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Performance of Tswana Sheep under Semi-Intensive Management in Gaborone, Botswana

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Abstract: The study was conducted at Botswana College of Agriculture, Notwane-farm, Sebele, Gaborone for 150 days from June to October 2006. A flock of 60 Tswana sheep were used consisting of 30 males and 30 females. Fifteen of the males were castrates, 7 weaners and 8 lambs while the female group consisted of 15 ewes, 7 weaners and 8 lambs. Animals were weighed on monthly basis for five consecutive months, using Avery Walk-in Scale. The flock grazed daily for 8 h on a fenced natural pasture and were housed at night in kraals with corrugated roofing. Water was provided ad-libitum in kraals and feed supplements such as sorghum bran and salt lick were also provided. Lambs had access to lamb-finisher. The data collected were analyzed using the box-plot, between males and females. Linear multiple regression was used to analyze data within each age-group while Duncan's multiple range test was used to separate the means. The means of male and females were different at $p<0.05$. In month 1, means body weights (kg) were 32.4±17.5 and 27.2±14.0 for males and females, respectively. Final body weight (kg) after 150 days were 36.5±13.7 and 27.8±8.10 for males and females, respectively. Generally, all sheep age-groups showed a significant increase in growth although July which is the second month of the study drastic decline in growth rate was observed which is one of the coldest winter month in Botswana. It can be concluded from the study that growth rates of different age-groups of Tswana sheep under semi-intensive management are different and also there is interaction between time and gender and time and type/age-group. The time of the year is amajor factor that influenced the growth rate of range grazed Tswana sheep.

Key words: Performance, sheep, semi-intensive, management, lambs, weaners

INTRODUCTION

Sheep and goats have provided alternative meat source to beef in many countries such as Botswana. Their short reproductive cycle also plays a major role in their availability to smallholder farmers. The short reproductive cycle of sheep also allows livestock populations to be restored quickly after culling and it allows high off-take rate as well as allowing rapid establishment of new flocks. Sheep have traditionally been multi-purpose animals used for their fibre, pelts, meat and milk. However, within the social context in which the farmers operate, the small size of sheep has several advantages. Firstly, it usually means low unit costs and it is possible to build up reserves in the form of livestock, whereas with other species this is difficult. Secondly, the slaughter of sheep is more likely to supply the nutritional requirements of a family unit than slaughter of a cow, which if the meat cannot be preserved properly, then is wasted. In addition, more recently there is growing importance in their contribution to land maintenance and sustainability. This variation is compounded by their suitability to perform and flourish under extreme climatic conditions. Finally, handling and husbandry are obviously much easier and within the capabilities of women and children who generally provide much of the labour on small family farms. Food is a major input into all sheep production systems. Traditional systems have developed to take advantage of the available food and sheep generally eat low quality food that is not eaten by pigs, poultry or man. Traditional systems are ecologically well-balanced, but sometimes there are shortages of specific nutrients, such as minerals. If this is the case, giving an appropriate supplement can have a big response. In order to develop new feeding systems it is necessary to understand the nutrient requirements of sheep and the ways in which they can be satisfied. However, Abubakar *et al.* (1992) mentioned that, there are other factors which influence flock productivity, amongst which include: birth weight, average daily gain to weaning and weaning rate. It is also mentioned that these traits are in turn influenced by genetic and environmental factors.

The Tswana sheep is fat-tailed with some coarse negligible wool on the coat. The coat colour is predominantly black and white and is mainly kept for mutton (Aganga *et al.*, 1997).

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The MOA (2004) indicated that there were 145,000 sheep and that the local Tswana sheep population was available in most parts of the country along with Dorper sheep, while the Karakul sheep are found in Gantsi, Kgalagadi, Kweneng, Tuli and Tati block. The average flock size was 49.0 sheep per holding. The off-take of sheep was 13.3% while birth and deaths were 30.7 and 15.5%, respectively (MOA, 2004). The average price of sheep (Pula) was 263 which is equivalent to 41 US $. The Botswana Government in conjunction with farmers have over the years invested enormous money through Financial Assistance Policy, technical assistance schemes and disease control programs. However, management is still poor leading to low output. Farmers do not routinely weigh their animals to assess the need of providing supplementation (Seabo *et al*., 1999). The main purpose of this study is to determine the growth rate of Tswana sheep under semi-intensive management system.

