	Bredasdorp	4	March '88—'91	751	660— 843
	5	Napier	3	March '88—'90	563	519— 638
	6	Protem	3	March '88—'90	390	382— 398
	7	Protem	4	March '88—'91	420	394— 446
	8	Klipdale	7	March, July '88—'91[a]	326	253— 427
Dohne Merino	1	Bredasdorp	4	March '88—'91	487	325— 564
	2	Napier	3	March '88—'90	820	478—1 139
	3	Strandveld	3	March '88—'90	1 095	1 059—1 121
SA Mutton Merino	1	Strandveld	4	March '88—'91	585	368— 755

[a] Excluding the July 1990 lambing season for which no data were available.

Ewe deaths were calculated as the difference between ewes joined and ewes present at lamb marking. An estimate was also made of the number of lambs born, by expressing the number of lambs present at lamb marking as a percentage of the number of wet ewes, to obtain an indication of fecundity. This figure was then applied to all the lambed ewes (lambed and lost ewes as well as wet ewes) to estimate the number of lambs born. Ewe deaths, ewes which lambed, the estimated number of lambs born, wet ewes at lamb marking and lambs present at lamb marking were expressed as percentages of ewes joined on a within-flock basis. The calculated number of lambs born and the lambed and lost ewes were similarly expressed as percentages of ewes lambed. These calculations were used as minimum estimates of fecundity and lamb mortality, respectively (Haughey, 1991).

In most flocks, ewes falling into the barren and lambed and lost categories were differentially ear notched in 1988—1990. In subsequent years, these ewes were used to obtain information on the importance of repeated reproductive failure by a minority of ewes to overall flock performance. Since this study deals with reproductive failure in its totality, ear-notched ewes were designated to two groups only, viz. wet (suckled ≥ 1 lamb) or dry (failed to suckle a lamb). The percentage of ear-notched ewes failing to suckle a lamb in subsequent seasons was then expressed on a 'per ewe present at lamb marking' basis, and compared to the same parameter in contemporaries without a previous record of rearing failure (i.e. not ear notched). These ewes also included maidens without previous lamb rearing experience.

Statistical analyses

Reproduction figures within farms, years, and seasons were used as replications within breeds. Means, standard deviations and ranges in reproductive efficiency were calculated for the respective breeds. Data for the Merino and Dohne Merino breeds were normally distributed, and no transformation was made. Between-group comparisons were analysed by standard one-way analysis of variance procedures (Snedecor & Cochran, 1967), with pair-wise comparisons performed by the protected l.s.d. procedure. It should be stated that management regimes, in general, were confounded with property within breeds, making it difficult to discern between the managerial skill of the farmer and the practices followed on the farm. The results with regard to the influence of a number of management practices (mating regime, the use of vasectomized rams, ultrasonic scanning, lambing management) should be seen against this background. Chi-square procedures (Snedecor & Cochran, 1967) were used to compare the proportions of dry (lambed and lost and barren categories) ewes amongst previously marked ewes within groups with contemporaries without a previous history of reproductive failure. Analysis of variance was used to compare the mean performance of marked ewes with unmarked contemporaries across farms and years and within breeds.

Results and Discussion

Mean levels of performance

Flock size at mating ranged between 253 and 1 528 breeding ewes (Table 2). Mean levels of ewe deaths ranged between 0.53 and 2.8% for the three breeds with the highest level of 5.9% deaths occurring in a Merino flock. Under Australian conditions, mean levels of ewe deaths were reported to be somewhat higher, namely 4.4—5.3% in Western Australian ewe flocks (Knight *et al.*, 1975), 4—5% for autumn and spring lambing ewes in New South Wales (Plant, 1984), and 7.3% for Merino flocks in Queensland (Jordan *et al.*, 1989). In the last study, a mean level of 15.7% was reported for ewe losses in lambing seasons with limited grazing, with a death rate as high as 36% occurring in one flock.

