Performance of Finnsheep in South Africa

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GREEFF, J.C., HOFMEYR, J.H., LOURENS, D.J., WYMA, G.A. & MAIJALA, K. 1992. **Performance of Finnsheep in South Africa.** Agric. Sci. Finl. 1: 195-202. (Irene Anim. Breed., SF-31600 Jokioinen, Finland.)

Reproduction, survival, growth and wool parameters were calculated for an experimental flock of Finnsheep from 1969 until 1986 under semi-intensive conditions. The total number of lambs born were 1774. Litter size, survival rate at birth and from birth to weaning differed significantly ($P<0.01$) between years. Lambing percentages varied between 56.0 and 90.6% while average litter size varied between 1.97 and 3.1 lambs. Survival rate at birth declined as litter size increased, from 92.2% for singletons to 63.5% for quintuplets, while survival rate from birth to weaning also declined from 74.1% for singletons to 57.0% for quintuplets. For singletons, twins, triplets, quadruplets and quintuplets the least squares means of birth mass was 2.5 ± 0.06; 2.2 ± 0.05; 2.0 ± 0.05; 1.8 ± 0.06 and 1.7 ± 0.10, weaning mass was 19.0 ± 0.47; 16.8 ± 0.37; 16.8 ± 0.36; 16.2 ± 0.45 and 16.4 ± 0.94, and 12 months mass 43.9 ± 1.5; 40.1 ± 1.4; 38.5 ± 1.3; 37.0 ± 1.5 and 38.9 ± 4.7 respectively. Average fleece mass were 2.6 and 2.4 kg with an average fibre diameter of 26.0 and 26.7 micron for rams and ewes, respectively.

Key words: Finnsheep, ewe reproduction, lamb survival, lamb growth, wool

Introduction

Attempts to improve economic and biological efficiency in sheep production systems have focussed attention on the vital role of reproduction and consequently on highly fertile sheep breeds of the world. Improvement in the reproduction rate through accelerated lambing and/or higher fecundity of the ewe flock may offer the greatest opportunity for increasing production. The infusion of high fertility genes through crossbreeding has proved to be the most rapid breeding procedure to increase the reproduction rate in sheep flocks and the Finnish Landrace has been used extensively for this purpose (MAIJALA, 1984). However, with the exception of a few publications (eg. GOOT et al., 1979; MAIJALA and ÖSTERBERG 1977; MAIJALA 1984; ABOUL-NAGA 1988; BAKER 1988; BOYLAN et al. 1988; VALLS ORTIZ 1988) there appears to be comparatively little published information on the general performance of Finnsheep. A nucleus of Finnish Landrace sheep (Finnsheep) was

imported into South Africa during 1968 for experimental purposes. The original consignment consisted of 5 rams and 20 ewes. A subsequent importation of semen from four rams was made in 1981. This paper reports on the performance of this nuclues flock of pure bred Finnsheep over a 18 year period in a temperate environment in South Africa.

Material and methods

Experimental animals and general management

The animals were kept at the Animal and Dairy Science Research Institute (ADSRI), latitude 22 55", longitude 28 12", and altitude 1523m above sea level. The climate is representative of the main inland region, with hot summer days and cool nights while the winter days are moderate with cold nights (sub-zero during June-August). The average rainfall is 580 mm per year which occurs mainly in summer (November-March).

After importation the animals were kept under confined veterinary quarantine conditions for three and a half years and standard management practices were followed with one lambing per year. Handmating was practised and mating took place during April and May (Autumn) each year with lambing during September and October (Spring). Three to four days before lambing ewes were penned individually where they lambed under close supervision and where birth details were recorded. Depending on the milk flow of the ewe, lambs were reared by their dams or received additional cow's colostrum for approximately 3 days after birth. Thereafter, depending on litter size and the strength of the lambs, they received additional cow's milk until weaning.

