AGE AT FIRST MATING ON LIFETIME PRODUCTIVITY OF CORRIEDALE EWES IN SOUTHERN BRAZIL[1]

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ABSTRACT – A total of five different Corriedale flocks (respectively initiated in years 1976-1980), totalling 2561 breeding ewes, were first mated at 19-20 or 30-31 months of age. Lifetime production data on: a) fleece weight and its components (as measured by greasy fleece weight, washing yield, clean fleece weight, fibre diameter and staple length), b) reproductive performance (as evaluated by the number of lambs weaned/ewe joined and lamb weaning weight/ewe joined) and c) ewe liveweight, were investigated within each flock up to 1982. Considering the environment provided in the study, the results indicated that earlier mating in these Corriedale ewes depressed their subsequent wool quantity, yet there was no appreciable effect upon wool quality components and reproductive performance. It has been concluded that when the early joining management is to be adopted, it is worthwhile considering the relative economic importance of the production components examined. These would indicate whether or not the income derived from the extra lambs produced at the early joining would compensate the losses in wool weight.

Index terms: sheep, mating age, wool, lambs.

DESEMPENHO PRODUTIVO DE OVELHAS CORRIEDALE NO SUL DO BRASIL EM FUNÇÃO DA IDADE AO PRIMEIRO ACASALAMENTO

RESUMO – Um total de cinco diferentes rebanhos Corriedale (iniciados nos anos de 1976 a 1980), totalizando 2561 ovelhas, foram encarneirados pela primeira vez aos 19-20 ou 30-31 meses de idade. Em cada rebanho foi investigada a produção subseqüente em termos de: a) peso de velo e seus componentes (medidos por peso de velo sujo e limpo, rendimento, diâmetro de fibra e comprimento de mecha); b) desempenho reprodutivo (avaliado pelo número de cordeiro desmamado/ovelha acasalada e peso de cordeiro/ovelha acasalada); c) peso corporal das ovelhas. Considerando o ambiente proporcionado aos animais neste estudo, os resultados indicaram que o acasalamento mais cedo diminuiu a subseqüente quantidade de lã, porém não afetou os componentes de qualidade dos velos e a performance reprodutiva. Foi concluído que, se o acasalamento aos 19-20 meses for adotado, é interessante considerar a importância econômica relativa dos componentes de produção envolvidos. Estes indicariam se o retorno derivado dos cordeiros extras, produzidos no acasalamento mais cedo, compensaria as perdas em peso de lã.

Termos para indexação: ovinos, idade acasalamento, lã, cordeiros.

INTRODUCTION

The effect of age at which ewes are joined for the first time upon their subsequent productivity has been investigated either as short-term observation or as lifetime production. Although there have been many studies, information on Corriedale ewe production is limited.

Age at first joining influences ewe performance and consequently flock productivity. However, there is no general agreement regarding the higher overall productivity when flocks include ewes being joined at early ages. While some studies on other breeds and environments reported reduced hogget and mature production (Ponzoni et al., 1979; Moore et al., 1983), others concluded

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that production of bred ewe lambs is usually lower although the difference rarely persists in later years (Timariu et al., 1963; Kennedy & Kennedy, 1968; Cannon & Bath, 1969; Suiter & Croker, 1970; Tyrell et al., 1974; Tyrell, 1976; Eurich, 1977; Baker et al., 1978; Levine et al., 1978; Baker et al., 1981). The distinct environmental condition provided to young females in the previous studies may well be the main reason for the contrasting results found, as it has been considered closely related to future performance (Southam et al., 1971; Dyrmundsson, 1973; Tyrell et al., 1974).

The results obtained in this work derived from breeding flocks run strictly on native pasture, and therefore have importance for a relatively large number of sheep growers in southern Brazil, where the extensive exploitation system is predominant. Lifetime wool production and reproductive performance of Corriedale ewes initially joined at 19-20 or 31-32 months old were evaluated.