MATERIALS AND METHODS

The study was conducted at Botswana College of Agriculture farm located along Sebele-Francistown road; which is north east outside Gaborone, the capital city of Botswana. The altitude of the area is 994 m and the coordinates are latitude 24° 34' S and longitude 25° 57'E. The average monthly temperature during the study period (June-October) ranged from 2.4°C minimum to 33.4°C maximum. The climate is semi-arid which experiences unreliable rainfall. The rainfall usually starts in October, but sometimes comes too early or too late and varies in amount. The type of vegetation in this area is mixed acacia/combretum tree savanna with average annual rainfall of 450 mm.

In this study a flock of 60 Tswana sheep were used. Animals were weighed on monthly basis using Avery Walk-in Scale, for 5 consecutive months from June, 2006 to October, 2006. Out of these flock, 30 were females while 30 were males. Fourteen of these sheep were yearlings out of which 7 were females and the other 7 males, while 16 were lambs with 8 females and 8 males. The remaining 30 were adult animals with 15 ewes and the other 15 being castrates.

The flock grazed daily for 8 h on a fenced natural pasture. The animals were housed at night in kraals with corrugated roofing sheets. In the pasture grazed by the sheep there were different species of grasses observed as shown in Table 1 to 4. The composition is referenced as indicated. Water was provided *ad-libitum* in the kraals and some feed supplements such as bran, salt lick and Lucerne were also provided.

Data collected for males and females were analyzed using the box plot. Across age groups data were analyzed using Multiple Linear Regression and ANOVA while Duncan's Multiple Range test used to separate means (SAS, 2004).

Table 1: Nutritive composition (percent) of locally available grasses collected in June (1999)

Samples	DM	CP	NDF	ADF	ASH	IVTD
Eragrostis rigidor	72.40±0.74^{a}	5.11±0.35^{b}	74.3±0.17^{a}	43.4±0.76^{a}	7.00±0.92^{b}	45.6±0.82^{b}
Eragrostis lehmanniana	51.98±0.44^{b}	7.76±0.19^{a}	72.9±0.77^{a}	44.5±0.51^{a}	10.68±1.37^{a}	50.2±0.48^{b}
Urochloa trichopus	51.00±0.43^{b}	8.50±0.12^{a}	67.6±0.47^{a}	42.1±0.07^{a}	16.58±0.48^{a}	58.0±0.79^{b}
Schimidta pappophoroides	63.45±0.52^{a}	8.97±1.02^{a}	73.3±0.23^{a}	43.7±0.13^{a}	10.05±1.12^{a}	47.6±1.32^{b}
Panicum maximum	49.80±0.35^{b}	9.72±1.83^{a}	68.8±0.66^{a}	39.3±1.40^{a}	11.38±0.38^{a}	52.2±0.39^{b}
Cenchrus ciliaris	32.64±0.27^{b}	16.03±0.42^{a}	64.2±0.02^{a}	35.5±0.78^{a}	11.04±0.67^{a}	57.6±0.63^{b}
Eragrostis superba	53.11±0.47^{b}	8.36±1.53^{a}	76.4±0.52^{a}	42.5±1.27^{a}	9.51±0.74^{a}	50.2±0.78^{b}

^{abc}: Means with different superscripts along the same column are significantly different at p<0.05, Source: Aganga *et al.* (2005)

Table 2: Mineral composition of locally available grasses collected in June (1999)