Initially, the animals received a basic diet of milled lucerne hay ad libitum with a daily allowance of about 200 g of a commercially pelleted concentrate. As from 1978 the animals were kept on *Pennisetum clandestinum* pastures and received a complete pelleted diet during late pregnancy and lactation. From three weeks of age the lambs had free access to the complete pelleted diet and received this diet through weaning at about 100 days of age until about six months of age. Ewe lambs mated at seven months of age were kept on this diet until their lambs were weaned.

Statistical methods

Lambing percentage and survival rate were analysed with a Chi-square procedure (STEEL and TORRIE, 1980) while fecundity, growth and wool data were analysed with the least squares means and maximum likelihood computor programme of HARVEY (1977). Year of birth, type of birth (i.e. singles or multiples), age of dam and sex of lamb were included in the model as fixed effects. Contrasts were used to test for significant differences between effects within a major class.

Results

Reproductive performance and survival

Observations on lambing percentage, fecundity and mortality rate for the flock are indicated in Table 1.

Year had a significant effect ($P<0.01$) on lambing percentage, fecundity and survival rate. Compared to the results of MAIJALA and ÖSTERBERG (1977), the lambing percentage was lower because ewe lambs which were mated at 7 months of age were included in the analyses. Ewes that were mated for the first time at about 7 months of age had an average lambing percentage of 56.8%. This low lambing percentage is probably due to a low body mass of less than 27 kg at time of mating. In 1977 ewe lambs were not mated at 7 months of age which accounted for the 100% lambing percentage recorded for the subsequent breeding season. In 1983 all ewes were artificially inseminated with imported frozen Finnsheep semen which accounted for the 23.4% lambing percentage. In 1984, 1985 and 1986 mature ewes were intra-uterally inseminated, after which ewes that did not conceive were mated to Finn rams. An average fecundity of 239.4% was obtained with a range of 197.6% (1978) to 310%

Table 1. Lambing percentage, fecundity and mortality rate of Finnsheep from 1969 until 1986.

Year	Lambing	Fecundity	Number of lambs born	Mortality		
				at birth	from birth to weaning	from weaning to 12 months
	(%)	(%)	(%)	(%)	(%)	(%)
1969	-	221.4	31	10	21	-
1970	-	213.3	32	25	17	-
1971	-	230.8	60	23	37	31
1972	-	220.0	77	25	50	0
1973	87.8	230.0	115	25	41	-
1974	-	227.8	82	-	-	52
1975	-	262.3	202	14	31	91
1976	83.3	227.2	184	20	40	24
1977*	100.0	242.9	119	12	20	74
1978	78.7	197.6	83	14	11	19
1979	84.9	232.3	151	19	24	34
1980	81.2	234.0	124	18	32	22
1981	59.5	240.0	86	27	32	30
1982	90.6	224.1	130	23	39	42
1983**	23.4	219.0	35	26	50	5
1984	75.0	290.0	61	39	55	26
1984	42.8(a)	175.0	21	31	48	30
1985	56.0	267.0	52	47	57	39
1985	39.4(a)	231.0	38	16	64	24
1986	73.1	310.0	59	20	45	34
1986	28.9(a)	246.0	32	40	52	33
Average	77.0(b)	239.4(b)	1774	21	38	36

Lambing percentage = (Number of ewes lambed / ewes mated) x 100
Fecundity = (Number of lambs born / ewes lambed) x 100
* During 1977 only ewes older than 12 months of age were mated,
** During 1983 all mature ewes were inseminated with frozen semen
(a) Lambing from intra-uterine inseminations
(b) Excluding 1977, 1983 and lambing from intra-uterine inseminations
Empty cells: Data not available

(1986) for handmating.

The age of the ewe had a significant effect ($P<0.05$) on fecundity which increased until 6 years of age (Table 2). The average mass of ewes at lambing was about 53 kg. These fecundity rates agree very well with comparable results in the literature (MAIJALA and ÖSTERBERG 1977). About 67% of all lambs were born either as twins or triplets while the rest were singles (11%) quadruplets (18%) or quintuplets (5%) (Table 3). Heavier ewes seem to produce more lambs (Table 3). Most of the lambs born as singles were from ewes lambing at 12 months of age.

