

# GENETIC AND ENVIRONMENTAL FACTORS AFFECTING GROWTH TRAITS OF GOATS IN SEMI ARID AREA OF NIGERIA

N. K. ALADE, S. T. MBAP and J. ALIYU

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## ABSTRACT

Growth performance of 194 kids of Sahel (S), Red Sokoto (RS) and West African Dwarf (WAD) breeds of goats from birth to 9 months of age was studied. Effect of breed was significant ( $p < 0.001$ ) with S (2.07kg – 13.49kg) breed being heavier than RS (1.81kg – 13.77kg) and WAD (1.42kg – 8.63 kg) though they were comparable with RS at 9 months. At all ages, WAD was the lightest. Seasonal effect showed that animals born in the wet season were significantly ( $p < 0.001$ ) heavier than those born in the dry season at the early ages, while those born in the dry season were heavier at the late ages. Litter size and sex also affected body weights. Single birth (1.96kg – 13.64kg) and male (1.88kg – 12.64kg) kids had significantly heavier weights compared with multiple birth (1.66kg – 12.33kg) and female (1.67kg – 11.28kg) kid, respectively. Sahel (56.33g/day) and RS (56.22g/day) had similar preweaning average daily gain but, both gained more significantly ( $p < 0.001$ ) than WAD (35.31g/day). Red Sokoto, however gained more than S at postweaning stage, while WAD still had the lowest ( $p < 0.001$ ) gain. Effect of season on preweaning gain followed the same trend as body weights. Effect of parity, litter size and sex on rate of gain, which significantly ( $p < 0.01$ ) favoured 4<sup>th</sup> parity, single and male kids respectively at the preweaning stage were not significant at the postweaning stages. The results of this study revealed that growth of Nigerian breeds of goats is generally low. Effort is required to provide standard environment, particularly at the preweaning stages, for improved productivity. In addition, before selection, adjustment is needed for any factors that affect performance.

**KEY WORDS:** Genetic, environmental, growth, goats.

## INTRODUCTION

The potential of goats as source of meat, milk, fiber and manure is attributed to their wide distribution in the tropics especially in smallholdings where they are reared as sources of income.

Where they are kept primarily for meat, body weights and growth are used to evaluate their performance. The increase in quantity of meat is determined principally by three factors: growth rate, live weight at slaughter and total number of goats available for slaughter (Devendra, 1985). Nevertheless, growth performance in developing countries is low due to their poor genetic make up and, probably influence of certain environmental factors (Warmington and Kirton, 1990; Das and Sendalo, 1992; Hussain *et al.*, 1996). Poor performance of local breeds of goats as compared with the exotic breeds had been reported by different authors at different ages (Arjun *et al.*, 1984; Chawla *et al.*, 1984; Ikwegbu and Ofodile, 1994; Akpa, 2000). On effect of season of birth on growth some authors (Lyatuu *et al.*, 1994) revealed that animals born in the wet season performed better than those born in the dry season due to the availability of forages. Others (Karua and Banda, 1994) were of the view that incidence of diseases and parasites, which are more prevalent in the wet season, affect the performance on animals in the wet season. Males are, generally, heavier than females especially at the preweaning stage (Sebhatul *et al.*, 1994). Animals born singles also performed better than those from multiple births (Hussain *et al.*, 1996) while parity effect is in line with the pattern of milk supply from the does (Stobart *et al.*, 1986). Kids from pimplarous does are therefore lighter in weight than those from multiparous does (Mavrogenis *et al.*, 1984).

Since attempts at raising exotic breeds and maintaining their crosses in the humid tropics had not been very successful because of environmental conditions of the tropics (Berhanu *et al.*, 1994), it is imperative to utilize the enormous potentials of local breeds available in these areas to encourage productivity. To exploit the maximum genetic potential of these breeds, efforts should be made to identify factors that hinder growth and development. This study was therefore undertaken to evaluate the response of growth traits

to different sources of variations with a view of providing the most suitable environment for improved productivity.

## MATERIALS AND METHODS

### Study site and animal management

The experiment was carried out between 1999 and 2003 at the university of Maiduguri Teaching and Research Farm. Maiduguri town is located in a semi arid region of West Africa on latitude 11°38' North and longitude 32°17' East of the equator at an altitude of 354 meters above sea level. The temperature of this region varies from 23°C to 40°C.

