

## Influence of Age and Sex on Body Weight and Some Body Linear Measurements of Extensively Reared Wad Goats in Derived Savannah Zone of Nigeria

<sup>1</sup>L.O. Ojedapo, <sup>1</sup>T.A. Adedeji, <sup>1</sup>T.B. Olayeni, <sup>1</sup>O.S. Adedeji, <sup>2</sup>A.R. Abdullah and <sup>1</sup>O.O. Ojebiyi

<sup>1</sup>Department of Animal Production and Health, Ladoke Akintola University of Technology,  
 P.M.B. 4000, Ogbomoso, Oyo state, Nigeria

<sup>2</sup>Department of Animal Science, University of Ibadan, Ibadan, Oyo state, Nigeria

**Abstract:** Body weight and body linear measurement (Diagonal body length, Height-at-withers, sac pelvic width, Heart girth) of 259 West African Dwarf (WAD) goats (both sexes) in three age groups (Kid, yearling and Adult) were measured. The least square means for body weight were 6.40, 10.5 and 18.9 kg for kid, yearling and Adult respectively. Means of other body linear measurements also vary within each age group. The variables measured vary positively with age of the animals and the correlations of body weight with diagonal body length, Height at wither, sac-pelvic width and heart girth were high, positive and significant ( $p < 0.01$ ). There is sexual dimorphism in body weight and other body linear measurements in favour of the female goats. The correlation matrix of each of the variable or combination could be used in predicting live weight of the animals.

**Key words:** Body weight, derived savannah, extensive, WAD.

### INTRODUCTION

Within the livestock industry of Nigeria, the small ruminants represent a very important national resource. Sheep and goats are important sources of meat, milk, skin, hair and income to many people. Nigeria is endowed with 34.8 million goats and 22million sheep; yet, the average Nigerian consumes less than 25% of the recommended 34 g/head/day animal protein, that is, less than 9 g (Adebanbo, 2003). Majority of these goats are found in the rural areas of Nigeria. They are adapted to wide geographical and ecological areas in the country.

Smallholders mainly rear WAD goats under semi-intensive or extensive system. Feeding for example is supposed to be based on among other things animal's live weight but this is not so at smallholder's level. Often times, marketing of animals is customary based on visual assessment while drug administration is mostly done by estimation. This occurred because the use of live weight criteria in feeding, marketing and drug administration requires sophisticated facilities, which are expensive and hardly affordable to many smallholder farmers. Scales are not readily available in most rural African farming communities (Mami *et al.*, 1991; Nesamvuni *et al.*, 2000) and impact of research findings have been lessened due to impracticability of relating these visual appearances of animals with their estimated

live weights. Body linear measurements have been used to predict live weights in poultry (Chambers and Fortin, 1984; Monsi, 1992; Okon *et al.*, 1997; Gueye *et al.*, 1998) goats (Hassan and Chiroma, 1990; Ozoje and Herbert, 1977) sheep (Bhadula *et al.*, 1979; Kandasamif and Gupta, 1983) cattle (Buvanendran *et al.*, 1980; Orheruta and Olutogun, 1994) and rabbit (Chineke, 2000; Abdullah *et al.*, 2003).

The present study was therefore undertaken to examine some selected linear body measurements as possible predictors of live weights and contribute to the existing knowledge on some selected linear body measurements as possible predictors of live weights in derived savannah area and possibly develop its applications in the farmer's yard where measuring tape and /weighing machines may not be available.