In general the survival rate of lambs was very poor. Table 1 indicates an average mortality rate of 21% at birth, 38% from birth to weaning at 100 days and 36% from weaning until 12 months of age. During 1975 95% of all lambs born died before one year of age. It appears that there are two major causes of the high mortality rates among Finnsheep:

1. Environmental stress caused by diurnal fluctuations in temperature results in heavy losses in newborn lambs.

Table 2. Average fecundity of Finnsheep per age group.

Age of the ewe at lambing (years)	n	Average body mass at lambing (kg)	Fecundity (%)
1	81	43	161.7[a]
2	194	50	222.2[b]
3	151	56	232.2[b]
4	123	56	264.9[c]
5	84	56	260.0[c]
6	46	58	296.3[d]
7	27	58	233.9[bc]
8	12	52	255.2[bcd]
9	5	47	261.9[bcd]
x	723	53	243.1

Means with different superscripts differ significantly (P<0.05)

Table 3. Occurrence of multiple births of Finnsheep.

Type of birth	Average body mass at lambing (kg)	% Occurrence
Singletons	51	11.1
Twins	52	33.9
Triplets	54	32.9
Quadruplets	55	17.6
Quintuplets	58	4.5

Table 4. Survival rate at birth.

Type of birth	n	Survival rate at birth	n birth to weaning (%)	Survival rate (%)
Singletons	166	92.2[a]	122	74.1[a]
Twins	496	85.2[b]	343	69.2[ab]
Triplets	497	79.9[c]	319	64.2[bc]
Quadruplets	252	68.4[d]	160	63.7[bc]
Quintuplets	50	63.5[d]	25	57.4[c]

Means in the same column with different superscripts differ significantly (P<0.05).

2. Finnsheep appear to be more susceptible than local breeds to lung diseases such as Pasteurellosis. Regular innoculation against this disease was not effective nor did sheep respond to treatment with antibiotics.

Survival rate is closely related to litter size (Table 4). As litter size increases, the survival rate at birth and from birth to weaning decreases significantly (P<0.05). Furthermore, notwithstanding the fact that lambs were fed additional milk irrespective of the type of birth, lambs born from ewes lambing at one year of age were generally weaker and required additional care.

Gestation length

No significant differences were found in gestation length between ewes with different litter sizes (Table 5), but these values (143 days) are lower than the average gestation length recorded for breeds such as the Merino (150.3 days), Karakul (150.7 days) and Romney Marsh (149.6 days) (Hugo, 1966).

Breeding season

Visscher (1974) reported that Finnsheep appears to have a longer breeding season than European breeds such as the Ile de France. To determine the oestrus pattern and the onset of oestrus of Finnsheep in South Africa, 26 ewe lambs born during October 1980 were teased with vasectomized rams for 12 months, from weaning at 100 days of age (January 1981) until December 1981 the same year. Ewes were teased daily and the number of ewes showing oestrus was recorded. The oestrus pattern of ewe lambs as a percentage of total oestrus response shown, is indicated in Table 6.

The first signs of oestrus occurred during March. In April there was a sharp increase which peaked in June. Thereafter it declined until October after which no signs of oestrus were recorded. Ewe lambs showed the first signs of oestrus at an average body mass of 31.8 ± 3.98 kg and at 242 ± 24.4 days of age, with an oestrus every 16.1 ± 1.03 days on average.

Table 5. Gestation length per type of birth (mean ± standard deviation).

Type of birth	Number births	Gestation length (days) $\bar{x} \pm s\,d$
Singletons	39	143 ± 2.44
Twins	66	142 ± 2.61
Triplets	47	142 ± 2.30
Quadruplets	22	143 ± 2.18
Quintuplets	3	143 ± 3.06
Total/Mean	177	143

Table 6. Seasonal oestrus pattern of Finnsheep ewe lambs (n = 26).

