Influence of season on herd size and birth rate of small-holder goats in the southern guinea savanna

KU Anoh1*, I Abdulahi2 & IK Al-Habib3

1. Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria-Nigeria
2. National Animal Production Research Institute NAPRI Shika-Zaria, Nigeria
3. College of Agriculture and Animal Science, Division of Agricultural Colleges, Ahmadu Bello University Mando-Kaduna State, Nigeria

*Correspondence: Tel.: +2348063465088; E-mail: kevin2us.man@gmail.com

Abstract

The study aimed to evaluate the influence of season on herd size and the birth rate of goats in Southern Guinea Savanna, Nigeria. The study was carried out in Idah, Kogi State, Nigeria. A total of 54 households from 6 villages were used for the evaluation. Structured questionnaires on the socio-economic characteristics of the goat owners were administered. Data on the reproductive performance of goats were collected by visual appraisal. The data collected were on herd size, sex, number of pregnant goats, lactating goats and newly weaned kids. The result showed that more women (63.6%) were involved in goat rearing than males (36.4%), and about 91.6% of the respondents had a herd size of 1-20 goats, while only 8.4% had a herd size of 21-30. The herd structure was 391 females and 184 males. Three breeds of goats were identified, the West African Dwarf (WAD) goats being the dominant (397), followed by Maradi (Red Sokoto) breed (113), and the least was Pygmy breed (75). Season significantly influenced pregnancy and the number of lactating goats. There were more lactating goats during the cold-wet period and more pregnant goats during the hot-dry season. It was concluded that goat production is still at the peasant level, and goats were kept as a supplementary source of income. The conception rate was high during the cold-dry season, which was manifested in the hot-dry season. More awareness is still needed to increase the production of goats in the area. We recommend a reproduction program should be targeted during the cold-dry season where the conception rate is high.

Keywords: Breeds, Goat, Herd-size, Pregnancy, Season

Introduction

Cattle and goats are the leading suppliers of meat in Nigeria (Adeleke et al., 2006). Specifically, about 90% of the country's cattle population and 70% of the sheep and goat populations are concentrated in the northern region of the country (Adeleke et al., 2006). A large number of rural households raise goats with a herd size varying from 3 to 20 heads. These herds represent more than 90% of the total goat population.
in Nigeria (Adedeji et al., 2006). Increasing productivity of goats will contribute significantly to the improvement of the living standard of the rural people. In Nigeria, goats are the most numerous of all the types of small ruminants and their production is increasingly becoming a major source of animal protein (Adebambo, 2002).

The people of Southern Savanna and the rain forest zones of Nigeria seem to be familiar with the rearing of goats than cattle, hence the need to advocate research on goat’s production in these areas. Nigeria pastoral systems are characterized by poor and fluctuating nutritional levels which can cause reproductive inefficiencies in goat flocks. Despite the ability of many local goat breeds such as the Small East African to be non-seasonal breeds, breeding females may exhibit prolonged periods of anoestrus, reduced ovulation rates, an ovulation, high embryonic and foetal losses as a result of poor nutrition and sometimes climatic conditions. (Oni 2002, Rojero et al., 2005; Bushara et al., 2016) Seasonal and climatic changes are a major factor that affects the distribution and production of ruminants in Nigeria. Traditional pastoral producers in the study area (Idah) exert very little control over reproductive activity in their goat herds. Farming accounts for 80% of the population of the area. The major crops grown are yam, cassava, maize, rice and tree crops such as oil palm, citrus, and cashew. The livestock that are commonly kept are goats, sheep and poultry. This study was designed to assess the influence of season on herd size and birth rate of small holder goat herd in Idah LGA, Kogi State Nigeria.

Materials and Methods

Experimental site
This study was conducted in Idah Local Government Area (LGA) of Kogi State Nigeria. Idah is a LGA on the eastern bank of the Niger River in the southern guinea savanna zone, north central region of Nigeria. The LGA has a typical savannah climate with distinct wet and dry seasons. The wet season stretches from April to October, while the dry season is from November to March. The annual rainfall ranges from 1100 mm to 1300 mm. Figure 1 shows the rainfall pattern and Figure 2 shows the temperature and relative humidity in the study area.

Sampling technique
A purposeful sampling technique was used in this study. The study commenced with a primary visit to identify smallholder goats. Fifty-four households from 6 villages namely Allah Okweje, Aloko-inah, Efulu, Ichekene Ekwokata and Ichala-Edeke (Table 1) were used for data collection. Structured questionnaire on the socio-economic characteristics of the goat owners were administered to few literate farmers, and for the illiterate farmers, the questions were read to them. The villages were spread across the local government area and were selected based on the number of goats available and the receptivity of the goat keepers.