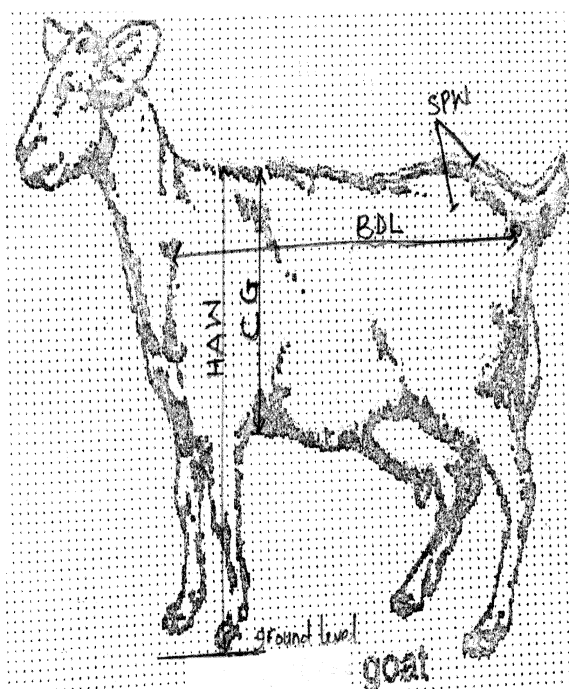
### MATERIALS AND METHODS

**Study area:** The study was conducted at Surulere local government area, Ogbomoso, Oyo state of Nigeria. The area lies on Longitude 4°15' East of the Greenwich meridian and latitude 8°7' North of the equator. The annual rainfall and temperature of the environment are 1247 mm and 27°C, respectively (Oguntoyinbo, 1978). The vegetation of the area is derived savannah and lies between 300 to 600 m above the sea level.

**Animal and management:** WAD of Nigeria have been variously described by various authors (Ademosun, 1992; Ngere, 1986; Ebozoje and Ngere, 1995).

The animals are allowed to freely graze with little or no health care from the owners. Occasionally, the owners do offer the animals' cassava peels, kitchen waste etc as supplements.

**Data collection:** A total of 259 WAD goats of both sexes and at various ages were studied for body weights and some linear body measurements. The ages of animal were classified into kid (<1 year,) yearling (1-2 year) and adult (>2 year). However, efforts were made as much as possible to exclude pregnant goats during the study.



**Data collected on each goat included (Diagram 1):**

- Body weight (Kg)-measured with a hanging scale
- Linear body measurements (cm) with the aid of a measuring tape as described by Searle *et al* 1989; Weiner and Hayter 1974.
- Diagonal Body Length (BDL): This was measured as the distance from the anterior point of the shoulder to the posterior extremity of the pin bone.
- Height-At-Wither (HAW): This was measured as the distance between the most dorsal point of the withers and the ground level.
- Sacral Pelvic Width (SPW) was measured as the distance between tuber coxae and tuber sacrae.
- Heart Girth (CG): This was measured as the circumference of the chest immediately behind the forelegs.

Age of the animals was determined through their dentition as described by Sasty and Thomas (1980).

Below is the annotated Diagram 1 of goat showing the aforementioned linear body measurements.

**Statistical analysis:** Data were subjected to a two-way analysis of variance using the General Linear Model procedure of SAS (1999). The fixed effects of age, sex and interaction of age and sex were determined on the parameters (BDL, HAW, SPW and HG) studied.

**The model is as shown below:**

$$Y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + e_{ijk}$$

Where:

$Y_{ijk}$  = measurement of body weight, BDL, HAW, SPW and HG

$\mu$  = overall mean

$\alpha_i$  = fixed effect of  $i^{th}$  age (kid, yearling, adult)

$\beta_j$  = fixed effect of  $j^{th}$  sex ( male, female)

$(\alpha\beta)_{ij}$  = interaction effect of age and sex

$e_{ijk}$  = random error which is normally distributed with mean = zero and variance  $\delta e^2$  where significant differences were observed, separation of means were done using the Duncan Multiple range test procedure.

The correlation of body weight with the linear body measurements were done with the use of Pearson's Moment correlation procedure (Steel and Torroee, 1980) .

**RESULTS AND DISCUSSION**

Table 1 shows the least square means of body weight and some linear body measurement as affected by age. The values obtained for all the measurements increase as animals advanced in age. This agreed with the work of (Mukherjee, 1978) in Grey and Brown Bengal goats. The values obtained for body weight and linear body measurements in this study is less than those reported by Hassan and Chiroma (1990) for Red Sokoto and WAD goats elsewhere. This may not be unconnected with differences in breeds, environment and ecological factors.