MATERIALS AND METHODS

Experimental flocks and management

Observations were carried out at EMBRAPA – Brazilian Agriculture Research Corporation – in Bagé, state of Rio Grande do Sul, Brazil. The field station is located 31°25' South and 54°07' West, with a mean annual rainfall of 1308.7 ±344.1 mm regularly distributed throughout the year, and mean temperatures of 24.0°C in summer and 13.3°C in winter. Over five years (1976-1980), flocks of Corriedale ewes were randomly allocated into two groups and assigned to be joined for the first time at ages of 19-20 months (Flock A - experimental) or 31-32 months (Flock B - control). Allocation of the ewes and their numbers within groups in each year are given in Table 1. In all years, the shearing of the first fleece occurred at an age of approximately 16 months and in both A and B groups ewes remained together until the breeding season (April-May), when group A was joined with 3% of rams. In the following joining (second for group A and first for B) and subsequent joinings, ewes ran as one flock on native pasture (*Paspalum notatum flügge* and *Axonopus affinis chase*) at a stocking rate of 6 ewes/ha.

TABLE 1. Experimental groups and numbers of ewes measured at EMBRAPA, Bagé, RS, Brazil.

Sampling	Age at shearing						
year	2¼	3¼	4¼	5¼	6¼	7¼	8¼
1976	A1 B1 170						
1977	A2 B2 119	A1 B1 162					
1978	A3 B3 123	A2 B2 102	A1 B1 159				
1979	A4 B4 92	A3 B3 118	A2 B2 91	A1 B1 146			
1980	A5 B5 85	A4 B4 92	A3 B3 101	A2 B2 90	A1 B1 130		
1981		A5 B5 74	A4 B4 72	A3 B3 90	A2 B2 65	A1 B1 108	
1982			A5 B5 67	A4 B4 65	A3 B3 86	A2 B2 60	A1 B1 94

Diagonals in the table (reading downwards) represent a drop, as follows:
groups A1 B1 = born 1974
A2 B2 = born 1975
A3 B3 = born 1976
A4 B4 = born 1977
A5 B5 = born 1978

Traits studied

Data on wool production and liveweight (LWS) were obtained from the annual shearing in years 1977-1982. The wool traits reported were greasy fleece weight (GFW), clean fleece weight (CFW), washing yield (WY) fibre diameter (FD) and staple length (SL). Sampling method and trait measurements followed the procedure described in Oliveira (1986). Ewe reproductive performance was evaluated by lambs weaned/ewe joined (LW/EJ) and liveweight of lambs weaned/ewe joined (TWW/EJ). Lamb weaning weights adjusted to a common 90-day weaning age (Levine et al., 1978). There was no sex adjustment. TWW/EJ for ewes which weaned twins was the sum of both lamb adjusted weights.

Statistical analysis

Estimates were obtained by the least square method (Steel & Torrie, 1981), using Harvey's program (Harvey, 1979). The model fitted to evaluate the effects upon wool traits, liveweight and reproduction data is represented by the equation below. All effects were treated as fixed.

$$Y_{ijk} = u + C_i + A_j + (CA)_{ij} + E_{ijk}$$

where:

Y_{ijk} = an observation on the k^{th} trait at the j^{th} age of the i^{th} class

and:

u = overall mean for that character;

C_i = effect of the i^{th} class of ewe ($i = 1,...,4$ classes; $\Sigma C_i = 0$);

A_j = effect of the j^{th} age of ewe at shearing ($j = 3,...,8$ years old; $\Sigma A_j = 0$);

$(CA)_{ij}$ = interaction between class and age;

E_{ijk} = random error of observation, assumed to be normally distributed with mean zero and variance (σ^2).

To attain the aims proposed, the analyses were applied only to the 30-31 month old ewes onwards. Class effects refer to grouping of ewes according to their own reproductive performance at the previous age (19-20 months). Thus, four classes were evaluated, viz.

