IJAAAR 10 (1&2): 1-9, 2014 *International Journal of Applied Agricultural and Apicultural Research*

Pre-weaning growth of lambs under village management system in Konni Local Government Area of Tahoua State in Niger Republic

Na-Allah, Y., Zamnao, A. *Garba, S. and Abdullahi, A. U.

Department of Animal Science, Faculty of Agriculture,
Usmanu Danfodiyo University, P. M. B. 2346, Sokoto-Nigeria.

**Corresponding author: email; sanigarba2003@yahoo.com Phone no. +234(0)8067090255*

Abstract

This study evaluated the pre-weaning growth performance of a total of 144 lambs from 118 dams selected purposively from cooperating farmers' flocks in Gabastawa and Gumbi villages in Konni Local Government Area of Tahoua State in Niger Republic. Body weight of the lambs was assessed weekly, using the hanging type weight-balance, for a period of 12 weeks. Prior to the weekly weighing, each of the lambs was identified, using plastic number tags, on the bases of breed, sex, birth type, location of flock, nutritional status and parity of dam which were recorded on the lambs' record card. Data collected was analyzed using SPSS software package (SPSS, 1995); and student's t-test as well as Duncan's new multiple range tests were used for mean separations. Results of the study revealed that mean bodyweight of lambs increased from 2.56±0.75 kg at one week after birth to 10.25±1.80 kg at 12 weeks after birth. Mean body weight gain of the lambs was 641 g week^{-1} (or 91.5 g day^{-1}). The lambs' pre-weaning body weight changes produced a linear regression equation; Y = 0.598x + 3.518; and R^2 = 93%. Of the various factors considered, only nutritional status of dam showed significant (P < 0.05) effect on the lambs' pre-weaning body weights. Lambs from dams that had adequate nutrition weighed significantly (P < 0.05) heavier from week 2 (5.99±2.5 kg) to week 12 (13.14±2.2 kg); followed by those lambs from dams that had moderately adequate nutrition from week 6 to 12 and than those from the dams that had inadequate nutrition from week 2 (3.55±1.9 kg) to week 12 (8.83±2.0). It can be concluded that the pre-weaning growth performance of lambs in this study was comparable to those obtained under on-station and the results underscore the importance of adequate nutrition as a major factor that influences lambs pre-weaning growth performance under the village production system. Hence, adequate nutrition of dams should be ensured to improve the pre-weaning growth of the lambs and overall productivity of sheep in the study area.

Key words: Pre-weaning growth, Lambs, Traditional management system, Niger Republic

Introduction

Sheep are among the hardy animals that survive the harsh climate, rudimentary housing and health management conditions in the arid and semi-arid tropical environments. Sheep in Niger Republic are among the most adapted domestic animals and occupies a very important place in the livestock sector of the country (Tim, 2006). With a population of 9,192,017 heads; the domestic sheep accounted for about 29.28% of the total grazing domestic livestock in

the country (RGAC, 2007). According to FAO (1978), sheep in Niger Republic are kept primarily for the breeding and production of mutton. The domestic sheep, together with goats, contributed 26.6, 10.3 and 30.9% of the total national production of meat, milk, and skins, respectively. They are also valuable assets to the local farmers and are used as an emergency source of cash. They are also regarded as an integral part of the family unit and are slaughtered at home for ceremonial and ritual celebrations such as naming and marriage ceremonies as well as during religious festivals. Five breeds have been identified as native sheep of Niger Republic, namely; *Balami, Uda, Yankasa, Ara-Ara and Koundoum* (INRAN, 1996).

According to RGAC (2007), about 62.42% (5,737,811 heads) of the sheep in Niger Republic are kept in villages under the traditional production systems in villages. The remaining 37.58% are being produced under the nomadic (18.35%) and transhumant (18.73%) production systems. However, most of the studies carried out in the country on the growth performance of lambs were conducted under experimental stations (Dumas, 1977; IEMVT, 1980; Kabbali and Berger, 1990; INRAN, 1996; Abolude, 2002), whereas, the general conditions in the experimental stations are better than those under which the village farmer operates. Thus, results from the experimental stations can hardly represent the animals' rearing conditions. It is therefore necessary to carry out evaluation of growth performance of lambs under the village production system.

