ESTIMATES OF REPEATABILITY OF LITTER SIZES AT BIRTH AND WEANING IN TRADITIONALLY-MANAGED RED SOKOTO GOATS

FAYEYE, T. R. AND OMOLOSHO, P. O.

[1]Animal Breeding Unit, Department of Animal Production, Faculty of Agriculture, University of Ilorin, Nigeria,
Correspondence: fayetiro@yahoo.com, +234 806 039 5678

ABSTRACT

Records of litter size at birth and weaning of 497 Red Sokoto goats belonging to 87 farm families in 5 communities located in Niger and Kebbi states were obtained using Progeny History Technique of the Participatory Rural Appraisal. The data collected were subjected to a one-way analysis of variance. Estimates of repeatability of litter size at birth and litter size at weaning were obtained from the variance components. Litter size at birth and litter size at weaning averaged 1.28±1.14 kids and 1.14±1.04 kids, respectively. The highest litter sizes at birth and weaning were recorded in the second parity (1.75±0.65 kids and 1.69±0.67 kids, respectively), after which they declined. Estimates of repeatability were very low for the two traits (0.25 and -0.12 for litter size at birth and litter size at weaning, respectively). The present study suggests that both litter size at birth and weaning are largely influenced by non-genetic factors. There is therefore the need for multiple records of each female goat for improved litter sizes at birth and at weaning.

Key words: Repeatability, Parity, Red Sokoto goat

INTRODUCTION

In Nigeria, goats are the most numerous of all types of livestock, numbering about 27.6 million. Red Sokoto goat is widely distributed across the Northern states of Nigeria where it makes significant contribution to the livelihood of many families and individuals. The Sokoto Red is still known for its suitability for fine leather.

Estimate of repeatability has remained one of the tools used in animal breeding; it measures the degree of association between records in the same animal life. This estimate indicates the gain in accuracy expected from multiple measurements. Estimate of repeatability is therefore used by farmers as basis for selection. Repeatability estimate of reproductive traits will indicate the extent at which selection will influence future animal performance (Ibe 2005). Falconer (1989) stated that low estimates of repeatability of reproductive traits could be traced to large influence of non-genetic factors associated with such estimates. The Progeny History Technique of the Participatory Rural Appraisal is an established technique for obtaining data on animals kept under traditional management systems (Kassaye *et al.*, 1992; Iles 1994). There is the need for information on the repeatability of reproductive traits for traditionally- managed animals in Nigeria.

The objective of this study is to estimate repeatability of litter size at birth and at weaning in traditionally- managed Red Sokoto Goat.

MATERIALS AND METHODS

Litter size at birth and weaning records of 497 Red Sokoto does belonging to 87 farmers in 5 communities located in Niger and Kebbi states (Fig. 1 and Table 1) were obtained using Progeny History Technique of the Participatory Rural Appraisal (Armbruster and Bayer, 1992; Kassaye *et al.*, 1992; Iles, 1994). Goats included in this survey belonged to local farmers, individuals or household and government and were all managed under traditional (i.e. free range) system. The animals were identified as Red Sokoto goats based on their phenotypic characteristics and the information given by flock owners. The data collected were subjected to a one way ANOVA of the SPSS (SPSS, 1996) to obtain the required mean square between and within class of the does' records. The litter size records per doe (i.e. k_1) was estimated as the harmonic mean of the litter records of the 497 does. The mean squares were equated to their expected values and the resulting equation solved for the required variance components. Estimate of repeatability was obtained from between and within class variance components using the formula below (Becker, 1992).

$$\text{Repeatability (R)} = \frac{\sigma^2_i}{\sigma^2_i + \sigma^2_e}$$

Where σ^2_i =variance due to the effect of individual animal and σ^2_e = within individual records variance or random error. The

mathematical model for obtaining the variance components used in calculating repeatability is as follows: $Y_{ij} = \mu + \alpha_i + e_{ij}$

Where: Y_{ij} = record from the j^{th} litter by the i^{th} doe
μ = population mean, α_i = effect of the i^{th} doe
e_{ij} = random error. All the effects were assumed to be random, normal and independent with their expectation equals to zero.

RESULTS AND DISCUSSION

The overall mean for litter size at birth and litter size at weaning in this study were 1.28±1.14 kids and 1.14±1.04 kids, respectively. The highest litter size at birth and weaning were recorded in the second parity (1.75±0.65 kids and 1.169±0.67 kids, respectively) (Table 2). The Repeatability estimates for litter size at birth and litter size at weaning for the Red Sokoto does in this study were low (Table 3). The number of kids per birth was slightly lower in the present work compare with 1.35 kids reported for Sudanese Taggar goats under intensive management in Dalanj area of Sudan (Bushara *et. al.*, 2013). The litter size peroformance of Red Sokoto goats in this study was also lower than 1.79±0.05 kids reported for the West African Dwarf goats under intensive management system (Odubote, 1996). The number of kids per birth was however higher than 1.06-1.12 lambs reported in the sub-humid and semi-arid zones in Nigeria (Bayer, 1986,Otchere *et al.*, 1995). The present results therefore suggest a lower reproductive performance of traditionally managed Red Sokoto goats compare with the West African dwarf breed under intensive management systems. The present work shows that the prediction of future reproductive performance of the investigated flock of Red Sokoto goats is highly unreliable, especially when few records of each animals are used. Estimates of repeatability of litter size at birth and weaning in the present work were poorer than the value reported for Yankasa sheep under traditional management in North-Western Nigeria (Hassan, *et. al.*, 2010) and for traditionally managed West African dwarf sheep in Nigeria (Fayeye *et al.*, 2011).