1. Weaned a lamb	(ewes from group A)
2. Lambed but did not wean	(ewes from group A)
3. Exposed to rams but failed to lamb	(ewes from group A)
4. Not exposed to rams	(ewes from group B)

According to Tyrell et al. (1974) "the production response from young ewes joined in different years can be different from year to year". Due to empty subclasses in the class x age x year matrix, this important interaction could not be fitted and therefore the model was used to examine the main effects and their interaction for "drop" group separately (1974-1978; as shown in Table 1). This analysis procedure will be referred to as "within-drop" analysis.

Considering, therefore, the feature of this analysis, the effect of age in the model has little value due to the confounding with both the effects of year of birth and year of measurement. The model was reduced to main effects as the $(CA)_{ij}$ interaction was not significant for any trait studied.

Comparisons between treatment means were made by the Duncan's Multiple Range Test, after selecting the linear function in Harvey's program.

RESULTS AND DISCUSSION

As the effect of age at first joining (ewe class) has been examined in a within-drop based analysis, there are five flocks (representing each drop year), which were experimentally initiated in five different years. This study was mainly concerned with the inspection of productivity from ewes belonging to classes 1 and 4, which respectively characterize ewes that weaned lambs when joined at 19-20 months old and those where the joining was postponed until 30-31 months old. Other classes (2 and 3) are the remaining ewes from group A.

The results presented in Tables 2 and 3 reveal an inconsistent effect of class on wool production and liveweight and no significant effect ($P>0.05$) on the components of reproductive performance.

Regarding wool production, there was a significant effect of class in four experimental flocks (drops 1974, 1975, 1977 and 1978), from which GFW varied significantly between classes, only in drops 1975 ($P<0.01$), 1977 and 1978 ($P<0.05$), and SL varied in drops 1974 ($P<0.01$) and 1978 ($P<0.05$). The least squares means for classes within-drop, shown in Table 4, indicate lower GFW, CFW and SL in ewes from the class 1. Although GFW was significantly different between classes only in drops 1975, 1976 and

TABLE 2. Within-drop least squares analysis of variance for wool traits.

Drop year	Source	DF	Mean squares GFW	CFW	WY	FD	SL
1974	Class	3	0.60	0.42	60.14	16.19	11.39**
	Age	5	15.38**	4.67**	238.70**	107.77**	62.76**
	Resid. Var.		0.25	0.18	35.41	9.43	1.86
	Resid. D.F.		775	659	659	618	772
1975	Class	3	0.90**	0.40	71.84	11.90	1.54
	Age	4	10.57**	4.67**	24.86	33.16*	39.38**
	Resid. Var.		0.22	0.18	37.53	9.55	1.69
	Resid. D.F.		391	327	327	273	350
1976	Class	3	0.20	0.14	77.38	0.44	3.01
	Age	3	6.54**	4.26**	100.50*	27.42**	36.03**
	Resid. Var.		0.24	0.19	31.30	4.95	2.08
	Resid. D.F.		378	365	365	282	378
1977	Class	3	0.64*	0.11	30.45	4.73	1.81
	Age	2	0.11	0.12	82.90	30.88**	3.51
	Resid. Var.		0.21	0.15	33.23	7.61	1.48
	Resid. D.F.		184	180	180	155	184
1978	Class	3	0.37*	0.20	1.33	1.28	4.00*
	Age	1	0.77	0.64*	10.92	23.73*	22.44**
	Resid. Var.		0.13	0.12	22.22	4.45	1.45
	Resid. D.F.		132	132	132	80	132

* (P < 0.05

** (P < 0.01)

1978, it was always lower in class 1. For example, when y compared with class 4 ewes, there were overall decreases in greasy wool weight/ewe by 0.12 kg, 0.17 kg, 0.06 kg, 0.18 kg and 0.21 kg from drops 1974 to 1978. Although not significant (P>0.05), CFW followed a similar pattern, showing mean reductions of 0.12 kg, 0.11 kg, 0.01 kg, 0.11 kg and 0.16 kg per head. SL was significantly shorter by 0.4 cm in drops 1974 and 1978.

