The West African Dwarf Sheep I. Reproductive Performance and Growth

By

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SUMMARY

THE study of the West African Dwarf flock at the University of Ibadan revealed that these sheep under moderately improved management, but without a breeding and selection programme were considerably better than they have been generally given credit for.

West African Dwarf ewes are prolific and early maturing. The sheep are small and have finished their growth by the age of two years. Average daily gain up to three months was 85 g and from three months to two years, 31 g.

Mortality of lambs with 20% up to three months of age, however, is still too high and should be reduced by improved pest and disease control.

INTRODUCTION

IN Nigeria sheep production is significant, and large numbers of animals are sold annually. Aside from producing milk, hides and other products, mutton is the most important. The sheep population was estimated to be over eight million head for 1970/71 (Oyenuga, 1974). With a human population of 60-70 million there were then 11-14 sheep per 100 people.

Although sheep are not as efficient as some other domestic animals they have in their favour that they can be self-sufficient and be maintained exclusively on the open range. They require low investment for shelter, management and feed. Sheep in the Northern arid and semi-arid regions are large and long-legged and belong to the group of hair sheep such as the Uda and Yankasa, while sheep in the humid South are small and compact like the West African Dwarf. The latter are mostly scavengers and fend for themselves among human settlements, while Northern sheep as a rule are herded in flocks covering many miles in search for water and feed.

In spite of the importance of sheep as a source of protein, comparatively little research into their production has been done and practically none in the area of

breeding for improvement. Before one ventures, however, to recommend improvement programs — either use of indigenous stock alone or as part of crossbreeding schemes, or substitution of native by exotic breeds, appraisal of local sheep should be made to assess their genetic value *per se* and as possible contributors to any breeding plans.

This paper is an attempt to evaluate the productivity of West African Dwarf ewes and the performance of their lambs. It is the first part of a paper presented at the Animal Production conference at Kano in 1974 (Dettmers and Loosli, 1974).

MATERIALS AND METHODS

West African Dwarf sheep are relatively tolerant to trypanosomiasis so that they have become the principal kind of sheep in the South of Nigeria. The data for this study came from such a flock of approximately 300 ewes maintained at the University of Ibadan since 1950 under somewhat improved management. The establishment of the flock, foundation stock, and details of the management have been described by Hill (1960). The animals were grazed in the morning and late afternoon and kept inside a concrete floored and aluminium roofed barn during the hot hours of the day and at night. Supplementary feed was only given to suckling ewes, rams in service, and young stock at a rate of 0.5-0.6 kg per head per day. Health precaution involved foot baths for all sheep when entering and leaving the barn. There was veterinary service available when needed.

The flock was breeding all year round and propagated to provide animals for nutrition and meat studies; rams were sold for slaughter. A selection and breeding

program was not followed. Weaning was not practiced; only ram lambs were separated from ewes at about three months of age while ewe lambs continued to run with their ewes and flock rams.

Records of 297-326 ewes were available from 1971 to 1973 including ewes having lambed from once to eight times.

RESULTS AND DISCUSSION

Traits relating to reproductive rate and ewe's productivity are her age at first lamb(s), number of lambs born alive, interval of lambing and the proportion of multiple births among lambs born.

Table 1 shows the composition of the ewe flock by age and as to whether they lambed or not. Among the 152 that did not lamb 2.6% were over two years old and 25.0% were between one and two years which could have lambed. The few older ones should have been culled. The majority of 110 (72.4%) were too young for lambing. To determine the breeding efficiency, the latter were deducted from the total ewes exposed so that 187 should have lambed. The breeding efficiency then was 145/187 or 77.5%.

Generation Interval

Table 2 shows average age of ewes at first lambing (generation interval). The

TABLE 1
West African Dwarf Ewes Which Did Not Lamb

<i>N</i>	<i>Age group</i>	<i>Age range (months)</i>	<i>% not lambed</i>
4	over 2 yrs.	27 - 30	2.6
38	1 - 2 yrs.	12 - 19	25.0
110	under 1yr.	- 11	72.4
152	did not lamb		100.0
145	lambd	See Table 2	
297	Total		

TABLE 2
Age of First Lambing of West African Dwarf Ewes

<i>N</i>	<i>%</i>	<i>Age range(months)</i>	<i>Average</i>
38	26.2	12 - 13	12.6
42	29.0	14 - 17	15.3
24	16.6	18 - 23	20.6
17	11.7	24 - 47	34.5
8	5.5	48 - 72	58.6
145	100.0	8 - 72	20.5

Breeding Efficiency

Breeding efficiency is given by a ratio of ewes that lambed over those exposed. Of the 297 ewes in this study 145 lambed while 152 had not lambed as yet. Among the latter were old ewes and very young ones.

range was from 8 to 72 months. The overall average age when weighted by number was 20.5 months.