The present research was, therefore, aimed at evaluation of the pre-weaning growth performance of lambs under the traditional management system in Gabastawa and Gumbi villages of Konni Local Government Area of Tahoua State, Niger Republic and assess the possible influence of breed of dam, sex of lamb, birth type, location of flock, nutritional status and parity of dam on the lambs' pre-weaning growth. According to Buvanendran *et al.* (1981), the usual measure of growth is the body weight change measured at regular intervals. Some factors also influence growth performance of lambs under tropical conditions; which include the breed, lambs' initial body weight (or birth weight), sex (male or female), birth type (whether single or multiple), nutritional status and age (or parity) of dam, location of flock as well as diseases and parasites (Ngere *et al.*, 1979; IEMVT, 1980; Adu and Buvanendran, 1982; Hassan *et al.*, 1990; Hassan, 2000).

Materials and Methods

Study Area

This study was conducted in Gabastawa and Gumbi villages in Konni Local Government Area (KLGA) of Tahoua State in Niger Republic. Konni Local Government is located in the Southern part of Tahoua State (latitudes $13^0$43' and $14^0$16'N; and longitudes $4^0$27' and $5^0$45'E) and is bordered by Illela Addar Local Government Area in the North, Dogondoutchi Local Government Area in the West, Illela Local Government Area (Federal Republic of Nigeria) in the South and Bouza and Madaoua Local Government areas in the East. The KLGA covers an area of 4661km^2 and comprises of 148 villages whose inhabitants engage mainly in crop and livestock production (DDATDC, 2007). The climate of the area is arid with Sahelo-Soudanian vegetation type. The study area receives a rainfall range of 450 - 700 mm

per annum. The relative humidity varies considerably; from maximum of 74 % in August to minimum of 10 % in February. Minimum ambient temperature of about 10 ^{o}C is normally recorded in December/January and maximum of 44^{o}C in April. The most common grasses are *Cenchrus biflorus, Eragrostis tremula*; with other herbs, such as *Sida cordifolia, Zornia glochidiata* being inter seeded, especially in grazing lands. Dominant trees in the study area include *Piliostigma reticulum, Balanites aegyptiaca*, *Acacia* and *Combretum* species. The dominant shrubs are *Guira senegalensis* and *Combretum micranthum* (Atté, 2007).

Methodology

A weekly monitoring of the body weight changes of one hundred and forty-four (144) newly born lambs from one hundred and eighteen (118) dams purposively selected from cooperating farmers' flocks of sheep was carried out for a period of twelve weeks in Gumbi and Gabastawa villages of Konni Local Government Area of Tahoua State in Niger Republic. Each of the study lambs was identified using plastic number tag tied by the neck and allocated a performance record card; on which was recorded sex of lamb, birth type, location of flock, breed, parity and nutritional status of dam. Breed of dams was determined phenotypically, using coat colour; while information on parity of dam (number of times a dam gave birth) was supplied by the dam owner. Nutritional status of dam was assessed using body condition score by visual observations. The study animals were grazed in communal grazing areas for 5 - 6 hours daily in both Gabastawa and Gumbi villages, although, level of feed supply in the grazing areas was described as generally inadequate but water supply was adequate. Farmers, however, used legume hays and cereal crop by-products from their farms for supplementary feeding of their animals.

Data Collection and Analysis

Body weights of the lambs were determined using hanging scale, and weighing was conducted on Wednesdays in Gumbi, and on Mondays in Gabastawa villages. Data collected were analyzed using SPSS software package (SPSS, 1995). Student's t-test and Duncan multiple range test were used to separate means that showed significant differences.

