Uluslararası Tarım Araştırmalarında Yenilikçi Yaklaşımlar Dergisi
International Journal of Innovative Approaches in Agricultural Research 2022, Vol. 6 (2), 157-163
https://doi.org/10.29329/ijiaar.2022.451.8

Original article

Reproductive Performances of Livestock Goats in Sahelian Region of Africa

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Abstract

The aim of this work was to determinate the reproductive performances of kidirmini goats in the farming systems of the south western of Chad. A total of 3599 local goats of Kirdimi breed in 2 farming systems was used in the study: the semi-extensive (n=2747) and the traditional extensive system (n=852). The age at the first farrowing, the farrowing interval and the cull age were calculated. The fecundity, fertility and prolificacy rates were also estimated in each farming systems. Results showed that the age at the first farrowing, the farrowing interval, the fertility and the fecundity rates did not differ between the systems. The cull age was higher in the traditional extensive system compared to that of the semi extensive system ($p<0.05$). However, the prolificacy rate was higher in the semi extensive system compared to the traditional extensive system ($p<0.05$). In conclusion, most of reproductive performances did not differ between the two goat farming systems. Despite the constraints of the region, reproductive performances of local goats in Sahelian region of Africa are considered acceptable compared to other regions. Thus, Kdirmini goat is a suitable breed in this region that requires good breeding practices to enhance a sustainable productivity.

Keywords: Local Goats, Kidirmini Breed, Reproduction Performances, Farming Systems, Sahelian Region.

Received: 23 May 2022 * **Accepted:** 20 June 2022 * **DOI:** https://doi.org/10.29329/ijiaar.2022.451.8

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INTRODUCTION

Goats are known for their resilience to the difficult environment conditions. They adapt difficult mountain and extreme climatic conditions. They accept low value feed and small quantities maintaining milk and meat production (Monteiro et al., 2017; Lohani and Bhandari, 2020). In Africa, traditionally goats are raised for milk and especially meat which is the most consumed product. Local breeds are the most animals that reunite all cited features for resilience and sustainablility in the production systems. They represent an important component of animal biodiversity (Oldenbroek, 2007). They also reflect the cultural heritage of communities with their traditional products and practices (Vastola, 2015). Moreover, local goats represents the most rearing for smallholders in developing countries, and often associated with others animal rearing such as sheep and cows (Manirakiza et al., 2020). In this regards, they are an important social and economic component for smallholders. In fact, they contribute to the family incomes, and provide sustainable livelihood and poverty reduction in rural areas (Granda et al., 2016; Ouchene-Khilifi et al., 2021). In Chad, Kidirmini is a local breed of goats that is suitable and developed in the several farming systems and even in the Sahelian region of Africa. Unfortunately, the rearing remains marginalized without any control or livestock management strategy. Hence, reproduction performances of Kidirmini goats aren't well evaluated because of the lack of data registration. The objective of the study was to determinate the reproductive performances of Kidirmini goats in the farming systems of the south western of Chad.

MATERIALS and METHODS

Experimental site

The experiment took place in the region of Mayo-Kebbi, in the south western of Tchad. The region's climate is sahelo-sudanian with 2 main seasons: the rainy season (April to October) with a rainfall ranging from 23 to 142 mm and mean temperature from 26 to 33°C, and the dry season (November to March) with a rainfall ranging from 4 to 42 mm and mean temperature from 27 to 33°C.

Animals

A total of 3599 local goats from breeding Kirdimi in 2 farming systems were used: the semi-extensive (n=2747) and the traditional extensive system (n=852). Feeding management is based on terrestrial and aerial grazing with food complementation using agricultural by-products in both system and a little use of forage in the semi extensive system.

The sexual activity of Kidirmini goats seems to be continuous throughout the years. It improves when the feed conditions become favourable, at the end of the rainy season and the start of the dry season (September to November). However, reproduction management in goats breeding is not controlled by farmers in both systems farming: males are kept with females and mating is made

randomly without the intervention of farmers. The peak of parturition is noted during January and February of each year.

Survey

A retrospective survey was elaborated to collect reproductive data goats from 96 farmers (semi-extensive: 73; extensive: 23). The investigation lasted 6 months, from July to December 2020. Breeders were questioned individually in their farm. Reproductive data were collected from farmers in both farming systems.