The number of ewes lambed as a percentage of ewes joined (El/Ej) exceeded 80% in all three breeds (Table 2), with the lowest figure (65.1%) being observed in a Merino flock. In the Dohne Merino flocks and the SA Mutton Merino flock under observation, El/Ej exceeded 81% on all occasions. In the study of Knight *et al.* (1975), the failure of mated ewes to lamb was found to be a major source of reproductive wastage, ranging from 20.1—26.4%. A further 2.2—4.4% of available ewes failed to mate, to bring reproductive losses owing to barrenness to *ca.* 25% of ewes mated. Plant (1984) similarly reported a mean percentage of 27% barren ewes in autumn lambing flocks. In other studies, El/Ej tended to be higher, e.g. >90% in the study of Jordan *et al.* (1989), whereas only 4% (ranges 1—14%) of ewes were barren in the study of Kelly (1982) in New Zealand.

The number of ewes which suckled at least one lamb as a percentage of ewes joined (Ew/Ej) ranged between 72 and 80% for the respective breeds (Table 2). In general, roughly three ewes suckled ≥ 1 lamb at lamb marking for every four ewes joined. Plant (1984) correspondingly reported that 53% and 68% of autumn and spring lambing ewes, respectively, eventually reared ≥ 1 lamb. The number of lambs born as a percentage of ewes joined (Lb/Ej) ranged between 99 and 129% for the breeds included in the present study. Fecundity (the number of lambs born as a percentage of ewes lambed; Lb/El) was similarly estimated at 122—140%. Since these results serve merely to establish minimum performance levels in the flocks investigated, it will not be discussed in detail. It should be mentioned that average levels of performance in the study of Knight *et al.* (1975) were somewhat lower than in the present study. Kelly (1982) reported a mean figure of 141.2% for Lb/El in sheep flocks in New Zealand. This figure is somewhat higher than our estimates for Merino and Dohne Merino ewes, but in correspondence with the figure for SA Mutton Merino ewes.

There was remarkable correspondence between the three breeds investigated, regarding the number of ewes which lambed and lost all progeny as a percentage of ewes lambed (El/El) (Table 2). From these results, a minimum level of *ca.* 12—14% could be estimated for lamb mortality in these flocks. Although this estimate accords fairly well with previous reports of Hofmeyr & Boyazuglo (1965) and Haughey (1989), it does not make provision for the differential mortality figures for multiple lambs when compared to singles (Hight & Jury, 1970; Dalton *et al.*, 1980). It is also reasonable to assume that at least some of the ewe deaths that occurred between joining and lamb marking were associated with lamb deaths owing to dystocia, mastitis, pregnancy toxaemia, or other causes. Results published by Plant (1984) and Jordan *et al.* (1989), nonetheless suggest higher mean percentages of lambed and lost ewes in their investigations. In the study of

Table 2 Means, standard deviations and ranges in reproductive efficiency of commercial Merino, Dohne Merino and SA Mutton Merino ewe flocks in the Bredasdorp and Napier districts

Parameter	Breed		
	Merino	Dohne Merino	SA Mutton Merino
Number of replicates (farms)	32(8)	10(3)	4(1)
Flock size (n)			
Mean	724	792	585
Range	253 — 1528	325 — 1121	368 — 755
Traits expressed per ewe joined (%)			
Ewe deaths (Ed/Ej)			
Mean ± SD	2.8 ± 1.7	2.0 ± 1.9	0.53 ± 0.51
Range	0 — 5.9	0.5 — 7.1	0 — 1.2
Ewes lambed (El/Ej)			
Mean ± SD	81.4 ± 6.8	86.2 ± 3.3	92.0 ± 2.1
Range	65.1 — 94.2	81.6 — 91.7	88.9 — 93.4
Ewes wet (Ew/Ej)			
Mean ± SD	72.2 ± 7.7	75.3 ± 5.2	80.4 ± 1.3
Range	52.3 — 87.8	69.5 — 85.2	79.1 — 82.0
Lambs born (Lb/Ej)			
Mean ± SD	98.9 ± 10.0	105.9 ± 10.5	128.9 ± 7.8
Range	78.1 — 109.6	89.8 — 121.7	121.9 — 139.7
Lambs present at lamb marking (Lm/Ej)			
Mean ± SD	87.7 ± 10.2	92.6 ± 11.9	112.7 ± 8.2
Range	62.8 — 103.3	75.6 — 113.2	104.7 — 124.2
Traits expressed per ewe lambed (%)			
Lambs born (Lb/El)			
Mean ± SD	121.6 ± 7.7	122.7 ± 10.7	140.2 ± 11.5
Range	100.3 — 133.8	108.4 — 136.3	131.2 — 157.0
Ewes lambed and lost (El/El)			
Mean ± SD	11.3 ± 4.0	13.7 ± 3.7	12.5 ± 1.5
Range	20.3 — 4.1	21.6 — 5.6	14.0 — 11.0