Animals were managed on semi intensive system: grazing twice (morning and evening) in a day. Supplementation in form of groundnut hay and a mixture of wheat offal and cowpea husk (1:10) were offered during pregnancy, lactation, weaning and late dry season. The animals were routinely treated for parasites and bacterial infections using ivermectin and oxytetracycline L.A. respectively.

### Data collection

The weights of the newborn kids were taken 24 hours after birth. Subsequently, monthly weights, including weaning weight (3 month weight) were taken up to 9 months of age. Preweaning and postweaning daily gains were calculated as follows:

$$RG = \frac{W2 - W1}{A}$$

Where:

RG = Preweaning/ Postweaning rate of gain (g/day)  
W1 = Birth weight for preweaning gain/ Weaning weight for postweaning gain (g)  
W2 = Weaning weight for postweaning gain / Weight at nine months for postweaning gain (g)  
A = 120 days (Age at weaning) for preweaning gain / 150 days (difference between 270 days and 120 days) for postweaning gain

### Statistical analysis

Least squares analyses were carried out for the fixed

**N. K. Alade**, Department of Animal Science, Faculty of Agriculture. University of Maiduguri, Maiduguri,

**S. T. Mbap**, Department of Animal Science, Faculty of Agriculture. University of Maiduguri, Maiduguri,

**J. Alivu**, Department of Animal Science. Faculty of Agriculture. University of Maiduguri, Maiduguri.

effects of breed, season, year, parity, litter size and sex using General Linear Model of SPSS (2001). Preliminary analysis revealed that interactions between factors were not significant, hence, they were not considered in the final analysis. The fixed effects for the least squares analysis of variance was as follows:

$$Y_{ijklmn_o} = U + Y_i + S_j + P_k + B_l + L_m + X_n + e_{ijklmn_o}$$

$Y_{ijklmn_o}$  = the  $o^{\text{th}}$  observation of an individual of the  $l^{\text{th}}$  breed and  $k^{\text{th}}$  parity belonging to  $n^{\text{th}}$  sex  $m^{\text{th}}$  litter and born within the  $j^{\text{th}}$  season of the  $i^{\text{th}}$  year

U = Overall mean

$Y_i$ ,  $S_j$ ,  $P_k$ ,  $B_l$ ,  $L_m$ , and  $X_n$  are fixed effects of the  $i^{\text{th}}$  year (1=1,4),  $j^{\text{th}}$  season of kidding (j=1,8),  $k^{\text{th}}$  parity of kidding (1,7),  $l^{\text{th}}$  breed group (1,3),  $m^{\text{th}}$  litter size (m=1,3) and  $n^{\text{th}}$  sex (n=1,2) respectively.

weights of goats that ranged from 1.42 kg (West African Dwarf) to 2.07 kg (Sahel) are much lower than 3.29 kg (Kumar and Singh, 1983) and 3.50 kg (Arjun *et al.*, 1984) reported for two exotic breeds (Jamunapari and Saanen), respectively. However, they are comparable to a range of 1.16 to 1.80 kg recorded for Nigerian goats by Ngere (1983). Similar values of 2.05 kg for Barbari, 2.0 kg for Red Sokoto and 1.39 kg for West African Dwarf goats were also reported by Arjun *et al.* (1984), Zakara (1985) and Reynolds and Adediran (1994), respectively. Values in this study are however higher than 1.21 kg reported by Kumar and Singh (1983) and Akpan (2000) in Black Bengal and Red Sokoto goats respectively.

At 3 months, 4.89 kg recorded for WAD is similar to 4.53 kg reported by Acharya (1992) for Black Bengal goats and 4.94 recorded for WAD by Reynolds and Adediran (1994) for WAD goats. Those recorded for S and RS (7.83 kg and 7.41 kg respectively) are similar to 7.91 kg (Barbari) 7.45 kg (Jamnapari) and 7.60 kg (Mashima) reported by

## RESULTS AND DISCUSSION

### Body weights

Table 1 shows the body weights of kids according to breed season, parity, litter size and sex. The average birth

Table 1: Least squares means (SE) of individual body weights (kg) at various ages (days)