This was considerably higher than reported earlier for ewes of the same flock by Hill (1960) who gave an average age of 11-14 months. A closer look at the table however

reveals that 37% of the ewes were, on the average, less than one year old and 66% on the average 13.3 months old at first lambing. The overall generation interval was accelerated by inclusion of ewes which had their lambs excessively late. If at least the eight ewes over four years old had been culled for reproductive inefficiency the average age would have been 17.2 months and if the 25 over two years had been excluded the average age would have been 14.8 months at first lambing.

Nonetheless, average age at first lambing is still better than for sheep from other countries. Ensminger (1969) gives an average generation interval of 24 months for breeds in the United States and McDowell (1972) states that 2/3 of the sheep like the Moghani of Iran and the Bikanari of India will lamb with 24 months and the remaining 1/3 with 36 months of age.

small numbers of lambs involved. The lambing percent of 146 is not only higher than that reported earlier by Hill (1960) with 120, it is also higher than for the Uda with 134 but less than the Yankasa with 176, the two most common breeds of Northern Nigeria (Ferguson, 1964).

The prolificacy of the West African Dwarf ewes stands up well among sheep of the world. The highest lambing percentage on record is 205 for East Friesian Milk Sheep, perhaps only exceeded by the Finnsheep. The Dutch Texel has been reported with 150-160% (Maymone, Haring and Linnoenkohl, 1961), and 166% for the most prolific Swedish landrace of sheep (Johansson and Hansson, 1943). The high records produced in the temperate zones, however, have been accomplished by sheep that are well cared for with good pasture, supplementary feed and superior management.

TABLE 3

Lambs Born to Ewes That Lambed by Lambing

Lambing	No. lambs	No. ewes	Lambing %
1st	176	145	121.4
2nd	144	98	149.0
3rd	113	71	159.2
4th	84	45	186.7
5th	24	4	171.4
6th	6	4	150.0
7th	6	3	200.0
8th		1	200.0
All	555	381	145.6

Lambing Percentage

Since lambing occurred all year round lamb crops per year are hard to determine. A better measure of prolificacy was that of number of live lambs produced by 100 ewes. Table 3 shows the lambing percent by parity of ewes that lambled.

The average lambing over all lambings was 146%. Already at first lambing 121 lambs were born to 100 ewes increasing to 190 lambs by the forth lambing. After that a decrease set in when the 7th and 8th lambings are disregarded because of too

Multiple Births

While Hill (1960) reported 20% twins and no triplets among lambs born, in this study it was found that 56% of live lambs born were twins and 8% triplets. Table 4 shows that twinning increased up to and including the fourth lambing. Triplets were few at first lambing (less than 4%), then increased to 11% by the 5th lambing.

Twins (T) and triplets (M) combined increased from 39% at first, to 65% at second, and to 84% and 89% at third and fourth lambings. This is the highest rate

TABLE 4

Single and Multiple Births

Lambing	Type	No. born	%	Lambing	Type	No. born	%
1st	S	107	60.8	5th	S	5	20.8
	T	63	35.8		T	16	66.7
	M	6	3.4		M	3	12.5
2nd	S	50	34.7	6th	S	2	33.3
	T	78	54.2		T	4	66.7
	M	16	11.1		T	6	100.0
3rd	S	29	25	8th	T	2	100.0
	T	75	66.5				
4th	M	9	7.8	Total	S	202	36.4
	S	9	10.7		T	310	55.8
	T	66	78.6		M	43	7.8
	M	9	10.7				

of multiple births reported for any Nigerian breed, and it was higher than that reported for the Swedish Landsheep which had 55% twins, 5% triplets and 0.4% quads and quins (Johansson and Hansson, 1943). According to Reeve and Robertson (1953) "... among all breeds of sheep and types of environment about 176 pairs of twins and ten sets of triplets occur in every 1000 births; and one set of quadruplets in every 5000." This amounts to a 119.6% lamb crop (Ensminger, 1969).