Results and Discussion

Mean body weight changes

The mean weekly body weight changes of the study lambs during the 12-week period and its variations according to breed, sex, birth type, location of the lambs, nutritional status and parity of the dam are presented in Table 1The lambs recorded a mean initial body weight of 2.56±0.75 kg at week one; which increased to 10.25±3.6 kg at week 12. This gave a total weight gain of about 7.69 kg during the 12 week period. This is equivalent to mean weekly gains of 641 g or daily gain of 91.5 g. The mean initial body weight of the lambs in this study (2.56±0.75 kg) is slightly higher than the 2.17kg reported as birth weights for Uda lambs in Niger (Ibrahim, 1975), 2.38 kg for Djallonke (Sahelian) lambs in Mali (Bourzat, 1979) and 1.5 – 2.2 kg for lambs in Southern Chad (Berger, 1979). The heavier initial weight obtained for the lambs in this study could be due to the possible weight gains by the lambs during the week before weighing was conducted. The mean

initial body weight of the lambs in this study is, however, within the range of 2.44 – 3.80 kg reported as birth weights for Uda lambs and 2.24 – 3.60 kg reported for Yankassa lambs from various on-station studies in Nigeria (Adu and Ngere, 1979; Adu *et al*., 1979; Buvanendran *et al*., 1981; Adu and Buvanendran, 1982; Hassan, 2000).

The mean body weight recorded for the study lambs at 12 weeks (84 days) of age in this study (10.25±3.6 kg) is within the range of values reported as weaning weight for Uda (8.38 – 13.71 kg) and Yankassa (9.14 – 12.75 kg) lambs at 90 days of age from various on-station studies in Nigeria (Buvanendran *et al*., 1981; Adu and Buvanendran, 1982; Hassan *et al*., 1990; Osinowo *et al*., 1994). The mean body weight gain obtained in this study is however; lower than 16.5 kg recorded for Fulani lambs in Senegal at 90 days (Berger, 1979). The mean pre-weaning weight gain obtained for the lambs in this study (91.5 g per day) is within the range of 76 – 118g per day for Uda and 65 – 109 g per day for Yankassa lambs from various on-station studies in Nigeria (Buvanendran *et al*., 1981; Adu and Buvanendran, 1982). The lambs' weekly body weight changes produced a linear regression equation in the form; $Y = 0.598x + 3.518$, and R^2 value of 0.93 (or 93%) as shown in Figure 1.