	BW0	BW90	BW180	BW270
n	192	111	103	94
OM	1.77	6.71	9.14	11.96
SE	0.07	0.45	0.76	1.07
Gen	***	***	***	***
S	2.070.1	7.830.36	10.630.62	13.491.10
RS	1.810.06	7.410.35	10.240.71	13.771.01
WAD	1.420.04	4.890.33	6.550.68	8.630.98
Season	n.s.	**	***	***
DH	1.79±0.01	6.51±0.38	7.65±0.58	12.05±1.02
DC	1.81±0.04	6.50±0.39	9.24±0.63	13.56±1.21
W	1.72±0.02	7.12±0.35	10.35±0.52	10.29±1.32
Year	**	n.s.	n.s.	n.s.
2000	1.69±0.01	7.60±0.31	10.98±0.52	15.52±1.01
2001	1.72±0.02	6.55±0.52	8.75±0.72	12.84±0.98
2002	1.69±0.01	6.04±0.38	8.78±0.69	12.57±0.91
2003	1.98±0.04	6.65±0.50	7.12±0.59	6.92±0.73
Parity	n.s.	n.s.	n.s.	n.s.
1	1.65±0.04	5.80±0.36	7.9±0.66	10.24±0.99
2	1.72±0.01	6.65±0.41	8.35±0.62	10.09±0.91
3	1.80±0.03	7.02±0.45	9.11±0.58	11.87±0.90
4	1.90±0.01	7.14±0.42	10.06±0.75	13.15±1.00
5	1.90±0.02	6.89±0.40	8.81±0.76	13.08±1.03
6	1.56±0.05	6.75±0.45	10.52±0.7	13.08±1.06
7	1.70±0.03	-	-	-
LS	***	**	**	**
1	1.96±0.05	7.49±0.49	11.17±1.01	13.64±1.11
2	1.66±0.03	6.27±0.42	9.45±0.72	12.33±1.12
3	1.69±0.02	6.37±0.42	8.79±0.82	9.92±1.91
Sex	**	***	**	**
1	1.88±0.01	7.34±0.51	9.88±0.74	12.64±0.93
2	1.67±0.02	6.08±0.47	8.40±0.68	11.28±0.931

\*, \*\*, \*\*\* are  $p < 0.05$ ,  $p < 0.01$ , and  $p < 0.001$  levels of significance respectively. n = number of animals, n.s = Non significant, O.M = Overall mean, W.A.D. = West African Dwarf, Se = Standard error, DH = Dry hot, DC = Dry cold, W = Wet, Gen = Genotype, LS = Litter size, Sex 1 = male: 2 = female.

Arjun *et al.* (1984) and Ndlovu and Simela (1996). Higher values of 16.50 kg (Alpine), 16.40 kg (Tahung) and 14.10 kg (Boer- Qing) were however reported for heavy breeds by Anous and Mourad (1993), Mahgoub and Lodge (1996) and Chunxiang *et al.*, (1998) respectively.

At 6 months, like other postweaning ages, body weights of 10.63, 10.24 and 6.55 recorded for S, RS and WAD, respectively are lower than 14.60 kg and 16.50 kg recorded for Alpine and Saanen breeds respectively by Chawla *et al.* (1984). Much higher value (23.29 kg) was also reported by Nagpal *et al.* (1995). For Sirohi breed in India. However, the value recorded for WAD is similar to 6.45 kg reported for the same breed by Reynold and Adediran (1994). Those of Sand RS are also similar to 9.18 kg (Barbari), 9.60 kg (Jamnapari) and 10.30 kg (Mashona East African) reported by Kumar and Singh (1983), Arjun *et al.* (1984) and Ndlovu and Simela (1996) respectively. The influence of genotype on body weights of goats have also been observed in the reports of Ahuya (1997) and Ahuya *et al.* (2002).

Differences between body weights of the different breeds studied showed genetic differences in growth potentials at both prenatal and postnatal stages. Deviation from the values in literature may not only be genetic but also due to differences in climatic, nutritional and management conditions under which the animals were reared. Thus, Warmington and Kirton (1990) cautioned that the performance of local breeds should not be regarded as a reflection of their genetic potential only. True capabilities can only be determined by performance testing of groups of kids under standard conditions of growth.

#### Effect of season

Season did not have significant effect ( $p > 0.05$ ) on body weights at birth. However, animals born in the wet season performed better than those born in the other two seasons at 3 and 6 months of age. At 9 months, animals born in the dry cold season were better than those born either during wet or dry season. The pattern of seasonal effect compares well with the reports of Ndlovu and Simela (1996). The non-significant effect of season at birth agrees with Khombe (1985), Ebozoje and Ngere (1995) and Hussain *et al.* (1996), but is contrary to preweaning superiority of kids born during the wet season over those born during the other seasons reported by Ikwegbu *et al.* (1995). Kids born in the wet seasons performed better other kids at 3 months and 6 months of age perhaps due to availability of pasture of the right quality and quantity (Chawla *et al.*, 1984) since kids born during these periods are not normally given supplementation. The superiority of animals born in the dry cold season over those born in the dry hot and wet seasons at nine months, which agrees with the reports of Das and Sendalo (1992), Karua and Banda (1994) and Lyatuu *et al.* (1994), may not be unconnected with tethering carried out during the wet season that led to poor growth (Karua and Banda, 1992). During the hot season restriction is removed and animals also have access to farm left over for fast growth.

