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BODY WEIGHT CHANGES OF GOATS UNDER AGRO-PASTORAL SYSTEM IN ZAMFARA GRAZING RESERVE, NORTH-WESTERN NIGERIA

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ABSTRACT

This study evaluates the effects of location and season on body weight changes of 127 agro-pastoral goats in the North, Centre and South of Zamfara grazing reserve, North-western Nigeria. The study goats were identified using plastic number-tags and weighed monthly for twelve months. Monthly body weight changes were determined for non-lactating does, lactating does, breeding bucks and weaner kids. Data obtained was analysed using the Analysis of Variance (ANOVA) and means that showed significant difference were separated using LSD-test $_{(t < 0.05)}$. Results showed that non-lactating does and weaner kids gained higher ($P < 0.05$) in the Centre (0.7± 0.64 and 0.83±0.64 kg month^{-1}) than in the North (-0.11±0.99 and -0.77±1.6 kg month^{-1}) and South (0.03±0.38 and 0.46±1.49 kg month^{-1}). Mean weight changes of lactating does and breeding bucks did not differ ($P > 0.05$) significantly between the locations. Non-lactating does gained higher ($P < 0.05$) during early dry (4.7±0.41 kg) season and lost weight during late dry season (-1.5±0.87 kg). Lactating does recorded higher ($P < 0.05$) weight change during early dry season (3.7±0.56 kg) compared to rainy and late dry seasons when body weight losses (-2.5±0.39 kg and -1.2±0.59 kg) were encountered. Breeding bucks and weaner kids did not encounter body weight losses and had higher ($P < 0.05$) net annual weight gain (7.9±1.29 and 6.8±1.32 kg). Increasing level of feed supplementation by farmers could improve the animals' rate of gain and will enhance productivity of the agro-pastoral goats in the study area.

Keywords: Body weight; Agro-pastoral goats; Zamfara grazing reserve

INTRODUCTION

FAO (2009) reported about 52.5 million goats for Nigeria. The Federal Department of Livestock and Pest Control Services (FDLPCS, 1992) reported that domestic goats in Nigeria make significant contributions to the nation's economy and provide farmers with income and socio-cultural benefits. According to FDLPCS (1992) and Hassan (2000), over 90% of Nigerian goats are reared in villages under various agro-pastoral husbandry systems with about 70% reared in the Savanna ecological zone of the country. The agro-pastoral goats in Savanna zone of Nigeria rely mainly on natural pastures, crop residues and by-products for nutrition and sustenance. Under this system, the animals gain weight during

the short rainy season (June to September), when there was availability of pasture and loose much of the weight gained in the long dry season (October to May) due to feed shortages that persist in the area (Malami, 2005; Babayemi and Bamikole, 2006; Aregheore, 2009). According to Cronjé (1990), the effects of seasonal weight losses by animals include stunted growth, loss of body condition, predisposing the animals to attack by diseases, reduced rate of conception and birth and high mortality rate of the young animals.

In order to improve livestock productivity in the Savanna zone of Nigeria, there is need to arrest the seasonal weight losses encountered by the animals. This can be achieved through evaluation of body weight change of the animals during the various seasons to map out strategies for proper supplementation. The objective of this study is to evaluate the effects of season and location on body weight changes of goats under agro-pastoral system in Zamfara grazing reserve of northwestern Nigeria.

MATERIALS AND METHODS

Study Area

This study was conducted in the four Agro-pastoral communities in Zamfara grazing reserve, North-western Nigeria. Zamfara grazing reserve, situated at the extreme Northern part of Zamfara state, Nigeria, is located within Latitudes $12^{o}10$" - $13^{o}05$" N and Longitudes 6^{o} 30" - 7^{o} 15" E, at an altitude of 350 m above sea level. It occupies a land area of about 232,500 ha of rangeland which extends about 130 km from north to south and about 30 km from east to west. The reserve encloses four agro-pastoral communities, namely; Dumburum, Shamushalle, Tsabre and Ajja and their farmlands. About 27,250 people have been estimated to be living in the enclaved villages and are mainly agro-pastoral farmers; producing millet, sorghum, cowpea and groundnut as the major crops. The major livestock species reared by the farmers are sheep and goats (Hoffmann, 1998).

The climate of Zamfara reserve was described as semi-arid with short rainy season (from May/June to September) and long dry season (October to April/May). Mean annual rainfall varies from 500 mm in the North to 900 mm in the South (Hofmann *et al*., 1998). The vegetation in the reserve also varies from Sudan Savanna in the North to northern Guinea Savanna in the South. Herbage biomass production increases from North to South of the reserve. Mean annual temperatures average 27^{o}c, with minimum of 17^{o}c in December/January and maximum of 40^{o}c in April/May (Arnborg, 1988).