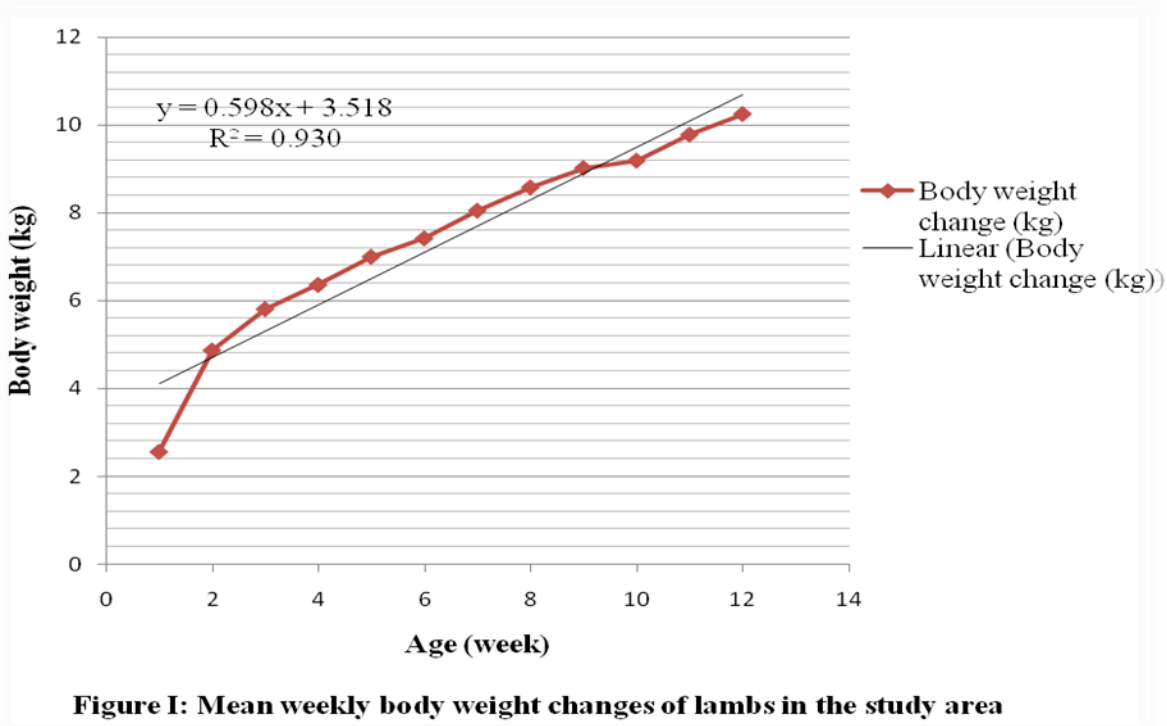

Figure I: Mean weekly body weight changes of lambs in the study area

Table 1 also indicates that, of the various factors considered (breed, sex, type of birth, location of flock, nutritional status and parity of dam), only the nutritional status of dam showed significant ($P < 0.05$) effect on the lambs' pre-weaning body weights. The different nutritional status of dams (adequate, moderate and inadequate) may

be a reflection of the differences in management practices of the animals, particularly the level of feed supplementation by the individual farmers in the study area (Wilson *et al*., 1983). Body weight of lambs from dams that had adequate, moderate and inadequate nutrition, which were initially statistically ($P > 0.05$) same (2.93±1.1 kg, 2.83±1.5 kg and 2.60±1.6 kg), differed significantly ($P < 0.05$) thereafter. The lambs from dams that had adequate nutrition weighed significantly ($P < 0.05$) heavier from week 2 (5.99±2.5 kg) to week 12 (13.14±2.2 kg); followed by those lambs from dams that had moderately adequate nutrition from week 6 to 12 and than those from the dams that had inadequate nutrition from week 2 (3.55±1.9 kg) to week 12 (8.83±2.0). Many researchers have already attested to this fact (Rombaut and Vlaenderem, 1976; Tchakerian, 1979; Djibrillou, 1986; Hassan, 2000; Na-Allah *et al.*, 2004); probably due to influence of the dam's nutritional status on milk production.

Although the effects of breed, sex, birth type, location of flock and parity of the dam were not statistically ($P > 0.05$) significant, the Uda lambs weighed slightly higher (3.14±0.8 kg - 11.22±1.9 kg) than the Yankassa lambs (2.29±0.6 kg - 10.70±2.8 kg); the males slightly heavier (3.37±0.7 – 11.22±1.9 kg) than the females (3.00±0.7 - 10.38±2.5); the singles also slightly heavier (3.29±0.7 - 11.38±2.1 kg) than the twins (3.14±0.7 - 10.53±2.6 kg) and lambs from Gumbi were slightly heavier (3.28±0.6 - 11.29±2.5 kg) than those from Gabastawa (3.16±0.7 - 10.67±2.3 kg). However, lambs from dams on higher parities (4 – 6) had slightly heavier initial body weights (3.23±1.9 - 4.00±0.5 kg) than those from dams on lower parities (1 – 3) (2.40±1.6 - 2.46±1.1 kg), but the reverse order was the case for the final lambs' body weights (9.38±4.0 - 10.18±3.6 kg versus 11.40±0.0 - 13.28±1.6 kg). Nevertheless, dams on parity 5 recorded comparatively higher values for the initial (4.00±0.5 kg) and final body weights (13.28±1.6 kg).

Table 1 : Mean weekly body weight (mean ± sd) of lambs under village management system in Gabastawa and Gumbi villages of Konni Local Government Area of Tahuoa State, Niger Republic