Method of data collection
The second visit was for the collection of data on the reproductive performance of the goats. The data was collected by visual appraisal of individual goat to examine the effect of season on the reproductive
efficiency of small holder goat herd. The data collected were on herd size, sex, number of pregnant goats, lactating goats (goats that were still breast feeding their young and newly weaned kids (goats that were no longer suckling). This was done during the cold-dry season (November – February), cold wet season (July – September) and during the hot-dry season (March – May).

Statistical analyses
Descriptive statistics was used to analyze the data on Socio-economic Characteristics of goat owners, herd and breed distributions of goats using SPSS software package, while data on the effect of season on the reproductive performance of goats were subjected to analysis of variance using the statistix 9.0 software and the differences in means were separated using Turkey in the software package.

Results
Socio-economic characteristics of goat owners in the study area
Table 2 shows the socio-economic characteristics of goat owners in the study area. About 62.6% of the sampled farmers were between the ages of 20 – 49 years. It was also found that 63.6% of the respondents were female while 36.4% were male. Majority of the respondents (78.6%) had one form of education or the other while 21.5% had no formal education. Only 15% of the sample goat owners had tertiary education. About 91.6% of the respondents had a herd size of 1 – 20 goats while only 8.4% were having a herd size of 21 – 30. Thirty-four holders representing 63.6% had a household size of between 6 - 10 persons.

Descriptive statistics of goat herd distribution
The goat herd distribution (Table 3) showed that the average herd size was 16.86 goats, within the range of 7 to 30 goats. The herd structure in this study was 391 does and 184 bucks. The average size of the litter from 1 to 4, but majority (90%) of the goats had litter size of 1 and 2, with rare cases of litter size of 4 (0.3 %). The average number of pregnant female and lactating goats were low (1.66 and 2.8) respectively.

Descriptive statistics of the distribution of breeds of goats
Three breeds of goats were identified (Table 4) and were common among the small goat holders in the area. The West African Dwarf (WAD) goats were predominant [397 (68%)], followed by Maradi (Red Sokoto) breed [113 (19%)] and the least popular were Pygmy breed [(75, (13%)]. In the three identified breeds, females were more than males.

Effect of season on the performance of goat herd
The cold-wet season significantly (P<0.01) increased the number of nanny does; the mean values of the nanny does was 7.71 compared to 3.14 what was recorded during the cold-dry and hot-dry seasons respectively. Goats were noticed to be pregnant by visual appraisal and they were significantly (P<0.01) higher in the hot-dry season than during the cold-dry and cold-wet seasons.

Table 1: Breakdown of Sample size amongst the villages in Idah LGA

| S/No | Village                  | House holds |
|------|--------------------------|-------------|
| 1    | Allah Okweje             | 6           |
| 2    | Aloko-inah               | 9           |
| 3    | Efulu                    | 5           |
| 4    | Ichekene                 | 8           |
| 5    | Ekwokata                 | 10          |
| 6    | Ichala-Edeke             | 16          |
| Total|                          | 54          |

Table 2: Socioeconomic characteristics of goat farmers

| Characteristics          | Frequency | Percentage |
|--------------------------|-----------|------------|
| Age (years)              |           |            |
| 20-29                    | 2         | 3.7        |
| 30-39                    | 19        | 35.5       |
| 40-49                    | 13        | 23.4       |
| 50-59                    | 12        | 22.4       |
| > 60                     | 8         | 15.0       |
| Total                    | 54        | 100        |
| Sex/Gender               |           |            |
| Male                     | 20        | 36.4       |
| Female                   | 34        | 63.6       |
| Total                    | 54        | 100        |
| Level of Education       |           |            |
| No Formal Education      | 12        | 21.5       |
| Primary Education        | 24        | 44.9       |
| Secondary/ Grade II      | 10        | 18.7       |
| Tertiary Education       | 8         | 15.0       |
| Total                    | 54        | 100        |
| Herd Size                |           |            |
| 1-10                     | 30        | 56.1       |
| 11-20                    | 19        | 35.5       |
| 21-30                    | 5         | 8.4        |
| Total                    | 54        | 100        |
| House hold Size          |           |            |
| 1-5                      | 9         | 15.9       |
| 6-10                     | 34        | 63.6       |
| 11-20                    | 11        | 20.6       |
| Total                    | 54        | 100        |
Discussion
Age classification shows that majority of the sampled goat owners were middle age and were still in their economic active age which could result in positive effect on production. Older farmers are assumed to have gained knowledge and experience over time and are better able to evaluate technology information than younger farmers (Kariyasa & Dewi 2011; Mignouna et al., 2011). Age classification is relevant to this study because adoptability of new farming techniques and productivity is influenced by age (Hall and Khan, 2002). More females were interested and were involved in the rearing of goats in the study area (Gefu, 2002) than male probably because goats are docile and easy to manage compared to cattle. Education plays a major role in creating awareness among farmers and influences the adoption of innovations. (Mignouna et al., 2011; Lavison 2013; Namara et al., 2013). Most people in Nigeria with tertiary education qualifications prefer white collar jobs to farming. Majority of the farmers in the study area still keep goats as a supplementary source of income and to meet immediate household needs (Gefu, 2002). Household size is important because it influences the amount of care and attention (Mignouna et al., 2011) that is given to the goats especially when they are pregnant and during the dry season when green feeds are scarce for goats.