Where age at joining significantly affected LWS, there was no constant pattern of variation among different ewe classes (Table 5). LWS in class 1 ranked differently in drops 1974 and 1975, where it assumed values even greater than those of other classes.

In the literature concerning the effect of age at first joining on Corriedale productivity (Ponzoni et al., 1979), not all wool characters studied here were examined, thus it does not allow comparisons of tendencies observed on some traits.

Considering, in the first place, the greasy wool production, it appears that the trends obtained in this study and those reported by Ponzoni et al. (1979) are not totally comparable since the authors worked with younger ewes and, in addition, a different nutritional management (improved and native pastures) was provided during their trial. The overall pattern observed was similar, indicating that early joining in Corriedales reduced mature greasy wool production. On the other hand, some studies on other breeds reported early joining causing significant reductions in wool production only at both the first and second shearings, whereas in

TABLE 3. Within-drop least squares analysis of variance for liveweight and reproductive performance.

Drop year	Source	DF	Mean squares LWS	Mean squares LW/EJ	DF	Mean squares TWW/EJ
1974	Class	3	144.38**	0.50	3	25.11
	Age	5	687.29**	0.74*	4	157.41**
	Resid. Var.		24.79	0.25		11.32
	Resid. D.F.		744	775		388
1975	Class	3	104.16**	0.14	3	15.41
	Age	4	456.52**	0.22	3	228.78**
	Resid. Var.		24.42	0.24		10.75
	Resid. D.F.		375	391		178
1976	Class	3	39.45	0.03	3	3.22
	Age	3	159.73**	0.35	2	47.15**
	Resid. Var.		20.40	0.21		6.27
	Resid. D.F.		362	377		163
1977	Class	3	22.96	0.32	3	0.88
	Age	2	206.62**	0.36	1	75.25**
	Resid. Var.		17.85	0.22		6.95
	Resid. D.F.		176	183		59
1978	Class	3	13.12	0.02	3	7.82
	Age	1	583.36**	0.18	-	-
	Resid. Var.		11.72	0.18		4.74
	Resid. D.F.		129	132		41

* ($P < 0.05$)
** ($P < 0.01$)

others no appreciable differences were found at the second shearing. These results contrast with those obtained here, since the absence of significant class x age interaction indicated that the ranking between classes at younger age persisted at older ages.

Though the analyses performed have not indicated any significant effect of early joining on clean wool production, it was somewhat lower in class 1 in all drops.

Employing the approach described by Turner (1958), an attempt was made to estimate clean fleece weight (W) differences between classes x within-drop year, which could be accounted for by variation in its components (Table 6). The inspection of this percentage deviation analysis shows the importance of fibre volume, or fibre diameter + staple length (components A+L), as a contributor to the lower CFW found in class. Liveweight (component S) being of secondary importance. However, it is assumed that these differences are not large enough to reduce W, and one considers that such an additional component as fibre number per unit area of skin (component N) may also be responsible. Brown et al. (1966) stated that the total number of fibres (component S+N) is reached at 2½ years of age and that liveweight (S) is the most important contributing factor. In addition, Turner (1958) pointed out that "any early retarding influence on follicle development is permanent". It is believed, therefore, that the lower adult wool production observed in class 1 ewes may also have been derived from a carry over reduction of the total fibre number in their fleeces.

There was no consistent response in terms of lambs weaned and weaning weight per ewe joined earlier. The effect appeared to slightly influence their reproductive efficiency in only two experimental years. Over all drop years (1974-1978) and related to class 4 ewes, the average advantage in LW/EJ was about 3.0% in class 1. This is not in agreement with results reported by Godlee (1968), Kennedy & Kennedy (1968), Dyrmundsson (1973; referring to several studies), Levine et al. (1978), Tyrell (1976), Ponzoni et al. (1979), Baker et al. (1981) and Moore et al. (1983).