Month	Oestrus as a percentage of total oestrus shown
February	-
March	8.02
April	17.65
May	19.79
June	22.99
July	19.79
August	8.02
September	3.21
October	0.53
November	-

Body mass

Table 7 indicates that as litter size increased, birth mass, weaning mass and 12 months mass decreased. No significant differences were found for weaning mass and 12 months mass between triplets, quintuplets and quadruplets, probably because quadruplets and quintuplets received preferential treatment from birth.

Age of the ewe had a highly significant effect ($P<0.01$) on birth mass and 12 months mass (Table 8) but not on weaning mass with a mean of 16.3 kg, probably because the effect of milk production was eliminated, since weak lambs received additional milk from birth until weaning. As the age of the ewe increased, birth mass increased to an age of 9 years. The twelve month mass of lambs born from ewes lambing at about 1 year of age was significantly ($P<0.01$) lighter than lambs born from mature ewes, in spite of the fact that no significant differences were found for weaning mass.

Sex of the lamb also had a significant effect on birth mass, weaning mass and 12 months mass. In all cases ewe lambs were significantly ($P<0.01$) lighter than ram lambs (Table 9).

Wool traits

Table 10 indicates the wool characteristics of Finnsheep rams and ewes. Very light fleeces of respectively 2.6 and 2.2 kg were recorded for rams and ewes. However, no significant differences were found between rams and ewes for any wool trait. Visually the fleeces differ greatly from Merino type fleeces but with a fibre diameter of 26.0 and 26.7 micron, and with crimps per 25 mm

Table 7. Least square means (± SE) of birth mass, weaning mass and 12 months mass of Finnsheep according to type of birth.

Type of birth	n	Birth mass $\bar{x} \pm SE$ (kg)	Weaning mass $\bar{x} \pm SE$ (kg)	n	12 months mass $\bar{x} \pm SE$ (kg)
Singletons	118	2.8±0.06a	18.8±0.53a	31	43.9±1.56a
Twins	342	2.5±0.06b	16.2±0.42b	69	40.1±1.35b
Triplets	318	2.3±0.05c	15.6±0.40bc	65	38.5±1.31bc
Quadruplets	160	2.1±0.06d	15.2±0.49c	32	37.0±1.48c
Quintuplets	27	1.9±0.12e	15.3±0.97bc	2	38.9±4.70bc
	965			199	

Means in the same column with different superscripts differ significantly ($P<0.01$)

Table 8. Effect of age of the ewe on birth and 12 months mass.

Age of ewe (years)	n	L.S means of birth mass $\bar{x} \pm SE$	n	L.S. means of 12 months mass $\bar{x} \pm SE$
1	70	1.89 ± 0.08^{a}	8	34.7 ± 2.66^{a}
2	237	2.05 ± 0.05^{a}	39	38.8 ± 1.61^{b}
3	232	2.20 ± 0.05^{b}	59	37.9 ± 1.49^{b}
4	181	2.25 ± 0.05^{b}	46	40.2 ± 1.62^{b}
5	115	2.26 ± 0.06^{b}	26	38.3 ± 1.74^{b}
6	67	2.33 ± 0.07^{bd}	12	46.8 ± 2.35^{c}
7	44	2.33 ± 0.09^{bd}	8	39.9 ± 2.45^{b}
8	15	2.63 ± 0.15^{c}	1	41.1 ± 0.00^{b}
9	4	2.77 ± 0.28^{cd}	-	-

Means in the same column with different superscripts differ significantly ($P<0.01$)

Table 9. Least square means (± SE) of birth mass, weaning mass and 12 months mass of ram and ewe lambs of Finnsheep.

	n	Ram lambs $\bar{x} \pm SE$	n	Ewe lambs $\bar{x} \pm SE$
Birth mass (kg	486	2.38 ± 0.05^{a}	479	2.22 ± 0.05^{b}
Weaning mass (kg	486	17.0 ± 0.40^{a}	479	15.5 ± 0.42^{b}
12 Months mass (kg)	92	41.8 ± 1.57^{a}	107	37.6 ± 1.50^{b}

Means in the same row with different superscripts differ significantly ($P<0.01$)

of 5.8 and 5.2 for rams and ewes respectively, Finnsheep wool falls within the acceptable Duerden standards (DUERDEN 1929).