	Ca	P	K	Na	Mg	Cu	Fe	Mn
Samples	----------(g kg^{-1})----------							
E. rigidor	1.05^{c}	0.51^{a}	42.29	0.081^{a}	0.52^{d}	6.00^{a}	376^{c}	2.00^{b}
E.lehmanniana	2.42^{c}	1.21^{a}	10.29^{c}	0.18^{a}	1.52^{c}	7.00^{a}	276.00^{d}	8.00^{b}
U. trichopus	4.89^{b}	1.13^{a}	14.44^{c}	1.02^{a}	2.36^{b}	9.00^{a}	1566^{a}	71.00^{ab}
S.pappophroides	2.95^{c}	0.81^{a}	8.78^{c}	0.27^{a}	1.16^{c}	7.00^{a}	756^{b}	2.00^{b}
P. maximum	5.07^{b}	0.78^{a}	16.30^{c}	0.46^{a}	3.19^{a}	7.00^{a}	626^{b}	4.00^{b}
C. ciliaris	5.74^{b}	1.27^{a}	27.79	0.28^{a}	1.67^{c}	7.00^{a}	186.00^{d}	2.00^{b}
E. superba	5.69^{b}	1.81^{a}	9.28^{c}	0.16^{a}	1.17^{c}	11.00^{a}	346.00^{c}	11.00^{b}

^{abcde}: Means with different superscripts along the same column are significantly different, Source: Aganga *et al.* (2005)

Table 3: Nutritive composition (%) of locally available grasses collected in August (1999)

Samples	DM	CP	NDF	ADF	ASH	IVTD
E. rigidor	86.96±0.37^{a}	4.29±1.20^{b}	78.40±0.39^{a}	44.90±0.11^{a}	5.50±0.95^{b}	39.60±0.40^{a}
E. lehmanniana	90.50±0.73^{a}	2.36±0.44^{c}	82.70±0.67^{a}	50.60±0.11^{a}	5.25±0.17^{b}	45.60±0.97^{ab}
U. trichopus	90.39±0.59^{a}	4.67±0.80^{b}	80.60±0.12^{a}	48.30±0.50^{a}	9.50±0.27^{a}	44.88±0.23^{ab}
P. maximum	84.47±0.12^{a}	6.18±0.74^{a}	70.80±0.82^{a}	45.50±0.42^{a}	8.25±0.50^{a}	51.00±0.34^{a}
C. ciliaris	78.80±1.08^{a}	10.80±0.14^{a}	80.00±0.44^{a}	51.70±0.65^{a}	7.00±0.24^{a}	35.80±0.23^{b}
E. superba	76.74±1.52^{a}	4.05±0.21^{b}	77.40±0.44^{a}	44.50±0.35^{a}	6.00±0.43^{b}	41.40±0.18^{ab}

^{ab}: Means±SE with different superscripts along the same column are significantly different (p<0.05), Source: Aganga *et al.* (2005)

Table 4: Mineral composition of locally available grasses collected in August (1999)

Samples	Ca	P	K	Na	Mg	Cu	Fe	Mn	Zn
	---(g kg^{-1})---								
E. rigidor	2.04^{d}	1.08^{a}	4.96^{bc}	0.86^{a}	2.66^{a}	2.00^{b}	588^{a}	1.00^{d}	18.31^{bc}
E. lehmanniana	3.05^{d}	0.89^{b}	2.33^{c}	0.19^{a}	0.91^{b}	1.00^{b}	406^{b}	BDL	18.30^{bc}
U. trichopus	5.00^{b}	1.18^{a}	8.35^{b}	1.23^{a}	0.78^{b}	2.00^{b}	92^{d}	2.00^{d}	148.16^{a}
P. maximum	6.64^{b}	0.82^{b}	11.42^{a}	0.33^{a}	0.63^{b}	2.00^{b}	106^{c}	1.00^{d}	76.39^{ab}
C. ciliaris	2.04^{d}	0.74^{b}	5.18^{bc}	0.23^{a}	0.89^{b}	2.00^{b}	578^{a}	3.00^{d}	15.90^{bc}
E. superba	2.68^{d}	0.89^{b}	5.25^{bc}	0.27^{a}	0.98^{b}	1.00^{b}	598^{a}	1.00^{d}	55.23^{b}

^{abcd}: Means with different superscripts along the same column are significantly different, Source: Aganga *et al.* (2005)

RESULTS AND DISCUSSION

Figure 1 is a box-plot indicating the average body weights of female and male sheep, respectively. The body weights for female in general ranged from 3 kg for lambs to 44.5 kg, for adults while for the males ranged from 2.5 kg to 56 kg. The average body weights were 31 and 39 kg for female and male Tswana sheep, respectively. This is in line with the findings of Khaldari *et al.* (2007) who reported that male progeny of lean-tailed and fat-tailed lambs of Chaal and Zandi breeds had significantly heavier slaughter weights (39.6 vs 34.8 kg) and empty body weights (34.6 vs 28.0 kg) than the female lambs. Also, Kunene *et al.* (2007) reported that the average liveweight of Nguni sheep was 30.88 and 27.20 kg for males and females, respectively.