The sex effect on the body weight and some linear body measurement is as shown in Table 2. Hassan and Chiroma (1990) Ngere *et al.* (1979, 1984) reported higher values for all the measurements in favour of male goats than female in Red Sokoto goats. The significantly ( $p < 0.01$ ) higher value favour of the female goats may be due to the sample size in favour of female goats. The owners do sell majority of their bucks at yearling leaving one or two bucks to service the females later.

Table 3 shows the Pearson correlation coefficient bodyweight and of some body linear measurement in WAD goats. (Sex and age of the animals combined).

Table 1: Least square means±standards errors of body weight and some body linear measurement as affected by age

Measurement	Kid	Yearling	Adult
Body weight, kg	6.40±0.27 <sup>c</sup>	10.5±0.37 <sup>b</sup>	18.9±0.63 <sup>a</sup>
Diagonal body length, cm	29.0±0.50 <sup>c</sup>	33.8±0.50 <sup>b</sup>	43.3±0.70 <sup>a</sup>
Height at withers, cm	31.9±0.47 <sup>c</sup>	37.5±0.42 <sup>b</sup>	44.5±0.58 <sup>a</sup>
Sac-pelvic width, cm	8.45±0.19 <sup>c</sup>	9.94±0.19 <sup>b</sup>	13.4±0.25 <sup>a</sup>
Heart girth, cm	41.1±0.65 <sup>c</sup>	47.8±0.71 <sup>b</sup>	60.7±0.77 <sup>a</sup>
No of observation	59	72	128

<sup>abc</sup>Means with a different superscript in a row are significantly different (p<0.01)

Table 2: Least square means±standards errors of body weight and some body linear measurement based on sex irrespective of age of animals

Measurement	Male	Females
Body weight, kg	6.70±0.26 <sup>c</sup>	15.8±0.42 <sup>b</sup>
Diagonal body length, cm	28.8±0.43 <sup>c</sup>	39.7±0.46 <sup>b</sup>
Height at withers, cm	32.2±0.43 <sup>c</sup>	41.8±0.38 <sup>b</sup>
Sac-pelvic width, cm	8.07±0.16 <sup>c</sup>	12.3±0.17 <sup>b</sup>
Heart girth, cm	41.0±0.49 <sup>c</sup>	55.9±0.63 <sup>b</sup>
No of observation	52	207

<sup>ab</sup>Means with different superscripts within a row are significantly different (p<0.01)

Table 3: Pearson's correlation coefficients of body weight and some body linear measurements in West African Dwarf Goats (irrespective of animal's age)

Measurement	BWT	BDL	HAW	SPW	CG
BWT	-				
BDL	0.904**				
HAW	0.929**	0.924**	-		
SPW	0.902**	0.867**	0.892**	-	
CG	0.934**	0.908**	0.915**	0.890**	-

\*\*Significant (p<0.01), BWT-Body weight, BDL-Diagonal body length, HAW-Height at withers, SPW-Sacral pelvic width, CG-Heart girth

Generally, the correlation coefficient are high and significant (p<0.01). The correlation coefficient between body weight and Heart girth was the highest and significant (r = 0.934) followed by Height-at-wither (r = 0.929) and diagonal body length (r = 0.904) in that order. A relatively higher association between body weight and heart girth is possibly due to greater relationship between chest girth (consisting of muscles and bones) and body weight in comparison to height and length. High correlation between body weight and heart girth has also been reported by Singh *et al.* (1979) Prasaad (1977) in Black Bengal goats; (Tandon, 1966) in Beetal goats; (Singh *et al.*, 1979; Moruppa and Ngere, 1986) in Indian goat breeds; (Ibiwoye and Oyatogun, 1987) in Red Sokoto goats. This suggests that these variables or their combination could be used to estimate or predict the live weight of WAD goat.