Lambing Interval

Table 5 gives lambing interval in days between first and second up to between seventh and eighth lambings. Again an improvement can be noticed up to the 4-5 lambing interval; the interval decreased

from 277 to 209 days. The overall average was 248 days as compared to 236, 270, and 273-284 days for the Yankasa, Uda, and their crosses with Merino respectively (Ferguson, 1964). Within this group of ewes two individual lambings were recorded with a 152 day interval. Next followed a group of 53 ewes with 182 days between second and 8th lambings. That was 22.5% of all ewes studied. If some selection pressure would be put on long intervals between lambings considerable progress could be made to reduce it.

Lamb Survival

Due to the small body size of the West African Dwarf sheep (adult female 14-27 kg, mature rams 18-41 kg; Hill, 1964) one would expect low birth weights for lambs

TABLE 5

Lambing interval in Days by Lambing

Interval	No. ewes	Average days
1-2	98	277
2-3	71	230
3-4	45	233
4-5	14	209
5-6	4	213
6-7	3	203
7-8	1	213
All	236	248

with a consequent relatively high mortality. Because the records available were not clear on prenatal losses, all the deaths reported here are postnatal up to three months of age. After that very few deaths occurred. The losses are given in Tabel 6 for the whole period under study and for the year 1972 alone. This was done because due to an outbreak of foot and mouth disease at the end of 1973 heavy losses were encountered.

Bikanari (McDowell, 1972) the West African Dwarf sheep did not do too well. Also breeds in the temperate zone have a higher survival rate (Johansson and Rendel, 1972). The high mortality must be probably attributed to parasites and disease mainly. Certainly such management aspects could be relatively easily improved. It was already somewhat lower now than reported by Hill (1960).

TABLE 6

Lamb Losses up to Three Months

	1972	1971-73
No. lambs born	283	712
No. dead to 3 months	55	157
Percent dead	19.44	22.05
singles	11.96	17.55
Twins	15.75	22.10
Triplets	46.67	34.85
Males	16.08	19.37
Females	22.86	19.95

TABLE 7

Reproductive Performance of West African Dwarf Ewes

Trait	1960	1973
Age of ewe at first lambing, months	11-14	20
No. lambs born alive to 100 ewes	120	146
Percent twins of live lambs	20	55
Percent triplets	-	8
Loss to 3 month, %	25	20
Lambing interval, days		248

As expected mortality for triplets was high (35-47%), followed by twins (16-22%) while the death rate for single lambs was 12-18%. Among the singles in 1972 more ewe lambs died than males (23 vs. 16%), however over the whole period 1971-73 there was no difference in mortality with regard to sex of lamb. Compared to earlier reports and from other areas for the same sheep the losses were lower in this study. But compared with other breeds in semi-arid areas such as Moghani which had losses ranging from 5-20% and a mortality of only 1-7% for the

Ewe Productivity

The life production of a ewe was high. She produced on the average three lamb crops in two years (Table 3) while some of the top ewes even four crops within two years. This was in agreement with both Hill (1957) and Ferguson (1964). With some selection against late lambers and those with long intervals between lambings the record would have been even better. In Table 7 the performance of the West African Dwarf ewe is summarized and compared with the earlier report by Hill (Dettmers and Loosli, 1974).

Birth Weights

Throughout different lambings and over the two year period under study the ratio of ram to ewe lambs was biased towards a larger number of females (46:54) than males in contrast to the Northern sheep breeds (Ferguson, 1964) for which sex ratios of 80-100:50 were reported. One would expect differences in birth weight and survival in favour of ram lambs in this study. However, we did not find significant differences in birth weight due to sex of lamb. Based on 258 male and 297 female lambs the average weight for a ram lamb was 1.748 and for the ewe lamb 1.711 kg. They were close to weights reported by Hill (1960). His ram lambs weighed 1.807 kg and his ewe lambs 1.725 kg. But it must be pointed out that there could have been sex differences. Singles were heavier at birth than twins, and twins weighed more than triplets (Table 8).

Hill (1960) also had slightly higher weights at birth for ewe lambs both for singles and twins. Triplet weights in this study were the only ones significantly different from each other.