An investigation in this study was carried out upon a rather large number of flocks, initiated in different years. Its results denote the actual productivity that can be expected in the environment studied since flocks experienced both excellent and bad years for sheep production. The trends found in this and other studies, highlight the need of knowing the production response in distinct areas since the inherent potential of breeds and/or environment are important factors influencing production response.

Overall, this study indicated that the earlier joining management does not influence the ewe

TABLE 4. Least squares means and standard errors (Se) for wool traits of ewes according to class effects and drop year.

Drop year	Ewe class	GFW(kg) mean	GFW(kg) ±Se	CFW(kg) mean	CFW(kg) ±Se	WY(%) mean	WY(%) ±Se	FD(#) mean	FD(#) ±Se	SL(cm) mean	SL(cm) ±Se
	1	3.04	0.04	2.25	0.04	74.1	0.51	29.5	0.28	10.9[a]	0.10
1974	2	3.09	0.05	2.31	0.05	74.5	0.70	29.0	0.37	11.1[a]	0.15
	3	3.11	0.05	2.33	0.06	76.0	0.79	30.2	0.42	11.6[b]	0.14
	4	3.16	0.03	2.37	0.03	75.0	0.40	29.8	0.22	11.3[b]	0.07
	1	3.07[a]	0.05	2.41	0.05	78.9	0.73	28.8	0.42	11.3	0.15
1975	2	3.13[a]	0.07	2.43	0.07	78.2	1.05	29.6	0.54	11.1	0.21
	3	3.32[b]	0.07	2.64	0.08	77.9	1.21	29.8	0.70	11.6	0.22
	4	3.24[b]	0.03	2.52	0.04	76.8	0.53	29.8	0.30	11.4	0.10
	1	3.14	0.04	2.47	0.03	78.4	0.45	29.3	0.42	11.0	0.28
1976	2	3.21	0.07	2.50	0.06	77.8	0.77	29.5	0.62	11.3	0.28
	3	3.34	0.17	2.71	0.15	81.2	2.00	na		10.5	0.29
	4	3.20	0.04	2.48	0.03	77.0	0.45	na		10.5	0.29
	1	2.75[a]	0.07	2.15	0.06	78.9	0.96	27.6	0.50	11.0	0.20
1977	2	2.85[b]	0.07	2.23	0.06	78.7	0.87	27.9	0.45	11.2	0.18
	3	2.97[b]	1.16	2.30	0.13	77.2	2.00	27.0	0.96	10.8	0.42
	4	2.93[b]	0.05	2.26	0.04	77.4	0.60	28.2	0.36	10.8	0.13
	1	2.77[a]	0.06	2.14	0.06	77.1	0.76	27.2	0.78	10.6[a]	0.19
1978	2	2.82[b]	0.05	2.18	0.05	77.1	0.70	27.8	0.57	10.7[a]	0.18
	3	2.97[b]	0.10	2.28	0.09	76.7	1.26	28.2	1.14	11.6[b]	0.32
	4	2.98[b]	0.06	2.30	0.05	76.7	0.75	27.3	1.48	11.0[b]	0.19

(#) = micrometres
na = Data not available.
For subsequent class groups: means not followed by common superscript are statistically different ($P < 0.05$).

TABLE 5. Least squares means and standard errors (Se) for liveweight and reproductive performance data of ewes according to class effects and drop year.

