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Growth Performance Evaluation of Goat Breed Under Farmers Management at Fantale District, Oromia Regional State, Ethiopia

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Abstract

The study was conducted in Fantale districts of east Shoa zone of Oromia regional state with the objective of assessing the productive and reproductive performance of goat under farmers' management condition in fantale districts in East Shoa zone of Oromia Regional State. The study was a monitoring study which took place for two and half years (2014-2016). Body weights (BW, WW, SMW, NMW and YW) records were assessed from 246 heads of sheep goats. The data were analyzed using the GLM procedures of SAS. The overall least square means ($\pm$ SE) for birth, three, six and nine month weights (kg) of goat kids at Fantale district monitoring site were 2.86 ± 0.05 , 8.22 ± 0.15 , 11.35 ± 0.15 , 14.06 ± 0.15 and 17.13 ± 0.18 , respectively. Birth weight was significantly ($P < 0.05$) influenced by season of birth, whereas weaning weight is influenced by year of birth and season of kid birth. In general, goat breed in fantale district monitored site significantly ($P < 0.05$) comparable in some parameters with other goats breed in Ethiopia. Different fixed effect influence growth performance needed to be considered whenever to improve the performance of goat population in this areas. For better productivity of the breed, increase awareness of farmer in utilization of the improved forage and locally available feed resources. To increase in the production and reproductive efficiency of goat in the study site improvement of management system is very crucial.

Keywords: Fantale; Goats; Productive; Reproductive; Weaning weight; Yearling weight

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Introduction

Ethiopia is endowed with abundant livestock resources of varied and diversified nature reared across several agro ecologies [1]. Farm animals as a whole are an integral part of the country's agricultural system and are reared across different agro ecologies of the country [2]. The habitats of the indigenous goats' breeds extend from the arid lowlands (the pastoral and agro-pastoral production system) to the humid mixed farms in the tepid cool highlands [3].

The reproduction and growth performances of small ruminants are important factors influencing flock productivity [4]. The growth traits are important factors influencing profitability in any meat producing enterprise. The reproductive process, birth weight and early growth rate of animals are determined not only by genetic potential, but also by maternal and environmental factors [5]. Body weights and growth rates in pre-weaning are often considered as an early indicator of the late growth and economic benefit and can affect body weight at puberty and at first kidding [6,7].

Performance studies under traditional management practices (on-farm) would provide information on location specific production conditions of performance by breeds and individual animals and breed improvement options appropriate to the system [8,9]. Without such information, some breed populations and unique characteristics they contain may decline significantly, or be lost, before their value is recognized and measures taken to conserve them [10,11].

Reproductive performances of goats together with, survival and growth traits are important determinants of productivity of goats in a meat livestock farming systems [12]. Goats traits need to be recorded for genetic and management improvement. However, no detailed analyses of growth performance, environment and management factors affecting growth and reproductive performance have been documented in the Fantale, central eastern parts of Ethiopia. Therefore, this study assessed the effect of non-genetic factors on growth traits such as birth weight, weaning weight, six month, nine month and yearling under village management conditions to make sound

recommendations for improvement of productivity of goats.

Materials and Methods

Description of the study area

The study was conducted in Fantale districts of the Oromia region from 2014 to 2016. Fantale Districts is located 200 km east of Addis Ababa. It lies at an altitude between 943-1135 m above sea level. The minimum temperature is 28°C and the maximum temperature is 40°C. The annual rainfall averages about 520 mm.

Study sites selection: A total of two study sites (Gola and Turo) were purposively selected for monitoring depending on their flock size and accessibility ten households from each site with average flock size of twenty goats. Two hundred fifty seven does and two hundred forty six kids were monitored for this study.

Data to be collected: Animals under the study were identified by permanent plastic ear tags applied at the beginning, birth or at purchase of the animals to facilitate recording. Performance data were collected from 2014 to 2016 using trained enumerator. The enumerator was supervised and data crosschecking was done by researchers from Adami Tullu agricultural research center.

The following growth performance data were collected:

Birth, Birth weight, Weaning weight, Six month weight, Nine month weight, Yearling weight and Prolificacy (type of birth).

Animal management

The does were kept under village management condition. The management of goats was in such a way that in both the wet and cropping season they were kept on the grazing land. While in the dry season most of the pastoralists in the area were moved their flock from place to place in searching of feeds. Breeding bucks run with the group flock to mate with any does in heat during wet and dry season. The goat breed in the study area was naturally selected for seasonal breeder. Animals were provided fenced/Karla shelter during the night. The goats were tagged and data collectors who resided in villages monitored and followed births date of birth of the does, the type of birth of the does, birth to yearling weight record, deaths, sale and exits of goat in the households of the villages. The growth traits were recorded for animals that gave birth during the monitoring period. Since the start of data collection, internal and external parasite control has been carried out. Ivermectin was used for de-worming and sick goats were treated.