Reproductive performances

According to the collected data, reproductive parameters were calculated to determinate in each farming systems: the age at the first farrowing, the farrowing interval and the cull age. The farrowing, fecundity, fertility and prolificacy rates were also determinate in each farming systems. Breeders' perception to inbreeding was noted (yes or no).

Statistical analysis

ANOVA was carried out using the software SAS (SAS Institute *Inc.*®). Farming systems (FS) and Inbreeding (I) effects on goat reproductive performances were performed using the GLM procedure:

$$Y_{ij} = \mu + FS_i + e_{ij}$$

Where:

μ: The population mean ;

Y_{ij} : Reproductive performances (age at the first farrowing; farrowing interval; cull age; fertility rate, fecundity rate, prolificacy rate);

e: Residuel error.

Comparison of means was performed using the Duncan test. The threshold of signification was set at $p<0.05$.

RESULTS and DISCUSSION

The age at the first farrowing and the farrowing interval did not vary between the semi extensive and the traditional extensive goat systems (Table 1). This result is in agreement with those reported by Charray *et* al., (1980) et Djibrillou (1989). However, these 2 parameters were lower than the results reported by Cardinale (1997) (16 months) and Mayeriya et al. (2017) (18 to 26 months). In fact, the age at the first farrowing depends on the growth of female goat kids which is related to feed resources avaibility in the studied zone. Slow growth leads to a delay in puberty (Zarazaga et al., 2005). The relationship between nutritional status, growth and the age at puberty could be explained by underfeed

which can delay the puberty to up one year (Sakuray et al., 2004). An optimal management of breeding feed goats could lead to an age at the first parturition at 12-13 months (Mayeriya et al., 2017).

The farrowing interval in our study (Table 1) is lower than those reported by Cardinale (1997) et Mopaté et al. (2014). They showed that farrowing interval was affected by the previous season of the birth of kids' goats, especially when the previous farrowing got at the end the hot season or during the cold season. Thus, unlike the moderate regions in which the reproductive activity is seasonally (Duricic et al., 2012), reproductive parameters are depending on the availability and abundance of food resources.

The cull age of female goats (Table 1) was higher in the traditional extensive than that of the semi-extensive system ($p<0.05$). The survey showed that the causes of culling animals are the lack of reproduction management (42%), diseases (28%), aging (17%) and others technical aspects of livestock management (13%).

Table 1. Variation of the age at the first farrowing, farrowing interval and the cull age according to farming goat systems.

Systems	Age at the first farrowing (months)	Farrowing interval (months)	Cull age (years)
Semi-extensive	13±0.9	7±0.8	7±1.9a
Traditional extensive	13±1.3	7±0.6	8.2±2.2b

a,b : $p<0.05$

The percentage of lactating females is represented in Figure 1. Parturition is usually followed by a nursing period. The goat nurses her kid until weaning. The results showed that the lactating females rate were higher in the semi extensive goat farm system compared to that of the traditional extensive system. The high rate in the semi extensive farming system is attributed to the significant number of animal in this system compared to the traditional extensive farming system. Moreover, it could be also related to the feed management in the semi extensive system which is based on pasture and complementation with forage and other agricultural by-product. The low rate of lactating females in the traditional extensive system could be attributed to pathologies and health problems which lead to kids' mortality at the birth or in the few post-partum days (McDougall et al., 2014).