Table 10. Least squares means of wool traits of Finnsheep.

Trait	Rams $\bar{x}$	Ewes $\bar{x}$
Number of animals	364	790
Greasy fleece mass (kg)	2.6	2.2
Fibre diameter (micron)	26.0	26.7
Staple length (mm)	110.2	105.5
Crimps per 25mm	5.8	5.2
Clean yield (%)	63.8	66.8
Fibre deviation from Duerden standard (= 100)	101.0	98.0

Carcass traits

Thirteen ram and 16 ewe lambs were slaughtered at 5 different live masses. Each carcass was dissected into subcutaneous fat (scf), meat and bone and the mass of each component, as a percentage of the total carcass mass are indicated in Table 11.

Although a small number of lambs is involved, it is clear that as slaughter mass increases, dressing percentage and percentage subcutaneous fat in the carcass also increases while percentage bone decreases in accordance with the general tendency recorded in the literature (KEMPSTER et al., 1982). Ewe lambs had a higher dressing percentage and more subcutaneous fat than ram lambs at all masses while the percentage lean was about the same. It appears that the amount of subcutaneous fat of both sexes is far less than the average amount of subcutaneous fat of 8.5 percent for carcasses of 17.5 kg of all sheep slaughtered in South Africa (BRUWER et al., 1987). These results agree with the findings of BOYLAN et al. (1976) in Finnsheep crosses, indicating the leanness of this breed.

Table 11. Least squares means of carcass traits of Finnsheep lambs.

Slaughter mass (kg)	Ram lambs n	Dressing (%)	Scf (%)	Meat (%)	Bone (%)	Ewe lambs n	Dressing (%)	Scf (%)	Meat (%)	Bone (%)
20	2	37	1.1	81.1	17.8	5	40	3.3	82.5	14.2
25	3	41	2.6	83.0	14.4	3	44	4.7	81.4	13.9
30	4	43	4.6	81.6	13.8	4	47	6.7	81.2	12.1
35	3	44	5.7	81.1	13.2	3	47	7.4	79.5	13.1
40	1	42	5.8	82.5	11.6	1	45	6.7	81.1	12.2
Total	13					16				

Scf = subcutaneous fat

Conclusions

With very few exceptions no significant role is seen for pure-bred Finnsheep in the local sheep industry. However, through crossbreeding, HOFMEYR (1980), GREEFF and HOFMEYR (1988) and GREEFF et al., (1990) showed that the high fertility of the Finnsheep can make a valuable contribution in increasing the reproductive efficiency of sheep production under intensive, semi-intensive and extensive conditions in South Africa.

Traditionally, the sheep industry has resisted any encouragement to promote multiple births in sheep. The comparatively low value of individual animals did not justify the managerial and labour inputs associated with multiple births such as the nursing and fostering of lambs. However, this perception has changed in recent years with the increase in improved pastures and relatively high mutton and lamb prices.

The local market has not been very receptive as far as Finnsheep wool is concerned, but HOFMEYR (1980) indicated that the processing qualities of Finn x Merino wool was closer to Merino wool than that of any other Merino cross produced. As wool production is a major consideration in a country such as South Africa, the Finnsheep could play an important part in the establishment of a dual purpose white wool composite female line for the industry, especially where nutritional conditions favour intensive lamb production.