Methodology

Due to variations in the herbage biomass productivity between North and South of the Zamfara reserve (Arnborg, 1988), the reserve was stratified into North,Centre and South. The North and Centre are represented by Dumburum and Shamashalle, respectively, while Tsabre and Ajja villages represent the South. The three grazing seasons in Zamfara reserve described by Na-Allah (2003), namely; rainy (from June to September) with high feed supply, early dry (from October to January) with medium feed supply and late dry seasons (from February to May) with low feed supply; was adopted for this study.

A total of 127 goats were purposefully sampled from 30 herds of cooperating farmers, with 29, 40 and 58 goats from the North, Centre and South, respectively. The animals were generally ungraded crossbreeds of Sokoto Red and Sahel goats. The animals

were grazed daily between 10.00 a. m. and 6.00 p. m. During the rainy season (June – September), the animals relied almost exclusively on the range for their feed supply. However, during the early dry season (October – January), the animals were supplemented with crop residues; such as cowpea and groundnut hays (*Harawa*) and cereal grain processing by-products (*Dusa* and *Kasari*) and the farmlands were also grazed in addition to range grazing. Lactating ewes were given priority in the supplementation. During the late dry season (February – May), most of the feed resources in the range and farmlands were depleted and the stored crop residues were exhausted, the animals suffered most seriously in terms of feed supply (Na-Allah, 2003).

The study animals consisted of 56 lactating does, 21 non-lactating does, 4 breeding bucks and 15 weaner kids, totaling 96 goats. The remaining 31 were suckling kids; whose pre-weaning and post-weaning body weight and weight changes have been reported (Na-Allah *et al*., 2004). Body weight change of the selected animals was monitored monthly for a period of twelve months, from June 2000 to May 2001.Prior to weighing, each of the study animals was identified using a plastic number-tag tied to it's neck and was allocated a bodyweight record card. First week of each month was slated for visits and weighing of the animals, using a mobile scale (KILCOM – 1).

The monthly body weights for the various animals' categories were used to compute body weight changes. Goat categories and locations were compared for body weight changes using Analysis of Variance (ANOVA) and means that showed significant difference were separated using LSD-test $_{(t < 0.05)}$.

RESULTS

Effect of Location on Body Weight Changes

Result on mean monthly body weight changes of the agro-pastoral goats in the North, Centre and South of Zamfara grazing reserve is presented in Table 1. The result showed that regardless of location, breeding bucks recorded higher ($P< 0.05$) body weight gain(1.29±0.99 kg month^{-1} or 43.0 g day^{-1}) than lactating does (0.20±1.28 kg month^{-1} or 6.7 g day^{-1}). The monthly weight changes for the study goats were similar ($P > 0.05$) across the locations, except for non-lactating does and weaner kids, which differed significantly ($P < 0.05$) between the locations.

The non-lactating does and the weaner kids, which recorded mean monthly weight gains of 0.62± 0.27 kg month^{-1} (20.7g day^{-1}) and 0.52± 1.12 kg month^{-1} (17.3 g day^{-1}), respectively, gained higher ($P < 0.05$) in the centre (0.7± 0.64 and 0.83±0.64 kg month^{-1}) than in the north (-0.11±0.99 and -0.77±1.6 kg month^{-1}) and south (0.03±0.38 and 0.46±1.49kg month^{-1}).Although the mean monthly weight changes of lactating does and breeding bucks did not differ ($P > 0.05$) significantly between the locations, but the animals located in the Centre appeared to have better weight changes especially for lactating does which encountered body weight losses in the north as well as in the south (Table 1).

Table 1: Mean monthly body weight changes of agro-pastoral goats in the North, Centre and South of Zamfara grazing reserve

Category	Body weight changes (kg month^{-1})			
	North	Centre	South	Mean
Non-lactating does	*-0.11±1.99^{b}	0.70±1.64^{a}	0.03±1.38^{b}	0.62± 1.27^{xy}
Lactating does	-0.17±1.57	0.27±1.55	-0.10±1.21	0.20± 1.28^{y}
Breedingbucks	NA	1.29±0.99	NA	1.29± 0.99 ^{x}
Weaner kids	-0.77±1.6^{c}	0.83±0.64^{a}	0.46±0.49^{b}	0.52± 1.12^{xy}

a, b, c, values in the same row carrying different superscript differ ($P < 0.05$); x, y, values in the same column carrying different superscript differ ($P < 0.05$); * Negative values indicate loss of body weight; NA = 'not available'

Effect of Season on Body Weight Changes

Result on body weight changes of the non-lactating and lactating does, breeding bucks and weaner kids during the rainy (June – September), early dry (October – January) and late dry (February – May) seasons in the study area is presented in Table 2. The result showed that regardless of season, breeding bucks recorded higher ($P < 0.05$) cumulative weight gains while the lactating does recorded lower gain. The body weight changes of the non-lactating and lactating does differed significantly ($P < 0.05$) between the seasons, but were similar ($P > 0.05$) for the breeding bucks and the weaner kids.