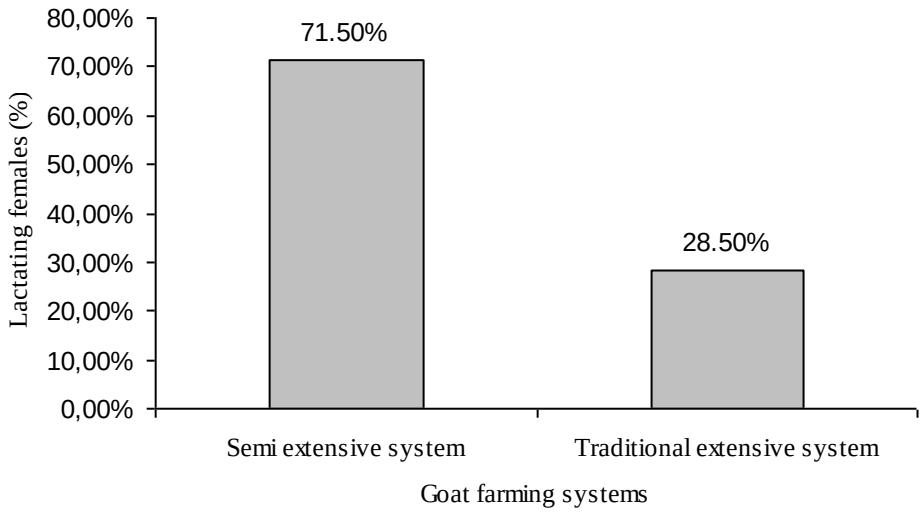

Figure 1. Variation of the rate of lactating females according to goat farming systems.

The fertility and fecundity rates did not differ with both goat farming systems (Table 2). The fertility rate ranged from 69% in the semi-extensive system to 79% for the traditional extensive. This result was lower than those reported by Abassa (1995) who found high rates of goat fertility in the sahel, semi arid and sub-humid zones of Africa. Likewise, the fecundity rate in both goat farming systems was higher than the results reported by Charray et al. (1980) and Abassa (1995) for the sahelian zone of Africa. It is important to note that in our case goat farmers do not practice either nutritional flushing or steaming. Safari (2010) reported that nutritional flushing in small east African goats did not improve the reproductive performances.

The prolificacy rate was higher in the semi-extensive goat farming system than that of the traditional extensive farming system ($p<0.05$). In contrary to the traditional extensive farming system, the prolificacy rate in the semi-extensive farming system was higher than those reported by Faugere et al. (1989) and Mopaté et al. (2014). Our result could be explained by housing, feeding and therefore body conditions of rearing goat in the semi-extensive.

Table 2. Variation of the fertility, fecundity and prolificacy rates in the semi-extensive and traditional extensive goat farming systems.

Systems	Fertility rate (%)	Fecundity rate (%)	Prolificacy rate (%)
Semi-extensive	69±25	197±39	144±78[a]
Traditional extensive	79±34	195±43	112±53[b]

a, b : $p<0.05$

The perception of goat breeders to inbreeding was noted. Goat farmers reported that there is a serious problem of breeding males who are crossed with their offspring: 93% and 96% of breeders respectively in the semi-extensive and traditional extensive goat farming systems recognized that there is inbreeding in their goat farm. Inbreeding has important consequences in goat rearing. It causes deficits

in health, fertility and vitality, and also leads to a loss of genetic variability (Frioud, 2018). It also decreases growth performances (Jannoune et al., 2014). According to the survey, inbreeding is considerable accordingly to the use of the same breeding males in the same herd for long period.

Table 3. Results of the analysis of variance

	ddl	Age at the first farrowing	Farrowing interval	Cull age	Fertility rate	Fecundity rate	Prolificacy rate
Farming system	1	ns	ns	*	ns	ns	*
R^2 (%)		33	40	56	41	27	38

ns: non significant ; *: $p<0.05$

CONCLUSION

Most of reproductive performances did not differ between the two studied goat farming systems. Only the prolificacy rate was lower in the traditional extensive system. This could be explained by the feed management and other environmental factors such as housing and health conditions. However, the culling age was higher in the traditional extensive system which could be explained by the lack of follow-up and assistance of goat herd. Based on these findings, goat farmers have a lack of knowledge on livestock management particularly on reproduction and even in health and feed. The study showed that despite these constraints, reproductive performances of local livestock goats in Sahelian region of Africa are considered acceptable compared to other regions. Thus, Kdirmini goat is a suitable breed in this region that requires good breeding practices to enhance a sustainable productivity.

Acknowledgement

The authors acknowledge the goat farmers of Mayo-Kebbi for their cooperation during the study.

REFERENCES

Abassa K.P. (1995). Reproductive losses in small ruminants in sub-saharan Africa: A review. ILCA Working document. International Development Research Centre, Ottawa, Canada.

Charray J., Coulomb J., Haumesser J.B., Planchenault O. & Pugliesse P.L. (1980). Les petits ruminants d'Afrique centrale et d'Afrique de l'ouest : synthèse des connaissances actuelles. IEMVT, Maison d'Alfort, France, 519p.