Lambs Body weight (kg)	Age of lambs (Weeks)											
	1	2	3	4	5	6	7	8	9	10	11	12
Overall body weight (n=144)	2.56±1.5	4.87±2.3	5.81±1.3	6.36±2.1	7.00±2.3	7.42±2.7	8.05±3.0	8.58±3.1	9.02±3.3	9.19±3.6	9.78±3.5	10.25±3.6
Effect of breed of dam												
Uda (n=93)	3.14±0.8	5.92±1.4	5.91±1.1	6.77±1.3	7.43±1.5	8.12±1.6	8.87±1.7	9.44±1.8	9.94±1.8	9.89±2.7	10.8±1.9	11.22±1.9
Yankasa (n=51)	2.29±0.6	5.03±1.5	5.70±1.5	6.50±1.8	7.24±2.0	7.43±2.7	8.40±2.4	8.97±2.6	9.40±2.7	9.85±2.8	10.18±2.8	10.70±2.8
Effect of sex												
Male (n=73)	3.37±0.7	5.77±1.4	5.93±1.1	6.85±1.2	7.53±1.4	8.28±1.6	8.99±1.8	9.55±2.0	9.99±2.1	10.48±2.2	10.86±2.2	11.44±2.2
Female (n=71)	3.00±0.7	5.24±1.5	5.64±1.6	6.42±1.9	7.10±2.2	7.10±2.7	8.15±2.4	8.73±2.4	9.24±2.5	9.01±3.2	9.97±2.6	10.38±2.5
Effect of birth type												
Single (n=122)	3.29±0.7	5.63±1.6	6.18±1.3	6.91±1.6	7.70±1.7	7.93±2.4	8.94±2.0	9.52±2.1	9.99±2.1	10.45±2.2	10.91±2.2	11.38±2.1
Twine (n=22)	3.14±0.7	5.44±1.14	5.32±1.2	6.34±1.5	6.86±1.7	7.58±2.0	8.26±2.2	8.82±2.3	9.17±2.4	9.12±3.2	9.96±2.5	10.53±2.6
Effect of location												
Gabastawa (n=68)	3.16±0.7	4.96±1.3	5.51±1.3	6.23±1.6	6.87±1.8	7.55±1.8	8.28±2.0	8.85±2.0	9.28±2.1	9.14±2.9	10.14±2.2	10.67±2.3
Gumbi (n=76)	3.28±0.6	6.14±1.4	6.08±1.3	7.02±1.4	7.72±1.7	7.96±2.5	8.96±2.1	9.52±2.3	10.02±2.4	10.50±2.5	10.80±2.4	11.29±2.5
Effect of nutritional status of dam												
Adequate (n=24)	2.93±1.1	5.99±2.5	6.67±1.3	7.83±0.8	8.57±0.9	9.55±1.5	10.53±1.8	11.13±2.0	11.82±2.1	12.36±2.2	12.78±2,2	13.14±2.2
Moderate (n=80)	2.83±1.5	5.17±1.2	6.09±0.9	6.42±1.4	7.16±1.6	7.22±2.1	7.79±2.3	8.34±2.6	8.72±2.7	8.63±2.5	9.37±2.0	9.92±2.2
Inadequate (n=40)	2.60±1.6	3.55±1.9	4.75±1.3	5.25±1.5	5.65±1.7	6.29±1.9	6.79±1.9	7.23±1.9	7.58±1.8	7.98±1.9	8.39±2,0	8.83±2.0
Effect of dam parity												
Parity I (n=24)	2.46±1.1	5.43±1.6	5.54±1.6	5.40±2.2	6.01±2.6	6.68±3.0	7.19±3.3	7.61±3.5	8.11±3.7	8.55±3.9	8.95±3.9	9.38±4.0
Parity II (n=32)	2.46±1.6	3.82±2.1	5.63±1.5	5.74±2.6	6.27±2.9	6.94±3.3	7.61±3.6	8.18±3.7	8.56±3.8	8.02±4.5	9.35±4.1	9.74±4.2
Parity III (n=40)	2.40±1.6	4.46±2.7	5.74±1.2	6.91±1.4	7.65±1.6	7.37±2.4	7.90±2.6	8.55±2.9	9.00±3.1	9.31±3.2	9.54±3.3	10.18±3.6
Parity IV (n=22)	3.23±1.9	5.84±3.9	6.61±1.5	7.86±1.4	8.60±0.7	9.25±0.7	9.84±0.5	10.31±0.5	10.85±0.5	11.25±0.6	11.60±0.4	11.96±0.4
Parity V (n=20)	4.00±1.5	6.30±1.5	6.33±1.3	7.63±0.8	8.30±0.6	9.40±1.0	10.70±0.7	11.17±1.2	11.52±2.1	12.3±1.5	12.08±1.6	13.28±1.6
Parity VI (n=6)	3.90±0.8	5.60±1.3	7.10±0.9	8.00±0.7	8.30±0.5	9.10±0.6	10.20±1.2	10.35±0.8	10.40±0.6	10.90±0.2	11.25±0.3	11.40±0.5