Non-lactating does recorded net weight gain of 5.8±0.27 kg (equivalent to0.48 kg month^{-1}or16.1 gday^{-1}), gained higher ($P < 0.05$) during the early dry (4.7±0.41 kg) season and lost weight during the late dry season (-1.5±0.87 kg). Lactating does had net weight gain of 1.5±0.58 kg (equivalent to0.48 kg month^{-1}or 16.1 gday^{-1}), recorded higher ($P < 0.05$) weight change during the early dry season (3.7±0.56 kg) compared to the rainy and the late dry seasons when body weight losses (-2.5±0.39 kg and -1.2±0.59 kg) were encountered. Breeding bucks and weaner kids, which body weight changes were similar ($P > 0.05$) across the seasons, recorded net weight gain of 7.9±1.29 (equivalent to mean of 0.66 kg month^{-1} or 21.9 g day^{-1}) and 6.8±1.32 kg (equivalent to 0.57 kg month^{-1} or 18.9 g day^{-1}), respectively, and did not encounter body weight losses during any of the seasons (Table 2).

Table 2: Cumulative body weight changes of agro-pastoral goats during rainy, early dry and late dry seasons

Category	Body weight changes (kg/season)			Net gain (Mean ± SEM)
	Rainy	Early dry	Late dry	
Non-lactating does	2.5±0.66^{b}	4.7±0.41^{a}	*-1.5±1.87^{c}	5.8±0.27^{y}
Lactating does	-0.6±2.39^{b}	3.7±1.56^{a}	-1.6±1.59^{b}	1.5±1.58^{z}
Breeding bucks	2.3±1.50	3.1±1.59	2.5±1.47	7.9±1.29^{x}
Weaner kids	1.3±1.37	2.5±1.33	3.0±1.31	6.8±1.32^{xy}

a, b, c, values in the same row carrying different superscript differ ($P < 0.05$); x, y, z, values in the same column carrying different superscript differ ($P < 0.05$; Negative values indicate loss of body weight

DISCUSSION

Effect of Location

The significantly lower ($P > 0.05$) monthly weight gain by the lactating does recorded in this study could be attributed to the loss of weight encountered by the animals located in the North and South of the reserve (Table 1). This may be explained by limitations of the rangeland pasture and crop residues as well as the supplementation by farmers to meet up with the high nutritional demands of the animals for body maintenance, growth and lactation. The higher ($P < 0.05$) monthly weight gain recorded by the breeding bucks in this study had shown a clear contrast with the lactating does in this regard. The higher ($P < 0.05$) body weight changes by the non-lactating does and the weaner kids in the central zone may be attributed to the high level of feed supplementation by farmers in the central zone compared to in the north and south of the reserve reported by Na-Allah (2003). The mean net weight gain recorded for breeding bucks in this (43.0g day^{-1}) was close to the 49.3 g day^{-1} reported as post-weaning rate of gain of weaner kids in Mali by Wilson (1988).This, however, was lower than the 70.0 g day^{-1} post-weaning rate of gain of weaner kids reported by Na-Allah *et al*. (2004) in the study area. No reports were available on rate of gain by the non-lactating and lactating does and the breeding bucks to compare results obtained in this study.

Effect of Season

The higher ($P < 0.05$) net annual body weight gains recorded by the breeding bucks and weaner kids in this study may be explained by the fact that these male animals did not encounter any loss in body weight (Table 2). This may be explained by adequacy of feed resources available in meeting up the nutritional demands by these animals during all the seasons in the study area. Conversely, the lower net annual weight gains by the breeding females (lactating and non-lactating does) was due to the body weight losses encountered by the lactating does during the rainy and late dry seasons and the non-lactating does during the late dry season (Table 2). The seasonal weight losses encountered by the lactating and non-lactating does in this study amounted to about 60 and 21%, respectively of their gained weights. These body weight losses may be explained by the inadequacy of pasture for grazing in the reserve and crop residues and by-products for supplementation to meet up the nutritional demands by the breeding animals especially during the late dry season (FDLPCS, 1992; Na-Allah, 2003; Malami, 2005; Babayemi and Bamikole, 2006).

CONCLUSION

Results from this study revealed that location of animals and seasons of the year had significant ($P < 0.05$) effect on body weight changes of the agro-pastoral goats at different physiological stages in Zamfara grazing reserve of North-western Nigeria. Goats located in the centre of the reserve, generally gained higher than their counterparts in the North and South of the reserve. Lactating and Non-lactating does recorded lower weight gains than breeding bucks and weaner kids. Increasing level of feed supplementation by farmers could improve rate of gain by goats at different physiological stages and enhance productivity of the agro-pastoral goats in the study area.

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