Jordan *et al.* (1989), it was reported that up to a mean of 58.9% of lambed ewes lost all progeny born up to lamb marking in lambing seasons with limited grazing. Fiss *et al.* (1991) similarly concluded that preweaning death loss is the most important factor affecting productivity in Canadian sheep flocks.

The number of lambs marked as a percentage of ewes joined (Lm/Ej) in the highest producing Merino flock was 64% higher when expressed relative to the lowest producing Merino flock (Table 2). In the Dohne Merino breed, the corresponding value was found to be 50%. This variation is, however, small compared to the four- to fivefold variation in Lm/Ej reported by Plant (1984). In the study of Jordan *et al.* (1989), Lm/Ej similarly ranged between 10 and 115% and mean values for good, average and poor seasons at lambing were 89.2, 71.0 and 52.7%, respectively. The average levels of performance in our study were somewhat better than those reported in Australia (Knight *et al.*, 1975; Plant, 1984; Jordan *et al.*, 1989), but (with the exception of the SA Mutton Merino flock) lower than the mean level of 120.4% for Lm/Ej reported in New Zealand (Kelly, 1982). The difference between Australian and New Zealand results could be related to differences in breed structure and breeding objectives between the two countries. Australian studies mainly involved Merino sheep, kept predominantly for wool production, whereas dual-purpose and crossbred ewes were used in the New Zealand study.

Influence of farm on reproduction

Since all farms were represented during 1988—1990, data for these years were used to investigate the influence of farm on reproduction. Lower ($P \leq 0.05$) means for Lm/Ej in Merinos were observed on farms 2 and 6 compared to the other six farms (Table 3). The poorer performances on these farms could be attributed to lower values for El/Em. Ewes kept on farm 6 also had a lower ($P \leq 0.05$) Ew/Ej than the other flocks. Ewes kept on farm 2 similarly had a lower ($P \leq 0.05$) Ew/Ej than ewes on the highest producing farms. Although the mean fecundity figures on the respective farms did not differ significantly ($P > 0.25$), the lowest absolute mean value was observed on farm 2. In Dohne Merino ewes, Lm/Ej was lower ($P \leq 0.01$) on farm 3 compared to the other farms

Table 3 Influence of farm on the mean (± SEd) reproductive performance of Merino and Dohne Merino ewes in 1988—1990

Breed and farm	No. of observations	Parameter[1] (%)					
		Ed/Ej	El/Ej	Ew/Ej	Lb/El	El/El	Lm/Ej
Merino							
1	3	3.6	86.5^{c}	74.4^{c,d}	124.6	14.0	92.8^{b}
2	3	3.9	77.5^{a,b}	67.1^{b}	114.2	13.4	75.9^{a}
3	3	4.9	82.9^{b,c}	71.6^{b,c}	124.1	13.6	88.9^{b}
4	3	3.3	87.5^{c}	81.3^{e}	119.4	7.0	97.1^{b}
5	3	1.3	83.5^{b,c}	75.4^{c,d,e}	119.2	9.6	89.9^{b}
6	3	3.3	71.8^{a}	60.9^{a}	120.8	15.3	73.6^{a}
7	3	2.9	86.3^{c}	77.3^{d,e}	123.5	10.3	95.5^{b}
8	5	1.7	82.4^{b,c}	73.3^{c,d}	128.1	11.0	93.9^{b}
SEd		1.2	2.9	3.3	5.7	2.9	5.1
Dohne Merino							
1	3	1.8	87.9	77.8	129.7^{b}	11.7	100.8^{b}
2	3	1.6	86.2	75.4	130.0^{b}	12.5	98.0^{b}
3	3	0.9	85.0	71.2	109.2^{a}	16.2	77.7^{a}
SEd		0.5	3.1	4.1	4.5	3.1	5.7

[1] Ed/Ej = Ewe deaths/Ewe joined; El/Ej = Ewes lambed/Ewe joined; Ew/Ej = Ewes wet/Ewe joined; Lb/El = Lambs born/Ewe lambed (calculated); El/El = Ewes lambed and lost/Ewe lambed; Lm/Ej = Lambs marked/Ewe joined.