#### Effect of year

With the exception of body weight at 6 months of age, year of birth had significant effect ( $p < 0.05$ ) on weights at different ages. This is comparable to reports in the literature. Mvrogenis (1983) made similar observation on Damascus goats. Ikwegbu *et al.* (1995) reported significant year effect on growth of WAD goats in the Sub humid Nigeria. Other investigators that made similar reports include Khombe (1985), Kassahum *et al.* (1989) and Karua and Banda (1994).

The significant effect of year on weight is not unusual since, there is bound to be differences in management, feeding, sanitary conditions and body conditions of animals from year to year. Growth is also likely to fall when there is adequate or too much rain. This reduces grazing period and feed availability (Karua and Banda, 1994). The result of this study however contradicts the non-significant year effect on body weights of Black Bengal goats (aged one to 12 months)

reported by Das and Sendalo (1992) and Hussain *et al.* (1996).

#### Effect of parity

Generally, parity had no significant effect on body weights. The non significant parity effect on body weights at all ages (except at birth) is in agreement with reports of several authors (Mittal, 1979; Arjun *et al.*, 1984; Khan and Singh, 1989; Hussain *et al.*, 1996) as against the significant effect recorded by Mavrogenis (1983) in Damascus goats and Ikwegbu *et al.* (1995) in WAD goats.

Does, in their late parities, may have favourable maternal environment for producing heavy kids (Khan, 1980). However, the amount of fleshing and fattening in their body can hinder proper development of the foetus (Moulick and Syrstad, 1970). Additionally, the increasing rate of multiple births may have a negative effect on body weights of individual kids (Awemu *et al.*, 1999).

#### Effect of litter size

Litter size had significant effect ( $p < 0.05$ ) on body weights at all ages. Body weights tended to decrease with increasing litter size, though differences became visible with advancing age. At birth, singles performed better than multiple due to competition for uterine space and available nutrients (Awemu *et al.*, 1999). Warmington and Kriton (1990) concluded in their study that competition for milk during suckling could make singles heavier by 1.2 kg at birth and 3.5 kg at weaning. Hussain *et al.* (1996) also reported persistency of effect of birth type from birth to yearling age. Mourad and Anous (1998) and Alexandre *et al.* (1999) made similar observations in Common African, Alpine and Alpine crossbred goats respectively. However, Ikwegbu *et al.* (1995) found that the effect of litter size was not significant at any age except at birth. This observation was due to milk offered to the kids before weaning (Ebozoje *et al.*, 1995).

#### Effect of sex

The results of the gender analysis showed that, at all ages, males were heavier than females. Different investigators have made similar observations. Das and Sendalo (1992) reported significant effect of sex on weights at 4, 12 and 18 months of age while, Ebozoje *et al.* (1995) reported significant effect of age at birth, 3 and 5 months. Alexandre *et al.* (1999) similarly found gender differences at birth, 10, 30 and 70 days of age. Hussain *et al.* (1996) and Awemu *et al.* (1999) however, found non-significant effect of sex in Common African x Alpine crossbred and Red Sokoto goats respectively. In their findings Murad and Anous (1998) reported non-significant sex effect only at birth while Ndlovu and Simela (1998) reported non-significant sex effect at birth and between 90 and 180 days of age.

Males are heavier than females because of longer gestation length (Ebozoje *et al.*, 1995). Disparity in weights of the two kids, especially at birth, may also be due to foetal hormones which promote higher skeletal; growth in males (Awemu *et al.*, 1999).

#### Preweaning and postweaning daily gains

The rates of gains (preweaning and post weaning) recorded (Table 2) are typical of light breeds. They compare favourably with other light breeds but less than values reported for heavy breeds. The average preweaning daily gain (49.45 g) is similar to 53.00g reported by Karua and Banda (1992) for indigenous Malawi breed of goats. Ademosun (1994) and Ikwegbu *et al.* (1995) reported 38.00 g and 41.20, respectively for WAD goats in Sub humid Nigeria. Ndlovu and Simela (1996) recorded 48.80 g for East African goats in North East Zimbabwe. For heavy breeds, Boer goats had preweaning daily growth of 160.00 g (Schoeman *et al.*, 1997) while Toggenburgh had 20.00 g (Ahuya *et al.*, 2002).

