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A note on growth rates of local goats and their crosses with Norwegian goats at village level in Tanzania

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Abstract

Growth performance of small East African goats (SEA) and crosses between Norwegian x SEA was studied in three villages namely, Mandamazingara, Msingisi and Langali representing humid, semi-arid and tropical highlands zones of Tanzania respectively. Weights of the animals were recorded for 2 years at five periods for animals in three age groups namely group A (0-4 months), B (4-12months) and C (above 1 year) in order to assess the effect of sex, genotype, season and zone on weight changes. Males tended to grow faster than females with a pronounced difference (9.0 g/d) being observed in group C. Crossbred goats grew faster with a marked difference (55.0 ± 4.2 vs. 28.0 ± 8.4 g/d) among animals in group B. Weight changes were influenced ($P<0.05$) by genotype, season and zone and were inferior in the wet season for animals in humid and highland zones but superior for animals in semiarid zone. It is concluded that exotic breeds with higher growth potential can be used to upgrade performance of the indigenous goats.

Key words: Small Ruminants, breeding and growth rates

Introduction

Small ruminant production constitutes an important part of agricultural activity in Tanzania, contributing substantially to household income and food security. Many studies on small ruminants in developing countries have indicated their importance to the livelihood of farmers (Ngategize 1989; Teufel *et al.* 1998; Braker *et al.* 2002). In the tropics, however, these animals have low productivity partly due to slow growth rate which is mainly attributed to breed type, although other factors such as disease challenges, poor nutrition and management are known to contribute to this. Nonetheless, they remain to be one of the main sources of dietary livestock protein to many households in the tropics. For this reason efforts to improve their productivity, and hence economic returns and increased per capita consumption of animal protein should be given priority. One way of achieving this goal is through crossbreeding (Malole *et al.* 2002). In order to improve performance of indigenous goats in Tanzania, a crossbreeding programme was initiated in 1988 in the high agricultural potential areas of the Uluguru

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highlands. This was done by crossing SEA with Norwegian dairy goats. The resulting crosses from this programme had faster growth rate and higher milk yields (Mtenga *et al.* 1998). As part of extension of this scheme, bucks of 75-94% Norwegian blood level were introduced in semiarid (Msingisi), tropical highland (Langali), and humid (Mandamazingara) areas of Tanzania in 2001 to assess how the resultant crosses would perform in different eco-climates. The objective of this technical note was therefore to report progress on the performance of local goats and their crosses under smallholder conditions in these three eco-climate zones.

Materials and methods

Data from 384 goats in 31 smallholder herds were used in this study during the December 2001 to November 2003 monitoring interval. The category of animals was either local goats or crosses with Norwegian goats (37.5 – 47.0% exotic blood). Animals were identified by ear tags, weighed in five periods (Table 1) and daily weight gains calculated.

Table 1: Periods of weight taking

Period	N	Date	Days
1 (Wet-dry)	104	December 01- July 02	220
2 (Dry)	42	July 02 – November 02	118
3 (Wet)	47	November 02 – March 03	128
4 (Wet)	60	March 03 – May 03	67
5 (Dry)	131	May 03 – November 03	177

The animals were grouped into three age categories: A (0-4 months), B (4-12months) and C (above 1-year). The effects of period, village/zone, genotype and sex on growth rate of each category were analysed by GLM procedure of SAS (2000) and least square means were used in the comparison. In the analysis of weight gain, the statistical model comprised initial weight of an individual, sex, age, period and zone as main effects. Genotype x zone and period x zone interaction terms were also included. During the period of study, examination for gastrointestinal worm infection was also carried out and animals with higher (above 1000 eggs per gram) faecal egg counts were treated routinely.

Results and discussion

Genotype significantly ($P<0.05$) influenced weight gains with a difference of 11, 27 and 16 g/d in favour of crossbred animals in group A, B and C respectively (Table 2). The difference in growth rate between genotypes was lowest in animals of age group A suggesting lowest heterosis expression at very early age. Anous and Mourad (1993) working with Alpine bucks and Rove does in Egypt indicated increasing heterosis in weight gain with the increase in age of kids. Daily weight gain of similar local goats at Sokoine University of Agriculture farm in Tanzania as reported by Malole (2002) was found to range from 26-40g/d, which is in agreement with our findings. Kiango (1996) reported weight gain of 78g/d for the SEA x Norwegian crosses in Mgeta highland. This value is higher than the values obtained in the present results (Table 3) and the difference could mainly be due to favourable climatic conditions and variability in feed quality in Mgeta highland (Madsen *et al.*, 1990). Similair positive effects on growth rates of crossbreeding (F1 – crosses) were also found in India and China using Boer goats (Jiabi et al. 2004, Nimbkar et al. 2000) and in India with Alpine and Toggenburger goats (Nimbkar et al. 1996). .In the dairy Goat Development Programme undertaken in the

Ethiopian Highlands between 1989 and 1997, on the other hand, crossbred goats (Nubian x local) did not perform better than indigenous goats on comparisons based on land, metabolic weight and labour input (Ayalew-Kebede 2003, A Tolera personal communication 2004). The tendency was for males to grow faster than females in all age categories and the difference in growth rate was significant for animals in C age group category. This finding in the present study was not surprising as superiority of males in growth has been extensively reported elsewhere (Aregheore 1995; Mahgoub and Lu 1998). The effects of genotype–zone interaction and sex–location interaction were not significant (P>0.05)