### CONCLUSIONS

- Body weight and some linear body measurements increased with the age of the animals (kid, yearling and adult) and the values recorded in each parameter or measurement favoured the female goats.

- There is generally high correlation coefficients amongst the parameter studied.

### REFERENCES

Abdullah, A.R., O.A. Sokunbi, D.O. Omisola and M.K. Adewumi, 2003. Interrelationships between body weight and body linear measurements in domestic rabbit. Proceedings of the 28th Annual conference of the Nigerian Soc. for Anim. Prod., 28: 133-136.

Adebambo, O.A., 2003. Animal Breeds: A Nations Heritage University of Agriculture, Abeokuta, Nigeria. Inaugural lecture, Series No. 16 pp: 5.

Ademosun, A.A., 1992. The Scope for improved small ruminant production in the humid Zone of West and Central Africa. The approach of the West African Dwarf goat project. In: Ayeni A.O. and Bosman H.G. (Eds.), Goat Production System in the Humid Tropics. Proc. Int. Workshop, Ile Ife, pp: 2 -13.

Bhadula, S.R., P.N. Bhat and R.C. Garg, 1979. Prediction of body weight from body measurements in sheep. Indian J. Anim. Sci., 49: 775-777.

Buvanendran, V., J.E. Umoh and B.Y. Abubakar, 1980. An evaluation of body size as related to weight of three West African breeds of cattle in Nigeria. J.Agric Sci., (Camb.) 95: 219-224.

Chambers, J.P. and A. Fortin, 1984. Live body and Carcass measurement as predictors of chemical composition of carcasses of male broiler chickens. Poult. Sci., 63: 2187-2196.

Chineke, C.A., 2000. Characterization of physical body traits of domestic rabbit in the humid tropics. Proceeding 25th Annual conference Nigerian Soc. Anim. Prod., Umudike, pp: 237-239.

Ebozoje, M.O. and L.O. Negere, 1995. Incidence of pre-weaning mortality in west African Dwarf goat and their Red Sokoto half breeds. Nig. J. Anim. Prod., 22: 93-98.

Gueye, E.F., A. Nohaye and R.D.S. Branckaert, 1998. Prediction of mature body weight on the basis of body measurements in mature indigenous chickens in Senegal. Livestock Research for Rural Development 10(3) <<http://www.cipav.org.co/lrrd/html>>.

Hassan, A. and A. Ciroma, 1990. Body weight measurements relationship in Nigerian Red Sokoto goats. In: B.Rey, S.H.B. Lebbie and L.Reynolds (Eds.). Small ruminant Research and Development in Africa. Proceedings of the first Biennial conference of the small Ruminant Research Network, ILRAD, Nairobi, Kenya, 10-14, December, 1990. ILCA (International Livestock Centre for Africa), Nairobi, Kenya, pp: 428-432.