Overall postweaning growth of 30.87 g/day recorded in this study is lower than preweaning gain. Similar results

have been reported by Mavrogenis (1983) and Sebhatul *et al.* (1994). Anous and Mourad (1983), Hussain *et al.* (1996) and Mourad and Anous (1998) also reported decreasing weight gain with age in different breeds of goats. Warmington and Kriton (1990) in their study on factors influencing meat production from goats concluded that growth declines as maturity approaches, but it varies with events such pregnancy and lactation. Wilson (1984) made similar conclusion and, in addition, stated that at appoint, age may not have effect on growth. It is more of consequence of poor assimilation of

nutrients from solid feeds as compared to intrinsic effect of the degree of maturity of the animal (Warmington and Kriton, 1990).

Postweaning growth rate of heavy breeds of goats in literature is far higher than the recorded values in this study. Damascus breed had 135 g/day (Mvrogenis, 1983). For Batina goats 100 and 120 g/day have been reported (Anonymous, 1987; Mahgoub and Lodge, 1996) respectively. However, postweaning growth rates (32.56, 36.80 and 23.81

**Table 2: Least squares means (g) of pre- and post-weaning body weights gains.**

	Preweaning weight gain (g/day)	Postweaning weight gain (g/day)
n	110.00	96.00
OM	49.45	30.87
Se	4.38	5.58
Gen	***	**
S	56.33±3.95	32.58±5.21
RS	56.72±3.42	36.22±5.22
WA D	35.31±2.99	23.81±4.11
Season	**	***
DH	42.65±2.96	36.76±3.62
DC	46.98±3.05	43.90±4.99
W	58.73±3.59	11.95±4.97
Year	**	**
2000	60.84±4.11	45.18±5.41
2001	50.48±4.01	34.52±5.39
2002	46.71±3.91	34.17±4.99
2003	39.79±3.54	9.61±4.01
Parity	**	n.s
1	43.56±3.05	20.58±3.86
2	45.83±3.51	18.50±3.99
3	51.63±3.62	28.40±3.45
4	54.54±4.10	35.11±5.21
5	47.80±3.99	36.80±5.22
6	43.35±4.10	45.83±4.99
LS	**	n.s
1	54.29±4.11	38.54±3.01
2	48.52±3.99	36.61±3.06
3	45.55±3.76	20.46±2.99
Sex	**	n.s.
1	54.27±4.22	31.83±3.66
2	44.64±3.96	29.91±3.59

\*, \*\*, \*\*\* are  $p < 0.05$ ,  $p < 0.01$ , and  $p < 0.001$  levels of significance respectively. n= number of animals, n.s = Non significant, O.M= Overall mean, W.A.D. = West African Dwarf, Se= Standard error, DH= Dry hot, DC= Dry cold, W= Wet, Gen = Genotype, LS= Litter size, Sex 1= male: 2= female.

g/day) recorded in this study compare favourably with 30.19, 23.10 and 26.48 g/day reported by Karua and Banda (1992), Ikwegbu *et al.* (1995) and Hussain *et al.* (1996) respectively for pure local breeds.

Superiority of preweaning gain of kids in the wet season (58.73 g/day) over those born in other seasons of other seasons (DH, 42.65; DC, 46.98 g/day) of the year agrees with Awemu *et al.* (1999) who recorded 91.30 g/day for late wet season as against 31.38, 63.79 and 26.03 g/day for wet, early dry and late dry seasons, respectively. Ndlovu and Simela (1996) however recorded 44.70 g/day in the hot dry season as compared to 33.00 g/day for hot wet season. Karua (189) and Karua and Banda (1994) also reported better growth performance in goats in the dry season. The rainy season in not a comfortable period for small ruminants because it is accompanied by high incidence of parasitic infections (Sinha

and Singh, 1997). On the contrary, Ebozoje *et al.* (1995), Ikwegbu *et al.* (1995) and Das *et al.* (1996) observed non significant seasonal; effect on growth rate of goats within 150 days of birth. Ebozoje *et al.* (1995) attributed this to the management system practiced wherein milk was offered to the young kids daily before weaning

Year of birth significantly ( $p < 0.05$ ) affected preweaning gain. This is in line with the reports of Das *et al.* (1996) and Awemu *et al.* (1999). Differences between years may be as a result of changes in management, feeding, sanitary conditions of dans (Mavrogenis, 1983), Ikwegbu *et al.* (1995) and Hussain *et al.* (1996) made contrary observations in West African Dwarf and Black Bengal goats respectively.