$^{a-c}$ Denote significance in columns within breeds ($P \leq 0.05$).

(Table 3). This difference was largely associated with a lower ($P \leq 0.05$) fecundity on farm 3.

It was attempted to relate the mean reproductive performance of groups of Merino ewes to the managerial regime under which they reproduced. The mean performance of 20 groups of ewes where vasectomized rams were introduced *ca.* 14 days prior to mating, was similar to results obtained for 12 groups of ewes mated without the use of vasectomized rams. Since most groups were joined in a period of low sexual activity for South African Merino sheep (Boshoff *et al.*, 1975), it was reasoned that, apart from the synchronization of oestrus, the presence of vasectomized rams could stimulate ewes in anoestrus to resume normal oestrous cycles, thus beneficially influencing conception rate. It is impossible to speculate with regard to the level of synchronization achieved in the flocks where vasectomized rams were used (Signoret, 1990), but it clearly did not contribute to a higher biological efficiency. The reproductive performance of 19 groups of ewes subjected to real-time ultrasonic scanning did not differ significantly from that of 13 groups in which no scanning took place. Bowman *et al.* (1989) and Herbst (1990) stressed the importance of ultrasonic scanning as a tool to select for multiple birth rate in sheep. The effect of this indirect advantage of scanning could not be assessed in the present investigation, but it did not contribute markedly to the variation observed between farms.

The length of the mating period (28—60 days), percentage of rams (2—4%) and flock size at mating (60—320 ewes) were unrelated to El/Ej in 25 groups of Merino ewes and 10 groups of Dohne Merino ewes subjected to flock mating. Mating performance in sheep depends on many factors like ram age (Croker & Lindsay, 1972), paddock size (Allison & Davis, 1976a), ewe age and live mass (Allison & Davis, 1976b) and ram serving capacity (Kilgour, 1980). The percentage of rams used in the present study was well above the minimum of *ca.* 1%, generally considered as sufficient for flock mating (Allison & Davis, 1976a; Fowler, 1982).

Correlations of number of ewes mated with Lm/Ej were –0.33 ($P \approx 0.05$) in 32 groups of Merino ewes and –0.65 ($P \leq 0.05$) in 10 groups of Dohne Merino ewes. Rohloff *et al.* (1982) correspondingly found that flock size decreased with an increase in lamb drop in high performance New Zealand flocks. The relationship between flock size and Lm/Ej was evidently not sufficiently strong to predict flock performance accurately. In Merino ewes, Lm/Ej was also correlated with flock size at lambing ($r = -0.55$; $P \leq 0.05$). This correlation was associated with corresponding relations of flock size at lambing with El/Ej, Lb/El and El/El.

Repeated reproductive failure of marked ewes

Fifteen groups of Merino ewes and four groups of Dohne Merino ewes, containing ≥40 ewes marked because of prior reproductive failure (6.7—29.5% of the total number of ewes present at lamb marking), were compared on the basis of the number of ewes dry as a percentage of ewes present at lamb marking (Ed/Epm) with contemporaries with no history of reproductive failure. Using chi-square procedures within farms and years, it was evident that Ed/Epm values in marked ewes were higher ($P \leq 0.10$) than in their unmarked contemporaries in 10 groups (67%) of Merino ewes and two groups of Dohne Merino ewes (Table 4). When groups of marked Merino ewes were compared with groups of unmarked contemporaries across farms and years by analysis of variance, the mean (± *SE*) Ed/Epm in the former groups (33.7 ± 4.1%) was higher ($P \leq 0.05$) than in the latter groups (24.2 ± 4.1%). A

Table 4 Performance (ewes dry/ewes present at lamb marking) of ewes marked because of previous reproductive failure in relation to their contemporaries