Mean values within same column and for the same category carrying different superscripts, a, b, c differ significantly ($P < 0.05$).
sd = standard deviation of means.
'n' indicates number of observations.

Conclusions and Recommendations

The pre-weaning growth performance of the study lambs under the traditional (village) management system in Gabastawa and Gumbi villages was comparable to the values obtained under 'better' production conditions in experimental stations; both in the Niger Republic and the neighboring Zamfara reserve in Nigeria. The results from this study have also underscored the importance of adequate nutrition as a major factor that influences lambs pre-weaning growth under the village management system. Thus, the lambs' pre-weaning growth under the village management system could be regarded as efficient, but farmers should ensure adequate nutrition of their animals, especially the lactating dams for better pre-weaning growth of lambs and overall productivity of sheep in the study area.

References

Abolude C. F. (2002), Management of pre and post-weaning lamb and kids. *In*: Lakpini C. A. M., Adamu A. M., Ehoche O. W., Gefu J. O. (Eds.). *Manual for Small Ruminant Production in Nigeria.* National Animal Production Research Institute, Shika – Zaria, Nigeria, pp. 17-30.

Adu, I. F. and V. Buvanendran (1982). Pre-weaning performance of lambs from pure and crossbred matings among Nigerian breeds of sheep. *World Review on Animal Production,* 18: 73 – 77.

Adu, I. F. and L. O. Ngere (1979). The indigenous sheep of Nigeria. *World Review of Animal Production,* 15: 51-62.

Adu, I. F., W. L. Brinckman and I. S. Kuteyi (1979). Reproductive performance of indigenous sheep and their crosses. *Nigerian Journal of Animal Production*, 6: 38 – 40.

Atte, H. (2007). Attentes et Besoins des Populations en Matiere d'Elevage. Direction Departmentale des Resources Animales. Birnin N'Konni, Tahoua, Niger Republic.

Berger, Y. (1979), Selection et Amelioration des Ovins-Caprin-Centre des Recherches Zootechniques (CRZ) Baouke, Cote d'Ivoire.

Bourzat D. (1979). *Projet Petit Ruminant, Rapport Semestriel*. Ministere du Development Rural, Ouagadougou, Haute Volta.

Buvanendrum V., I. F. Adu, and B. A. Oyejola (1981). Breed and environmental effects on lambs' production in Nigeria, *J. Agric. Sc*. (Cambridge), 98: 9 - 15.

DDATDC (Direction Departementale de l'Amenagement du Territoire et du Development Communautaire 2007). *Monographic du Department de Konni*. Direction Departementale de l'Amenagement du Territoire et du Development Communautaire. Konni, Tahoua, Niger Republic.

Djbrillou O. A. (1986). Croissance et Viabilite de la Chevre Rousse de Maradi au Centre d'Elevage Caprin de Maradi. These, Ecole Inter-Etat des Sciences et de Medicine Vet. Dakar, Senegal.

Dumas, R. (1977). Analyse des Charachteritiques de Reproduction des petits Ruminats du Tchad. *In*: J. Charray, J. Coulomb, J. B. Haumesser, D. Planchenault et P. L.

Pugliese (Eds.); *Les Petits Ruminants D'Afrique Centrale et D'Afrique de L'Ouest: Synthese des connaisances actuells*. Institut d'Elevage et de Medicine Veterinaire de Pays Tropicauux. Paris – France. 295 pp.

FAO (Food and Agriculture Organization of the United Nations, 1978). *Annual Report.* Rome, Italy.