The significant effect of parity on preweaning rate of gain corresponds with reports in literature (M,avrogenis *et al.*, 1984; Mavrogenis, 1996). The maximum growth rate at the 4<sup>th</sup>

parity in this report conforms to the reports of Mavrogenis (1983) and Awemu *et al.* (1999) as against the 2<sup>nd</sup> parity reported by Hussain *et al.* (1996). Mavrogenis *et al.* (1999) and Ikwegbu *et al.* (1995) have also given evidence of lower rate of gain of kids from primiparous does as compared to does of higher parities. Inyagala *et al.* (1992) reported similar finding in sheep and attributed it to superior maternal environment of older dams, which translated into better performance of young animals up to weaning.

Differences between pweaning gains of kids from litter sizes agree with reports of many workers especially those who did not subject kids to artificial rearing. Das *et al.* (1996), Mourad and Anous (1998) and Alenxandre *et al.* (1999) made similar observations in different breeds of goats. Das *et al.* (1996) attributed it, mainly to competition for doe's milk by littermates. Artificial rearing tends to remove differences in growth between single and twins (Ebozoje *et al.*, 1995). The relationship between milk yield and preweaning performance accounted for about 60% of total variation in average growth rate between birth and weaning and 40 to 50 % in weaning weights (Jeffery *et al.*, 1971).

Gender as a source of variation for preweaning growth favoured the males. Such difference had been documented by many investigators (Warmington and Kirton, 1990; Mahgoub and LU, 1998). The 18% difference recorded between the two sexes in this study is lower than 25% of Louca *et al.* (1975) and 30% of Nicoll (1985). However, it is higher than 5% reported by Sebhatul *et al.* (1994) but within the range of 10 to 25 % reported by Mavrogenis and Lodge (1984). In their findings on Omani Batina goats, Mahgoub and Lodge (1996) reported that buck grew faster and reached slaughter weights earlier than wether and does. Some authors were of the view that hormonal differences between sexes have resultant effect on growth (Bell *et al.*, 1995). The possibility of influence of higher birth weight of males cannot, however, be ruled out completely since birth weight correlates positively with preweaning gain. (Mourad and Anous, 1998). Different observations were however made by Hussain *et al.* (1996) and Awemu *et al.* (1999) who reported negligible differences between preweaning gains of males and females.

Among all the sources of variation, only breed ( $p < 0.01$ ), season ( $p < 0.001$ ) and year (0.01) affected postweaning gain. Effects of litter size, parity and sex were not significant ( $p > 0.05$ ).

Non-significant effects of litter size and parity have been reported by Mavrogenis *et al.* (1984) and Das *et al.* (1996). Postweaning growth best reflects the genetic potential for growth (Mavrogenis, 1996) and, to a greater extent, is free from maternal factors as litter size and availability of milk (Mavrogenis *et al.*, 1984), hence the non significant postweaning differences between singles and multiples and, between kids from different parities. In addition, similarity in the postweaning growth rates of males and females showed that males could not maintain their superior growth rates above the weaning age. According to Wilson (1987a, b) as males approach sexual maturity they become temperamental, feed intake reduces and consequently, there is reduced weight gain. However, this contradicts observations made by Mavrogenis (1983) and Sebhatul *et al.* (1994).

Variations in postweaning gain due to year of birth confirms the reports of Ikwegbu *et al.* (1995) and Das *et al.* (1996) but is contrary to that of Hussain *et al.* (1996). Yearly differences could be explained by the yearly variation in amount of rainfall that influences pasture growth and availability.

The animals born in the dry cold season had the highest postweaning gains. This is similar to the significant seasonal difference reported by Ikwegbu *et al.* (1995) and Das *et al.* (1996) though, the authors recorded highest postweaning gain during the wet season. Access to crop residues and reduced outbreak of diseases in the dry cold season had contributed to better postweaning gain in this season.

## CONCLUSION

It is concluded from this study that performance of Nigerian local breeds of goats is very low, although they compare well with other light breeds in other developing countries. Improvement in growth performance can however be achieved by providing standard environment of good nutrition and health care. Finally, when selecting for improvement, adjustment for factors that influence performance is necessary, otherwise selection should be restricted to contemporary kids.

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