Figure 2 shows the growth rate of female and male sheep from month 1 June to month 5 October, respectively. It just confirms the box-plot mentioned earlier. In the first 2 months, a sharp increase in growth was recorded in both female and male sheep, even though it was more pronounced in males than in females. Between month 2 July and month 3 August, there was negative growth in both sexes. However, the decline in growth was much stronger in females than in males. Between month 3 and month 4 September, there was a marked or significant increase in growth in both sexes and finally, between month 4 and 5 the growth rate for both sexes increased at a declining rate.

Figure 3 indicates the average growth rate of different age groups of sheep, that is castrates, ewes, weaners and lambs from month 1-5. Between month 1 and 2, there was a significant increase in weight for both castrates and ewes. However, the growth rate for ewes was relatively lower than that of castrates and weaners experienced an equivalent growth rate to castrates, while the lambs had the highest increase in weight during the same period. From month 2 and 3, there was a decline in growth in both castrates and ewes and was more severe in the latter. Weaners too, had reduction in weight gains at the same rate as for castrates during the same period. However, lambs continued gaining weight during the same period though at a lower rate compared to month 1 and 2. For

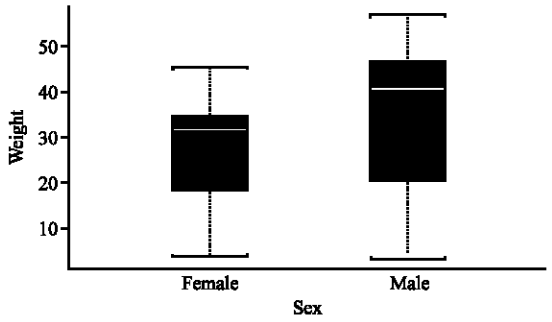

Fig. 1: Indicates the maximum, minimum and average weight gain between m ale female sheep

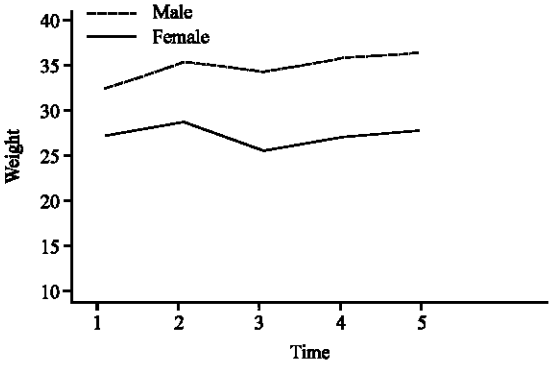

Fig. 2: Daily weight gain between male and female sheep

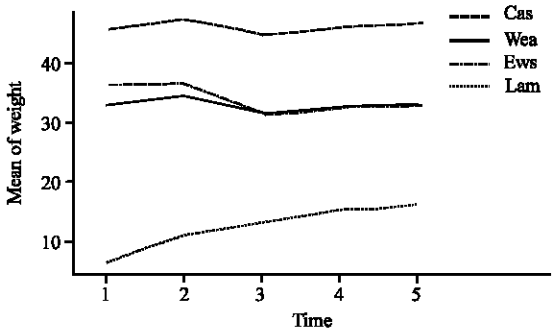

Fig. 3: Average daily weight gain across age groups of sheep

Table 5: Average body weight of Tswana sheep raised under semi-intensive management over a 5 month period

	Month				
Type	June	July	August	September	October
Ewes	36.5±4.02	36.9±3.81	31.5±3.92	32.7±4.04	33.1±4.03
Castrates	46.4±4.71	48.2±4.61	45.4±4.56	46.8±4.53	47.5±4.52
Weaner-female	32.8±2.17	33.5±1.75	28.1±2.36	29.5±2.30	30.1±2.80
Weaner-male	33.3±2.00	35.7±1.75	35.1±3.93	36.1±2.25	36.5±1.58
Lamb-female	4.75±1.12	9.59±1.83	12.2±1.83	14.4±2.42	15.8±2.50
Lamb-male	5.50±3.76	10.9±3.61	12.6±3.14	15.0±3.02	15.8±3.09

months 3 and 4, castrates, ewes and weaners had increased growth rate. Lambs maintained a steady growth rate attained in months 2 and 3 while the growth rate in months 4 and 5 of the study declined across the age groups. This period correspond to the cold dry season in Botswana.