Herd distribution recorded in this study was lower than the average herd size of 19.2 in the range of 2 to 70 reported in Zaria (FAO, 2009). The herd structure in this study was comparable to the smallholder goats herd structure in Zaria which comprised of 79.3% females and 20.6% males with average buck to doe ratio of 1:19. The high number of females in the herd implied that farmers were conscious of keeping only that category of animals which are productive and can conceive for the sake of increasing their herd size. The number of kids and litter size are similar compared to those reported by Akpa et al. (2010). The average number of pregnant does and lactating goats were low (1.66 and 2.8) respectively. This implied that majority of the females had just weaned their kids and were yet to conceive again or some were in their early stages of pregnancy which was not noticed by visual appraisal.

The result on breeds of goats agrees with Ogah, (2016) who found that the WAD goats are predominant in Kogi and Benue states of Nigeria. The dominance of the WAD goats is likely as a result of the influx of the goats from the southern parts into the study location and also due to the socio-cultural and aptive value of the goat to the farmers. The about 19% brown goats identified in the study area conforms the inflow of the Red Sokoto (brown) from the Northern parts of the state towards the south. Kogi state (Idah) is situated along the commercial route linking the North and South of Nigeria. Lakhini (2002) observed that the central states of Nigeria have a mixture of Northern and Southern types of goats. In the three identified breeds, females were more than males. Most males are usually sold off while more females are kept for reproduction.

Table 3: Descriptive Statistics of Goat Herd distribution

| Parameters | Sum | Mean/SD | C.V. | Min | Max |
|------------|-----|---------|------|-----|-----|
| Herd size  | 585 | 16.86±2.34 | 19.77 | 7.00 | 30.00 |
| Bucks      | 184 | 5.26±1.45 | 20.53 | 3.00 | 9.60 |
| Does       | 391 | 11.17±4.52 | 21.02 | 6.00 | 20.40 |
| Kids       | 202 | 5.77±2.43 | 24.11 | 2.00 | 10.00 |
| Pregnant Does | 58 | 1.66±1.42 | 51.82 | 1.00 | 6.00 |
| Lactating Does | 98 | 2.80±1.56 | 34.98 | 1.00 | 7.00 |

Table 4: Descriptive statistics of the distribution of Breeds of Goat in the study area

| Parameters | Sum | Mean/SD | C.V. | Min | Max |
|------------|-----|---------|------|-----|-----|
| West African Dwarf Goats | | | | | |
| Herd size | 397 | 25.63±5.42 | 9.63 | 14.00 | 29.00 |
| Bucks | 121 | 8.70±2.43 | 12.59 | 7.00 | 10.00 |
| Does | 276 | 17.25±2.43 | 18.40 | 8.00 | 20.00 |
| Maradi | | | | | |
| Herd size | 113 | 14.13±4.52 | 31.99 | 4.00 | 10.00 |
| Bucks | 39 | 2.44±1.27 | 25.47 | 1.00 | 4.00 |
| Does | 74 | 5.12±2.11 | 23.39 | 3.00 | 8.00 |
| Pygmy Goats | | | | | |
| Herd size | 75 | 9.38±3.34 | 25.68 | 3.00 | 7.00 |
| Bucks | 29 | 2.43±2.20 | 40.47 | 1.00 | 3.00 |
| Does | 46 | 3.55±1.6 | 21.65 | 2.00 | 4.00 |
During the cold-wet season, there was increase in availability of green fodder that supports production (Silva et al., 1998; Madibela et al., 2002; Dadi et al., 2008) hence, more milk production by the nanny goats. Nanny goats could afford to comfortably breastfeed their young without stress. This is an indication that young goats can afford to continue to run with their mothers without being restricted by them. The reason for the increase number of pregnant goats during the hot-wet season may be attributed to early conception which might have occurred during the cold-dry season, probably because temperature was favorable (Marai et al., 2008) and this was manifested in the preceding season which is the hot-dry season. Also, it could be because of the presence of the number of males in the flock running with the females (Silva et al., 1998; Webb & Mamabolo, 2004). During the cold –dry season majority of the males and some old females were usually sold for slaughter during festivities like Christmas and Salah. It was concluded that majority of the people that were involved in goat rearing in the study area are educated, within the productive age and were women with small goat herd sizes. The West African dwarf goat is predominant in the area and majority were female goats. Conception rate is high during the cold-dry season which was manifested in the hot-dry season. More awareness is still needed to increase production of goats in the area and reproductive program should be structured to target the cold-dry season for optimum conception (reproduction) and production.