CONCLUSION

The estimates of repeatability of litter size at birth and weaning in traditionally-managed Sokoto Red does were low. The present study suggests that both litter size at birth and weaning are largely influenced by non-genetic factors. There is therefore the need for multiple records of each female goat to determine the culling levels for unproductive does with respect to litter size at birth and litter size at weaning in the investigated flocks.

REFERENCES

Armbruster, T. and Bayer, W. (1986). Traditional small ruminant production in sub humid zone of Nigeria. In. Kaufmann, R. Von, Chater, S. and Blench, R. (Eds.). Livestock systems reasearch in Nigeria's sub-humid zone, pp 141-166.

Becker, W. A. (1992). Manual of Quantitative Genetics .5th edition Academic Enterprises Pullman

Bushara, I, Abdelhadi, O. M. A., Elemam, M. B., Idris A. O., Mekki D. M., Ahmed, Muna M. M. and Abu Nikhiala A. M. (2013). Effect of season of birth and litter size on Taggar goat's production in western Sudan. Wudpecker Journal of Agricultural Research, Vol. 2(4): 128-133.

Falconer D. S. (1989). Introduction to quantitative genetics 2nd Edn, London. Inc.

Fayeye T. R.; Hagan J. K. and Alao S.A. (2011). Estimates of Repeatability of Litter size at birth and weaning in Traditionally-managed West African Dwarf Sheep. Proceedings of the Genetics Society of Nigeria 35th Annual conference, Zaria, Pp 23-28.

Hassan W. A., Wassmuth R., Hoffman I and Steinbach J. (2010). Estimate of repeatability of litter traits in traditionally- managed Yankasa sheep in North- Western Nigeria. Nigerian Journal of Genetics, 23/24,121-127.

Ibe S. N. (1995). Repeatability of growth traits in Nigerian Local Chicken using early records. Nigerian Journal of Animal Production, 22(1), 25-26.

Iles K. (1994). Progeny history data collection technique: A case study from Samburu District Kenya. Rural Rapid Appraisal (RRA) Notes, 20, 71-77.

Kassaye H., Mohammed Y. and Girmay T. (1992). Interviewing cows. Rural Rapid Appraisal (RRA) Notes, 15, 52-53

Odubote I. K (1996). Genetic analysis of the reproductive performance of West African Dwarf goats in the humid tropics, In: Small Ruminant Research and Development in Africa, S.H.B. Lebbieand E. Kagwini (eds). Proceedings of the Third Biennial Conference

of the African Small Ruminant Research Network, 5-9 December 1994, UICC, Kampala, Uganda

Otchere E. O., Mohammed A. K., Gefu J. O., Keripe O. M., Osinowo O. A., Akinpelumi O. P., Sanni S. A. and Lakpini C. A. M. (1995). Small ruminant production under traditional management in Kaduna and Sokoto states of northern Nigeria. Paper presented at 20th Annual conference of the Nigerian Society of Animal Production, Federal University of Technology, Minna, March, 1995.

SPSS (1996). Statistical package for social sciences. Window Release 7.5.1. Standard version.

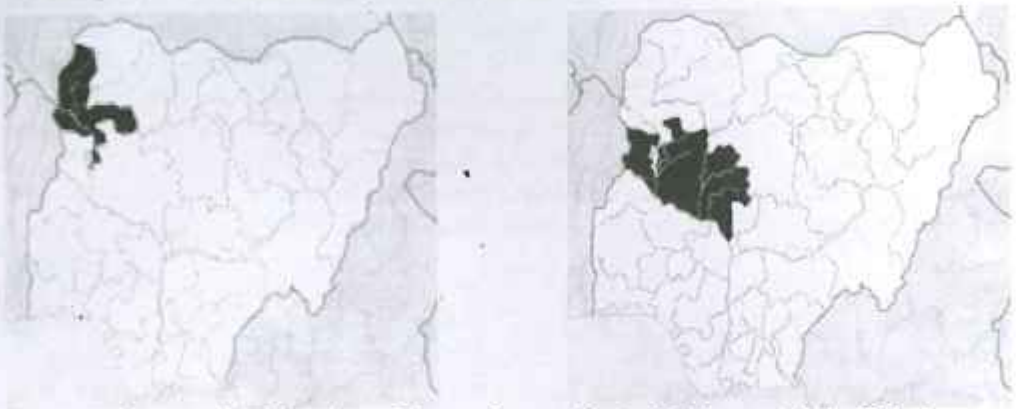

Figure 1: Geographical location of the study area (Left: kebbi state, Right; Niger)

Table 1: States, Local Government and Communities where Progeny history of does were collected

State	LGA	Community	Farmers/ Owners	Does
Kebbi	Zuru	Zuru	19	81
Kebbi	Ribba	Danko Wasagu	15	92
Niger	Rijau	Magagiya	12	132
Niger	Rijau	Rijau	17	106
Niger	Kontagora	Kontagora	24	84
Total	4	5	87	495

Table 2: Mean litter size at birth and weaning for Traditionally-managed Red Sokoto does

Parity	Litter size at birth	Litter size at weaning
1	1.42 ± 0.49	1.35 ±0.49
2	1.75 ± 0.65	1.69 ±0.67
3	1.61± 1.19	1.39± 1.16
4	0.92± 1.30	0.80± 1. 17
5	0.67± 1.34	0.49± 1.06
Overall	1.28± 1.14	1.14 ±1.04

TABLE 3: Estimates of Repeatability of Litter size at birth and weaning in Traditionally-managed Red Sokoto Does

	Litter size at birth	Litter size at weaning
Variance between	0.33	-0.12
Variance within	1.00	0.89
Repeatability ±S.E	0.25	-0.12