Cardinale E. (1997). Elevage des petits ruminants, connaissance et amélioration de la productivité. Agricultures des savanes du Nord Camroun, vers un développement solidaires des savanes d'Afrique centrale. CIRAD, Actes de l'atelier d'échange, 25-29 novembre 1996, Garoua, Cameroun, 123-135.

Djibrillou O. (1989). Facteurs influent les poids à âge-types des chèvres rousses de Maradi en station au Niger. African Small Research and Development. ILCA, Addis Ababa, Ethiopia.

Duricic D., Grzeli J., Dobranic T., Harapin I., Vince S., Kocila P., Folnozi I., Lipar M., Gracner G.C. & Samardzija M. (2012). Reproductive performance of Boer goats in a moderate climate zone. Vet. Arhiv, 82, 351-358.

Faugere O., Faugere B., Merlin P. & Moulin C.H. (1989). L'élevage traditionnel des petits ruminants dans la zone de Louga. ISRA/IEMVT-CIRAD. Dakar, Sénégal.

Frioud E. (2018). La consanguinité doit être surveillée de près dans les élevages caprins. Agri Hebdomadaire Professionnel Agricole de la Suisse Romande, 9 novembre.

Gnanda B.I., Wereme N'Diaye A., Sanon H.O., Somda J., Nianogo J.A. (2016). Rôle et place des caprins dans les ménages au Sahel. Tropicultura 34(1):10–25

Jannoune A., Boujenane I., Falaki M. & Derquaoui L. (2014). Effets de la cansanguinité sur les performances de croissance et de viabilité des ovins des races Timahdite et Sardi. Revue Marocainedes Sciences Agronomiques et vétérinaires, 2(1), 23-28.

Lohani M., Bahandari D. (2020). The importance of goats in the world. Professional Agricultural Workers Journal, 6(2), 4-19.

Manirakiza, J., Hatungumukama, G., Besbes, B., Detilleux J. (2020). Characteristics of smallholders' goat production systems and effect of Boer crossbreeding on body measurements of goats in Burundi. *Pastoralism* **10,** 2.

Mayeriya K., Ngona I.A., Mbiya L. & Khang Maté A.B. (2017). Détermination de la puberté et de l'âge à la première mise bas des cheverettes en élevage familiale à Lubumbashi, République Démocratique du Congo. Journal of Applied Biosciences, 109, 10673-10679.

McDougall S., Malcom D., Prosser C.G. (2014). Prevalence and incidence of intramammary infections in lactating dairy goats. New Zealand Veterinary Journal, 62(3), 135-145.

Monteiro A. Costa J.M., Lima J.M. (2017). Goat system production : advantages and disadvantages to the animal, environment and farmer. Goat science Sandor Kukovics, IntechOpen.

Mopaté L.Y., Zeuh V., Adoum I.Y. & Nadjissara D., (2014). Structure and reproductive performances of Sahelian goats in the Guera region in central Chad. Open Journal of Animal Sciences, 4(4), 175-181.

Oldenbroek K. (ed) (2007) Utilisation and conservation of farm animal genetic resources. Wageningen Academic Publishers, The Netherlands.

Ouchene-Khelifi N.A., Ouchene N., Lafri M. (2021). Characterization and typology of goat production systems in Algeria based on producers survey. Bulletin of the National Reseach Centre, 45,22.

Safari J.G., (2010). Strategies for improving productivity of small ruminants in Tanzania. Thesis, Departement of animal and aquacultural sciences, Norwegian University of Life Sciences.

Sakurai K., Ohkura S., Matsuyama S., Katoh K., Obara Y. & Okamura H. (2004). Body growth and plasma concentration of metabolites and metabolic hormones during the pubertal period in female Shiba goats. Journal of Reproduction and development, 50, 197-205.

Vastola A. (ed) (2007). The sustainability of agro-food and natural resource systems in the Mediterranean basin. School of Agricultural, Foresty, Food and Environemental Science, University of Basilica, Potenza, Italy.

Zarazaga L.A., Guzman J.L., Domínguez C., Perez M.C. & Prieto R. (2005). Effect of plane of nutrition on seasonality of reproduction in Spanish Payoya goats. Animal Reproduction Science, 87, 253-267.