Hassan, W. A. (2000). Biological Productivity of sheep and Goats under Agro silvo-Pastoral Systems in the Zamfara Reserve in North-Western Nigeria. A Ph.D. Dissertation. Justus Liebig University, Giessen, Germany, 259 p.

Hassan, W. A., N. I. dim, V. Buvanendran, B. Y. Abubakar, and O. A. Osinowo (1990). Environmental influence on body weight of Yankas lambs at different ages. *In*: A. O. Akinsoyinu and A. O. Adebanbo (Mrs.) (eds.); *Animal Production in Nigeria*. Proceedings of the 13th Annual Conference of the Nigerian Society for Animal Production (NSAP), held in April, 1988 at the University of Calabar, Calabar, Nigeria. 152 - 166.

Ibrahim, A. T. (1975) Contribution a l´Étute de lElevage Ovin au Niger. Etat actual et Proposition d´Ameleoration. These Doctorat Vetenare-Dekar-Senegal.

IEMVT (Institut d´Elavage et de Medicine Veterinaire des Pays Tropicaux, 1980). Les Petits Ruminants d´Afrique Centrale et d´Afrique de l´Ouest. Paris, France. 295 pp.

INRAN (Institut National des Recherches Agronomiques du Niger, 1996). *Les Races Ovines du Niger*. Institut National des Recherches Agronomiques du Niger. Niamey, Niger.

Kabbali, A. and Y. M. Berger (1990). L'Elevage du Muton dans unPays a Climat Mediterraneen. *Le system Agro-pastoral du Marocco.* 235 pp.

Na-Allah, Y., S. A. Maigandi, H. M. Tukur and A.I. Deneji (2004). Body weights and weight Gains of lambs under the traditional management systems in the villages of Zamfara reserve, North-western Nigeria. *In*: H. M. Tukur, W. A. Hassan, S. A. Maigandi, A. I. Daneji, K. M. Baba and B. R. Olorede (Eds). *Sustaining Livestock Production Under Changing Economic Fortunes*. Proc. of the 29th NSAP Conference held at Usmanu Danfodiyo University Sokoto, Nigeria. 21st-25th March 2004), pp. 370-373.

Ngere, L. O., Adu, I. F. and I. Mani (1979). Report of small ruminants breeding subcommittee, *NAPRI Bullatin* 1: 1.

Osinowo, O. A., B. Y. Abubakar, M. E. Olayemi, R. O. Balogun, O. S. Onofade, A. A. Adewumi, A. R. Trimnell and F. O. Dennar (1994). Pre-weaning performance of Yankassa sheep kept under semi-intensive system of management. *In*: S. H. B. Lebbie, B. Rey and E. K. Erungu (eds.). *Small Ruminant Research and development in Africa.* Proc. Of the 2nd Bienniel Conf. Of the Afri. small rum. res. and netw., held at AICC, Arush, Tanzania, 7th – 11th December, 1992, Pp 65 – 68.

Rambaut, D. and G. V. Vlaenderem (1976). Le Mouton Djallonke de Cote

d'Ivoire en Milieu Villageois: Comportement et Alimentation. *Rev. Elev.-Med-Trop*- 29: 157-172.

RGAC (Recensement General de l'Agriculture et du Cheptel 2007). *Resultats Officiels du Volet Elevage*. Recensement General de l'Agriculture et du Cheptel 2004/07. Niamey, Niger.

SPSS (Statistical Package for Social Sciences 1995). *Statistical Package for Social Sciences Production Facility*. Release 7.0.

Tchakerian, A. (1979). Elevage Ovin Naisseur eleveur en Milieu Agro-pastoral Structure d'exploitation de Boulel-Bambey (Senegal).

Tim, R. (2006). *Sheep Production and Management*. College of Agriculture and Home Economics, New Mexico State University. Available at: http://www.cahe_nmsu/edu/pubs/b/100b15-html.

Wilson, R. T., C. P. Peacock and A. R. Sayers (1983). Livestock production on Masai group ranches 2: Growth and liveweight in goats and sheep at Langata Wuas and the factors influencing them. *Beitrage Tropical Landwirtsch Veterinaermed,* 21(2): 191 – 198.