Table 2: Daily weight gains (g/d) by age class

Factor	Category	Group A	Group B	Group C
Genotype	Local	$27.0^{a} \pm 4.8$	$28.0^{a} \pm 8.4$	$19.0^{a} \pm 2.6$
	Cross	$38.0^{b} \pm 7.7$	$55.0^{b} \pm 4.2$	$35.0^{b} \pm 6.0$
Sex	Male	36.6 ± 7.1	43.3 ± 2.3	$34.0^{a} \pm 3.0$
	Female	31.3 ± 4.2	39.4 ± 6.9	$25.0^{b} \pm 2.2$
Zone	Humid	33.8 ± 5.1	$35.8^{c} \pm 4.2$	$25.2^{b} \pm 4.0$
	Highland	-	$41.2^{b} \pm 2.3$	$30.4^{a} \pm 3.4$
	Semi-arid	34.1 ± 6.7	$47.0^{a} \pm 5.5$	$24.3^{b} \pm 3.9$
Season	Period 1(Wet-dry)	$36.7^{b} \pm 4.6$	$28.5^{b} \pm 4.3$	$19.3^{c} \pm 8.2$
	Period 2(Dry)	-	$41.3^{a} \pm 5.6$	$26.2^{b} \pm 4.6$
	Period 3(Wet)	-	$32.6^{b} \pm 2.4$	$22.0^{ab} \pm 4.2$
	Period 4(Wet)	$33.1^{b} \pm 8.0$	$33.7^{b} \pm 4.6$	$16.8^{c} \pm 4.8$
	Period 5(Dry)	$44.0^{a} \pm 5.0$	$48.7^{a} \pm 4.5$	$34.5^{a} \pm 4.4$

In this and the following Table, values with different superscript letters within column for each factor differ significantly (P<0.05)

Generally, lower weight gains were obtained during wet seasons (Period 3 and 4) in humid and highland conditions (Table 3). An increase in daily weight gain was observed as the season changed from wet to dry. A possible explanation for this trend is that, at the beginning of dry season, there is more concentration of nutrients in feeds. In the wet season the forages are more succulent. In addition, in the wet season, goats are usually tethered or confined in the sheds to prevent crop damage and hence may have limited intake and selectivity of forages. Pannin (2000) had similar observation in Botswana when small ruminant production systems were studied

Table 3: Mean growth rates (g/d) of goats for different periods in 3 zones of the study (± s.e)

Zone	Period	Local		Cross	
		Group B	Group C	Group B	Group C
Humid	1	$36.4^{a} \pm 2.8$	$14.0^{b} \pm 2.5$	-	-
	2	$39.0^{a} \pm 3.6$	$14.3^{b} \pm 4.1$	-	-
	3	$27.5^{b} \pm 2.6$	$18.4^{a} \pm 4.0$	-	51.5 ± 7.6
	4	$23.3^{b} \pm 5.2$	$19.2^{a} \pm 3.4$	44.0 ± 4.5^{b}	49.0 ± 9.1
	5	$36.3^{a} \pm 3.6$	$22.7^{a} \pm 6.8$	52.0 ± 6.5^{a}	44.1 ± 9.9
Semi-arid	1	$27.0^{ab} \pm 5.3$	16.4 ± 6.5	-	-
	2	$28.2^{ab} \pm 2.6$	18.6 ± 3.6	-	-
	3	$39.0^{a} \pm 6.1$	21.0 ± 6.3	-	39.0 ± 5.3^{a}
	4	$40.8^{a} \pm 7.2$	20.4 ± 6.3	47.3 ± 6.1^{b}	26.2 ± 5.8^{b}
	5	$20.0^{b} \pm 4.1$	17.7 ± 5.7	64.0 ± 4.6^{a}	22.6 ± 1.8^{c}

Highland	1	31.8 ± 5.5^b	$24.6^c \pm 2.1$	-	-
	2	38.0 ± 6.6^a	$33.7^a \pm 6.3$	-	-
	3	24.7 ± 3.9^c	$18.3^b \pm 4.0$	32.3 ± 5.7^b	$32.3^b \pm 4.3$
	4	25.0 ± 4.7^c	$17.5^b \pm 5.7$	30.1 ± 8.0^b	$32.0^b \pm 4.7$
	5	27.6 ± 7.3^{ac}	$28.4^a \pm 2.1$	66.2 ± 9.1^a	$57.4^a \pm 11.0$

In the present study, season effects were reversed under semiarid zone (Msingisi). Here animals tended to grow faster in the wet season. In semi arid zones, disease challenge is less pronounced (Soulsby 1982) and in the wet season the succulence of forage prevails for a very short period. In the dry season, forages are extremely scarce compared to humid and highland areas. This could mainly account for lower growth rate during the dry season.

Further more, disease challenge may be high in wet season (Mboera and Kitalyi 1994) contributing further to low growth rate. A survey of diseases of small ruminants performed in the same areas as examined in this investigation, showed that the gastrointestinal parasitic load largely correlated to rainfall figures in the humid and highland zones, while in the semi arid localities, egg counts were also high during the dry season (Kimbita et al., to be published). The lower weight gains could therefore, to some extent, be related to higher parasitic load.

Another intriguing factor, which could not be picked up in this study, is the effects of the existing differences in grazing management of these animals on growth performance, and this is also subject to further investigation.

Conclusion

Although this is a preliminary finding, it can be concluded that local goats with exotic Norwegian goats improves the growth rate of the resultant crosses. However, information on long-term basis is being collected to assess more accurately the many factors, which play role in determining the performance of goats.

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