Table 5 displays the average body weights of different sheep age-groups from month 1-5. Table 6 shows the average body weights of male and female sheep over a 5 month period. Just like in Fig. 1 mentioned before, the growth rate across the sheep age-groups increased from month 1-2, then declined between month 2 and 3 with the exception of the lambs. Thereafter, there was increase in growth across the age-groups although at a declining rate and again with an exception of lambs which had maintained a steady growth rate up to month 4. Table 7 the multiple linear regression shows that the growth rate of the sheep was higher in June compared to the second month of July. In general all the months had an effect in growth of sheep across the age groups. The findings are in agreement with the reportof Ayantunde *et al.* (2007) that stated that, the combination of low growth rates and long fattening period often characterizes the traditional sheep fattening system which makes it largely unprofitable. In order to make sheep fattening profitable, it is pertinent to address alternative feeding strategies, what to feed and at what quantity and time.

Figure 1 shows that the average body weights of female and male sheep were ±31 and ±39 kg, respectively. This is quite below an average of 72.5 and 112.5 kg for female and male sheep, respectively for superior breeds under intensive management and good pastures.

Figure 2 indicates the growth curve for Tswana sheep on natural pastures and it fluctuates with abundance of forage for the grazing animals which is influenced by precipitation and season of the year. The period of very low growth rate is the winter season with a minimum temperature of 3.5°C. Most range grasses were getting drier and nutritious species were reduced due to grazing, hence sheep had to adjust for a while to those conditions. This may be explained with the findings of Aganga *et al.* (2005) that reported that the Dry Matter (DM) and fibre content (NDF and ADF) increase, while crude protein of native grasses reduce during the dry season.

Table 6: Average body weights of male and female sheep

Month	Females	Males
1	27.2±14.0	32.4±17.5
2	28.8±12.0	35.4±16.0
3	25.6±8.77	34.3±14.3
4	27.1±8.41	35.9±13.8
5	27.8±8.10	36.5±13.7

Table 7: Multiple Linear Regression on average weight gain

Coefficients	Values	Std.Error	t-value	Pr(>|t|)
(Intercept)	31.0792	0.7918	39.2512	0.0000
factor (time)1	1.1458	1.2519	0.9152	0.3608
factor (time)2	-0.3444	0.7228	-0.4765	0.6340
factor (time)3	0.2163	0.5111	0.4232	0.6724
factor (time)4	0.2615	0.3959	0.6604	0.5095

Figure 3 gives the average growth rate of different age groups of sheep: Castrates, ewes, weaners and lambs; from month 1 June to October. However, lambs did not experience any negative growth, but a slight decline in their growth rate since the lambs were provided with supplements. The decline in lambs' growth rate could have been a result of cold weather rather than feed. From period 3-4, that is, August to September, there was a general peak in growth across the age groups. As for the lambs, there was a constant growth rate maintained from the previous month since they were offered supplementary feeding. This is in line with the findings of El-Hag *et al.* (2007) that stated that supplementary feeding of desert ewes at mating time for 45 days pre-lambing, or both combined, increased lambing and twinning, gave heavier lambs and farmers a greater monetary return. Supplementing the diet of weaned lambs for four months gave increased growth, advanced puberty and gave higher conception and lambing rates.

In general, all the months had an effect in growth of sheep across the age groups.

CONCLUSION

The conclusion drawn from the study is that growth rates of Tswana sheep under semi-intensive management for different age groups fluctuates and are dependent on range condition. It further suggests that there is significant difference between sex, time and age groups; and that there is interaction between time and gender and time and age groups.

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