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Manuscript received September 1991

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SELOSTUS

Puhtaan suomenlampaan menestyminen Etelä-Afrikassa

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Lammastalouden taloudellista ja biologista tehoa parannettaessa on kiinnitetty huomio lisääntymiskykyyn ja sikiäviin rotuihin. Sikiävyysgeenien tuonti muista roduista on tässä osoittautunut nopeaksi menetelmäksi. Tähän on käytetty paljon suomenlammasta. Siitä haluttiin kokemuksia Etelä-Afrikassakin, jonne koe-eläinainesta tuotiin 1968 sekä lisäksi neljän pässin spermaa 1981. Nämä pidettiin sisämaassa (22 et.lev., 1523 m kork.), jossa kesäpäivät ovat kuumia ja yöt viileitä, talvipäivät lauhkeita ja yöt kylmiä. Sadetta tulee keskimäärin 580 mm/v., pääosa kesällä.

Karitsointi-%:ssa, vuonuekoossa ja eloonjäänti-%:ssa oli merkitseviä vuosien välisiä eroja. Karitsointi-% vaihteli 56.0 -90.6 % ja vuonuekoko 1.97 - 3.1. Eloonjäänti-% syntyessä ja syntymästä vieroitukseen aleni vuonuekoon noustessa.

Syntymävuosien ja -tyyppien välillä oli merkitseviä eroja syntymä-, vieroitus- ja 12 kk:n painossa. Ykkösten vastaavat painot olivat 47, 16 ja 13 % suuremmat kuin viitosten, mutta 3-, 4- ja 5-karitsoiden väliset erot vieroitus- ja 12 kk:n painoissa eivät olleet merkitseviä, koska 4- ja 5-karitsat saivat lisähoitoa syntymästä alkaen. Uuhen iällä oli hyvin merkitsevä vaikutus syntymä- ja 12 kk:n painoon, mutta ei vieroituspainoon, koska heikkojen karitsoiden saama lisämaito syntymästä vieroitukseen eliminoi maidontuotannon vaikutuksen. Uuhen vanhetessa syntymäpaino nousi 9 vuoden ikään asti. 1-vuotisista uuhista syntyneet karitsat painoivat 12 kk:n iässä merkitsevästi vähemmän kuin aikuisten uuhien karitsat, vaikka vieroituspainossa ei ollut merkitseviä eroja. Karitsoiden sukupuoli vaikutti merkitsevästi kaikkiin painoihin: uuhet olivat kevyempiä kuin pässit.

Sekä pässien että uuhien villamäärät olivat pienet (2.6, 2.2 kg). Villan laadussa ei ollut merkitseviä sukupuolieroja. Se poikkesi suuresti merinotyypin villasta, mutta villakuitujen hienous ja kiharatiheys täyttivät maan laatuvaatimukset.

Tulosten perusteella ei puhtaalle suomenlampaalle ole nähtävissä merkittävää roolia Etelä-Afrikan lammastaloudessa. Risteytyskokeiden mukaan voidaan sen hyvästä hedelmällisyydestä silti saada arvokas apu lammastalouden lisääntymistehoon maan erilaisissa voimaperäisyysolosuhteissa. Maassa on vastustettu monisynnytysten edistämistä, koska eläinyksilöiden vähäarvoisuus ei ole innostanut hoitotyön lisäämiseen. Käsitys on kuitenkin muuttunut viime vuosina, laitumien parantuessa sekä lampaanlihan hintojen noustessa. Maan villamarkkinat eivät myöskään ole olleet kovin innostuneita suomenlampaan villasta, mutta suomenlammas x merinoristeytysten villan käsittelyominaisuudet ovat lähempänä merinovillaa kuin minkään muun rodun merino-risteytysten. Koska villa on maan lammastalouden päätuote, voisi suomenlammas näytellä tärkeätä osaa valkovilla-lihaemälinjan perustamisessa teollisuutta varten, erityisesti siellä, missä ruokintaolosuhteet suosivat voimaperäistä karitsantuotantoa.