			Marked ewes (M)		Contemporaries (C)		Difference	
Breed	Farm	Year	No.	Ed/Ep[a] (%)	No.	Ed/Ep (%)	(M – C)	Significance[b]
Merino	1	1989	113	33.6	816	22.7	10.9	*
		1990	75	30.7	835	21.9	9.1	0.10
	2	1989	196	38.3	1 169	35.6	2.7	NS
		1990	261	31.8	1 045	23.0	8.8	**
		1991	327	50.5	1143	39.4	11.1	**
	3	1989	111	37.8	1 211	23.0	14.8	**
		1990	243	26.3	826	20.6	5.7	0.10
	4	1989	65	33.8	661	13.5	20.3	**
		1990	49	26.5	677	13.9	13.5	*
		1991	89	20.2	717	18.7	1.5	NS
	5	1990	77	26.0	553	24.1	1.9	NS
	6	1989	85	57.6	307	44.0	13.6	*
		1990	108	29.6	258	31.0	–1.4	NS
	7	1991	40	52.5	358	22.1	30.4	**
	8	Jul 1991	41	9.8	382	11.5	–1.7	NS
Dohne Merino	1	1989	96	42.7	411	25.5	17.2	**
		1990	40	25.0	488	11.9	13.1	*
	2	1989	122	31.1	703	24.0	7.1	NS
		1990	74	32.4	1 055	24.6	7.8	NS

[a] Ewes dry/Ewes present at lamb marking.

[b] NS – Not significant ($P > 0.10$); 0.10 – significant ($P \leq 0.10$); * – significant ($P \leq 0.05$); ** – significant ($P \leq 0.01$).

similar tendency ($P = 0.06$) was obtained in Dohne Merino ewes (32.8 ± 4.9 vs. 21.5 ± 4.0). From these results it appears that overall flock reproduction would benefit from the culling of ewes which fail to rear ≥1 lamb to lamb marking.

Following the reasoning of Lush (1956) as outlined by Turner & Young (1969), the difference in performance between the marked ewes and their unmarked contemporaries should give an indication of the repeatability of reproductive failure in the groups of ewes concerned. The repeatability of reproductive failure was thus estimated at 0.095 for Merino ewes and 0.113 for Dohne Merino ewes. As the reproductive failure in maiden ewes entering the breeding flocks were not previously determined, these figures cannot be regarded as 'true' repeatability estimates. These figures can nonetheless be related to the difference of *ca.* 0.14 lambs weaned/ewe joined found between Merino ewes rearing no lambs at two years of age and contemporaries rearing one lamb in a subsequent study by Cloete & Heydenrych (1987). Piper *et al.* (1982) and Haughey *et al.* (1985) reported that the repeatability of ewe rearing ability (which is part of Ed/Epm) was in the order of 0.10. These results support the contention that repeated reproductive failure in a comparatively small number of ewes add to unsatisfactory performance in the flock as a whole. In studies on rearing failure it was found that a minority of ewes (*ca.* 27%) was involved in roughly 60% of all cases of rearing failure in Australian and South African sheep flocks (Haughey *et al.*, 1985; Cloete & Haughey, 1988).

Conclusions

The mean levels of reproductive performance in the commercial flocks recorded were satisfactory, particularly in relation to Australian results. Mean figures of 72.2 to 80.4% for mated ewes rearing ≥1 lamb to lamb marking do, however, suggest ample scope for further improvement. Despite significant differences in reproductive efficiency found between farms within the Merino and Dohne Merino breeds, it was impossible to relate these differences conclusively to specific managerial practices. The managerial skills of the shepherds employed on the respective farms could not be ascertained in this study, but it appears to be of paramount importance. Ewes which were marked because of previous reproductive failure, generally performed poorer than contemporaries without a history of reproductive failure. The culling of such ewes would enhance reproduction in the current flock. Selection for twinning and against reproductive failure in Australia resulted in a marked improvement in overall reproductive efficiency (Atkins, 1980). It is reasonable to assume that the combination of selection for twinning (using ultrasonic scanning) and against reproductive failure (using the 'wet and dry' technique) would lead to similar benefits in South Africa. These methods can be implemented in large commercial flocks with the keeping of minimal records.

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