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Conflict of Interest
The authors declare that there is no conflict of interest.

References
Adebanmo OA (2002). Animal Breed: A National Heritage. An Inaugural Lecture, University of Agriculture, Abeokuta Nigeria Inaugural Lecture Series No 16.

Adedeji TA, Ojedapo LO, Adedeji SO, Aderogba TA & Abdullah AR (2006). Characterization of Traditionally Reared West African Dwarf Goats (WAD) in the Derived Savannah Zone of Nigeria. Animal Veterinary Advancement, 5(1): 686-688.

Akpa GN, Alphansus C, Dalha SY & Garba Y (2010). Goat breeding structure and repeatability of litter size in smallholder goat herds in Kano, Nigeria. Animal Research International, 7(3): 1274 – 1280.

Bushara I, ElGazafey B, Muralal MO, Mekki DM, Ahmed UAM & Abu Nikhaila AM A (2016). Effect of Different Seasons on Taggar Goat Performance. International Journal of Research Studies in Agricultural Sciences (URSAS), 2(7): 22-26

Dadi H, Duguma G, Shelima B, Fayera T, Tadesse M, Woldu T & TUCHO TA (2008). Non-genetic factors influencing post-weaning growth and reproductive performances of Arsi-Bale goats. Livestock Research for Rural Development: 20(7), 45-51.

FAO (2009). Small Goat; Red Sokoto Goats. Food and Agricultural Organization, Rome, Italy. ftp://ftp.fao.org/docrep/fao/009/t0376e/t0376e07.pdf, retrieved 13-03-2020

Gefu JO (2002). Socio economic considerations in Small Ruminant Production. Manual for Small Ruminant Production Training Workshop.Held 13 – 18th January, 2002. NAPRI/ABU Shika, Zaria, Nigeria.

Lakpini CAM (2002). Management of Sheep and Goats. Compilation for a Training Workshop on Small Ruminants. Held 13 – 18th January, 2002.NAPRI/ABU Shika, Zaria, Nigeria.

Madibela OR, Mosimanyana BM, Boitumelo WS & Pelaelo TD (2002). Effect of supplementation on reproduction of wet season kidding Tswana goats. South African Journal of Animal Science, 32(1): 14-22.

Marai IFM, El- Darawany AA, Fadiel A & Abdel-Hafez MAM (2008). Reproductive performance traits as affected by heat stress and its alleviation in sheep. Tropical and Subtropical Agroecosystems, 8(2): 209 – 234.

Ogah DM (2016). Breeding strategies for indigenous goat genetic resources among smallholder farmers in north - central Nigeria. Livestock Research for Rural Development. 28, 60. http://www.lrrd.org/lrrd28/4/ogah28060.htm, retrieved 24-02-2020.

Oni O (2002). Breeds and Genetic improvement of small ruminant In: Manual for Small Product in Nigeria. NAPRI (2002). Pp 1 – 7.

Rojero DLM, Lagunas AAM., Santamaria LR & Mendez JV (2005). Reproductive performance in three goat breeds under dry tropics.
conditions in Guerrero, Mexico *Veterinary Mexicain*, 36(2): 147-155.

Silva E, Galina MA, Palma JM & Valencia J (1998). Reproductive performance of Alpine dairy goats in a semi-arid environment of Mexico under a continuous breeding system. *Journal of Small Ruminant Research*, 27(2): 79-84.

Webb EC & Mamabolo MJ (2004). Production and Reproduction characteristic of South African indigenous goats in communal farming system. *Journal of Animal Science*, 34(1): 236-239.

Namara E, Weligamage P & Barker R (2003). Prospects for adopting system of rice intensification in Sri Lanka: A socioeconomic assessment. Research Report 75. Colombo, Sri Lanka: International Water Management Institute.

Lavison R (2013). Factors Influencing the Adoption of Organic Fertilizers in Vegetable Production in Accra, Msc Thesis, Accra Ghana.

Woodsong, C. (1994). “Old farmers, invisible farmers: Age and Agriculture” *Jamaica Journal of Cross-Cultural Gerontology* 9(3): 277–299.

Mignouna B, Manyong M, Rusike J, Mutabazi S & Senkondo M (2011). Determinants of Adopting Imazapyr-Resistant Maize Technology and its Impact on Household Income in Western Kenya: *Ag Bioforum*, 14(3), 158-163.

Hall B & Khan B (2002) Adoption of new technology. New Economy Handbook.

Kariyasa K & Dewi A (2011). Analysis of Factors Affecting Adoption of Integrated Crop Management Farmer Field School (Icm-Ffs) in Swampy Areas. *International Journal of Food and Agricultural Economics*, 1(2): 29-38.