- Ibiwoye, T.I.I. and M.O.O. Oyatogun, 1987. Body weight estimation from measured parameters in sheep and goats in the Kainji Lake Basin, Nigeria. 12th Annual Conference, Nigerian Society for Animal Production. Ahmadu Bello University, Shika-Zaria, Nigeria.
- Kandasamy, N. and D.C. Gupta, 1983. Studies on physical measurements live weight and fleece weight in native and cross-bred sheep in a semi arid zone of India. *Trop. Agric. (Trinidad)*, 60: 92-94.
- Mani, R.I., A.R. Abdullah and R. Von Kanfinann, 1991. Composition of scale weight to type estimates and their relationship with condition scores in Bunaji cattle. *Nig. J. Anim. Prod.*, 18: 78-81.
- Monsi, A., 1992. Appraisal of interrelationships among live measurements at different ages in meat type chickens. *Nig. J. Anim. Prod.*, 19: 15-24
- Moruppa, S.M. and L.O. Ngere, 1986. Biometric studies on the Bornu While and Red Sokoto (Maradi) goat breeds. Paper presented at the 11th Annual conference of Nigerian Society for Animal production Ahmadu Bello University; pp: 23-27.
- Mukherjee, D.K., 1978. A study on the estimates of phenotypic parameters of some economic characters in grey and brown bengal goats of bihar. M.Sc. Thesis, Rajendra Agricultural University, Bihar.
- Nesamvuni, A.E., T. Malaudzi, N.D. Ramanyimi and G.J. Taylor, 2000. Estimation of body weight in Nguni-type cattle under communal management conditions. *South Af. J. Anim. Sci.*, 30 (supplement1) <<http://www.sasas.co.za/sajas.html>>
- Ngere, L.O., I.F. Adu and I. Mani, 1979. Report of small Ruminant Breeding Subcommittee. NAPRI Bulletin I. Ahmadu Bello University, Shika-Zaria, Nigeria.
- Ngere, L.O., I.F. Adu and T.O. Okubanjo, 1984. The indigenous goats of Nigeria. FAO/UNEP Animal Genetic Resources Information 3:1-9. FAO (Food and Agriculture Organisation of the United Nations), Rome, Italy.
- Ngere, L.O., 1986. Principle for indigenous animal improvement in the tropics. African experience with sheep and goats. FAO Animal production and Health, pp: 66:125-135.
- Oguntoyinbo, J.S., 1978. Ogbomoso Vital Statistics. In Ogbomoso Community: The dawn of a new era (2002). (C.A.Ajao, E.A. Oyegade and J.O. Gbadamosi Eds.) Daybis Ltd, Ibadan, Nigeria, pp: 2-6.
- Okon, B., J.B. Ogar and O.O. Mgbere, 1997. Interrelationships of live body measurements of broiler chickens in a humid tropical environment Nig. *J. Anim. Prod.*, 24: 7-12.
- Orheruata, A.M. and O. Olutogun, 1994. Pre-and Post-weaning phenotypic relationship between some N'dama Cattle linear measurements in the tropics. *Nig. J. Anim. Prod.*, 22: 76-82.
- Osinowo, O.A., S.A.S. Olorunju, E.O. Otchere and L.A. Arigi, 1989. Development of a weight-band for Yankasa sheep and Red Sokoto goats. Paper presented at the 14th annual conference of the Nigerian society for Animal Production held at Makurdi.
- Ozoje, M.O. and U. Herbert, 1977. Linear measurements in West African Dwarf (WAD) and WAD\* Red Sokoto goats. *Nig. J. Anim. Prod.*, 24: 13-19.
- Prasad, B., 1977. A study on estimates of phenotypic parameters for some economic characters of Black Bengal goats in Bihar, M.V. Sc. (A.H) Thesis Rajendra Agricultural University, Bihar.
- Sasty, S.R. and C.R. Thomas, 1980. Dentition in Farm Animals management. Visca house Ltd. India, pp: 39-45.
- SAS, 1999. Statistical Analysis system users guide: Statistics. S.A.S. institute Inc. Cary, Nc 27513 USA.
- Searle, T.W., N. McCgraham, J.B. Donnelly and D.E. Makgen, 1989. Breed and sex differences in Skeletal Dimensions of sheep in the first year of life. *J. Agric. Sci.*, 113: 349-354.
- Singh, C.S.P., H.R. Mishra, B.D. Sharma, D.K. Mukherjee and D.K. Singh, 1979. A note on body measurements of Black Bengal goats. *Indian J. Anim. Sci.*, 49: 669-671.
- Steel, R.G.D. and J.H. Torrie, 1980. Principles and procedures of Statistics, A biometrical approach. (2nd Edn.), McGraw-Hill Book Co., New York, USA., pp: 633.
- Tandon, H.S., 1966. Relationship of body weight with body measurement in Beetal goat. *Indian J. Dairy Sci.*, 19: 187-190.
- Weiner, G. and S. Hayter, 1974. Body size and Conformation in sheep from birth to maturity as affected by breed, crossbreeding, maternal and other factors. *Anim. Prod.*, 19: 47-65.