Drop year	Ewe class	LWS(kg) mean	LWS(kg) ±Se	LW/EJ(n) mean	LW/EJ(n) ±Se	TWW/EJ(kg) mean	TWW/EJ(kg) ±Se
	1	37.0[a]	0.36	0.64	0.04	15.3	0.33
1974	2	38.8[b]	0.50	0.64	0.05	16.5	0.54
	3	36.3[a]	0.55	0.53	0.05	14.7	0.58
	4	38.0[b]	0.27	0.67	0.02	15.8	0.26
	1	40.3[a]	0.53	0.64	0.05	14.7	0.51
1975	2	37.6[b]	0.80	0.74	0.08	14.6	0.62
	3	41.3[a]	0.76	0.68	0.07	16.6	0.84
	4	39.5[a]	0.36	0.63	0.03	15.0	0.35
	1	37.4	0.36	0.72	0.03	14.7	0.33
1976	2	37.6	0.63	0.68	0.06	15.0	0.59
	3	36.6	1.60	0.75	0.16	13.2	1.32
	4	38.6	0.37	0.72	0.04	14.8	0.29
	1	34.5	0.71	0.70	0.08	12.9	0.65
1977	2	34.6	0.64	0.73	0.07	12.9	0.61
	3	35.5	1.52	0.62	0.16	12.9	1.32
	4	35.8	0.44	0.57	0.05	13.3	0.57
	1	33.8	0.56	0.79	0.07	13.6	0.63
1978	2	33.9	0.51	0.80	0.06	14.1	0.56
	3	33.9	0.91	0.78	0.11	15.9	1.09
	4	35.1	0.56	0.74	0.07	15.0	0.58

(#) = micrometres
na = Data not available.
For subsequent class groups: means not followed by common superscript are statistically different ($P < 0.05$).

TABLE 6. Relative contribution of wool components to differences in clean fleece weight among ewe classes within--drop. Deviations are related to the group overall mean.

Source		Components					Total
		W	S	A	L	A+L	
Drop year	Ewe class						
1974	1	-2,8	-0,9	-0,8	-2,9	-3,7	-4,6
	2	-0,2	-2,2	-4,2	-1,1	-5,3	-7,5
	3	+0,6	+2,3	+3,8	+3,3	+7,1	+9,4
	4	+2,4	+0,8	+1,2	+0,7	+1,9	+2,7
1975	1	-3,6	+0,1	-4,8	-0,4	-5,2	-5,1
	2	-2,8	-3,5	+0,8	-2,2	-2,4	-5,9
	3	+5,6	+2,7	+2,0	+2,2	+4,4	+7,1
	4	+0,8	-0,2	+2,0	+0,4	+2,4	+2,2
1976	1	-2,8	-0,1	-0,6	+1,6	+1,0	+0,9
	2	-1,6	+0,1	+0,6	+4,4	+5,0	+5,1
	3	+6,7	-1,7	na	-3,0	na	na
	4	-2,4	+1,7	na	-3,0	na	na
1977	1	-3,8	-1,1	-0,6	+0,5	-0,1	-1,0
	2	-0,2	-0,9	+1,8	+2,3	+4,1	+3,2
	3	+2,9	+0,8	-4,8	-1,4	-6,2	-5,4
	4	+1,1	+1,2	+3,8	-1,4	+2,4	+3,6
1978	1	-3,8	-0,7	-3,0	-3,4	-6,4	-7,2
	2	-2,0	-0,5	+1,2	-2,5	-1,3	-1,8
	3	+2,5	-0,5	+4,2	+5,7	+9,9	+9,4
	4	+3,4	+1,8	-2,4	+0,2	-2,2	-0,4

na = Data not available.

future reproductive performance. Subsequent wool quantity is depressed, yet there is no harmful effect upon those component indicators of wool quality. Considering the environment provided to ewes in this study, it appears that when the early joining management is to be adopted, it is worthwhile considering the relative economic importance of the production components examined. These would indicate whether or not the "bonus" derived from the lambs produced at the early joining, would compensate the losses in wool weight. It has been stated that nutritional mangement should be examined as perhaps the key factor by which subsequent production effects can be alleviated (Tyrell et al., 1974). In addition, Dyrmundsson (1973) concluded that when nutritional requirements provided to early bred ewes are satisfactory, they will overcome the depressing effects of pregnancy and lactation at about 2-3 years of age. However, if higher nutritional levels are to be employed, the relative costs to raise such ewes should be weighed against the economic return that could be expected by using this breeding management (Cannon & Bath, 1969).

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