Heritability of Birth Weight

Since weaning was not practised and therefore weaning weights proper not available a closer look was taken at birth weights. If the heritability would be sufficiently high they could aid in selecting breeding stock (if also a fair correlation would exist with later weights). Heritability was determined from paternal halfsib correlation. The ram component obtained from an analysis of variance was used for an estimate (Table 9) as a ratio of four times the ram component to the total variance component.

where R = ram, E = ewe and L = lambs and k_1 and k_2 are average number of lambs per ewe and k_3 the average number

TABLE 8

Birth weight of West African Dwarf Lambs by Sex and Type of Birth [kg]

Sex	Single	Twin	Triplet
H	1.925	1.635	1.525
F	1.934	1.639	1.267

TABLE 9

Analysis of Variance for Birth Weight and Components of Variance

Source	d.f.	M.S.	Expected M.S.	62
Between rams	1	23.35=MS _R	$6_L^2 + k_2 6_E^2 + k_3 6_R^2$	0.11
Between ewes within rams	315	1.66=MS _E	$6_L^2 + k_1 6_E^2$	0.98
Between lambs	158	0.18=MS _L	6_L^2	0.18

where R = ram, E = ewe and L = lambs,

of lambs per ram. The heritability was 0.35 with a standard error (Dickerson, 1969) of 0.513. The size of the standard error indicated that the heritability estimate was not too reliable; the ram component was based only on two rams.

Another heritability estimate was obtained from simple lamb on ewe regression, where the heritability was estimated by twice the regression coefficient. It was 0.10 with a standard error of 0.099. Usually estimates of heritability obtained from regression are higher than those obtained from variance components. A better estimate was derived by pooling both by averaging the two values weighted inversely proportional to their variances (Dettmers, 1962). The pooled heritability estimate of birth weight was 0.11 ± 0.097 . It was too low to be of any value in selection; birth weight depends to a large degree on environmental variations. Compared with heritability estimates reported in the literature it was also much lower. Estimates obtained from halfsib correlation range from 0.15 (Nelson and Venkatchalam, 1949) to 0.33 (Blackwell and

Henderson, 1955) and from 0.25 (Yao, Simmons and Schotti, 1953) to 0.72 (Nelson and Venkatchalam, 1949) when obtained from regression. Ensminger (1969) gives an average heritability of 33% as a fair value.

The Growth Pattern of West African Dwarf Sheep

Sheep of the University flock were weighed monthly on approximately the same day rather than at a specific age of the animal. Weights available were grouped by age ranging from birth to 81 months. Average weights were determined at weekly intervals from birth to twelve weeks of age (three months) and thereafter in monthly intervals up to an age of six years. The average weights were then plotted against age to obtain a growth curve as shown in Figure 1.

There were three distinct growth periods, namely from birth to the age of three months, from three months to two years and thereafter. The first portion of the curve would correspond to the pre-weaning

Fig:1 GROWTH PATTERN OF WEST AFRICAN DWARE SHEEP

time and the second to post-weaning up to maturity. Average gain for the first period was 85 g daily, for the second 31 g and after the age of two years only 5 g. For all practical purposes the ewes had finished their growth by the age of two years, indicating that animals determined for slaughter (culls) should be killed from that age on and only breeding stock retained. After two years of age or somewhat later no gains can be expected, and to keep slaughter animals for a long time after that would be uneconomical.

In Figure 2 the growth curve obtained in this study was compared with one based on weights taken from Hill (1960).

Up to an age of more than one year the two curves are identical. After that weights in the 1960 study increased to a lesser degree than the sheep in 1973, but kept on increasing till they reached about four years. While the 1973 animals stopped gaining at two years, the earlier sheep surpassed at about three years. The different growth pattern may have to do

with the fact that this study included rams only at earlier ages while older weights were from ewes.

CONCLUSION

This study of reproductive performance traits of West African Dwarf ewes and their growth rate was based on a sufficiently large number of animals that under the conditions of a somewhat improved management, but without selection for performance the sheep at the University of Ibadan can be characterized as follows:

1. West African Dwarf ewes are prolific, they have a 146% lambing and showed a high proportion of multiple births (64%) among lambs born alive.
2. Ewes are early maturing. Two thirds of the flock lambed within 15 months of age.
3. Lambing interval was 248 days among which more than 20% of the ewes averaged 182 days interval between second and eighth lambings.

4. Death losses of 20% up to the age of three months, however, were too large. Better parasite and disease control could increase survival of lambs.
5. On the average a ewe produced three lamb crops within two years and some top ewes four crops.
6. The sheep were small and weighed about 30 kg at four years. From a birth weight of 1.7 kg they gained 85 g daily up to an age of three months, 31 g between three and 24 months and only 5 g per day from two to six years of age.

There is no doubt that the performance of the sheep can be improved if ewes which do not lamb between one and 1½ years of age and ewes with longer than average lambing interval are not retained, and emphasis placed on dams giving birth to healthy twins. Rams should be selected on the basis of growth rate. Preferably a breeding program with rams allotted to a group of ewes should be designed to be able to keep records on parentage of lambs in orders to evaluate ram and ewe performance.

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