Data management and statistical analysis

All the data collected were entered and managed using Microsoft Excel computer program. The data were analyzed using General Linear Model (GLM) procedures of SAS [13]. Tukey Kramer test was performed to separate means of effect with two or more levels which were significant in the least squares analysis of variance. The traits studied were: Birth weight, Weaning weight, six month weight, nine month weight yearling weight, ADWG. The fixed effects fitted in the model for BW, WW, SMW and YW were Year (2014, 2015 and 2016); season (Autumn, Winter, Spring, and Summer); type of birth at lambing (single, twin) and Sex (Male, Female).

For the analysis of the growth performance of the breed, the following model was used:

The statistical model was explained as follows:

$$Y_{ijklm} = \mu + G_k + S_j + Y_l + L_m + e_{ijklm}$$

Where:

Y_{ijklm} = Observation on birth weight and weight at different ages;

μ = overall mean;

G_k = Fixed effect kid sex (k=male, Female)

S_j = Fixed effect of kid birth season (j=Autoum, Winter, Spring and Sammer);

Y_l = Fixed effect of kid birth years (l=2014, 2015 and 2016);

L_m = Fixed effect of kid birth (m=Single, twin)

e_{ijklm} = is the random error attributed to the n^{th} kid.

Results and Discussion

Birth weight and growth performance of goats in the study areas

The current study result of overall least square mean birth weight of goat breed at the study site had higher value than the report (1.91±0.04 kg) of Belay (2008) for Abergele breed, Hulunim (2014) were reported 2.42±0.05 kg for Borana and 2.19±0.08 kg for Short-eared Somali goats. Only season of birth had effect on birth weight of goat breed at monitoring site at $p < 0.05$ significant levels (Table 1). This may relate to the breeding season and kidding concede with the rainy season which is naturally selected. The current result disagrees with Ahuya et al., 2009 and Belay D., (2008) [14,15] reports that report significant effects of sex and type of birth on birth weight.

The observed overall least square mean birth weight (2.86±0.05 kg) of goat breed at Fantale district was more or less comparable for many of the reports made on different Ethiopian indigenous goat breeds birth weight.

The birth weight is a trait which has a lot of economic importance and therefore kids with higher birth weight are usually has higher growth performance through lifetime [16]. Growth is the most important trait in small ruminant production affecting the contribution of the sector to the farm household through live animal sale and meat production [15].

Weaning Weight Performances

The findings pertaining to the weaning weight performances of the ewes are presented in Table 2. The findings show that the weaning for the kids did not vary across birth type and sex of the kids. This might be ascribed to similar management of the kids in the studied districts. Besides the genotype of the breeds, type of birth and sex has no significant effect on weaning weight. The findings also show that weaning of the kids varied ($P < 0.05$) across year of birth and season

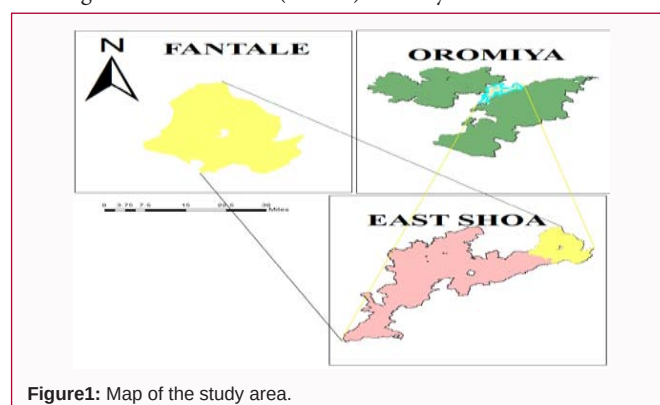


Figure1: Map of the study area.

Table 1: Least squares Mean of birth weight (kg) for goats breed found in Fantale.

Factors	Traits	
	N	Birth weight
Overmeans	246	2.86 ± 0.05
Year of birth		
2014	133	2.90 ± 0.08
2015	108	2.81 ± 0.05
2016	5	2.88 ± 0.16
Season of Birth		
Autumn	125	3.14 ± 0.07 ^a
Winter	57	2.55 ± 0.07 ^b
Spring	51	2.60 ± 0.07 ^b
Summer	13	2.56 ± 0.14 ^b
Type of birth		
Single	211	2.89 ± 0.05
Twin	35	2.66 ± 0.14
Multiply	-	-
Sex		
Male	129	2.90 ± 0.06
Female	117	2.82 ± 0.07

The effect of year of birth, season of birth and sex had no significant effect on birth weight.

Table 2: Least squares Mean of weaning weight (kg) for goats breed found in Fantale.

Factors/parameters	Trait	
	N	Weaning weight
Over means	225	8.22 ± 0.15
Year of birth		
2014	125	8.99 ± 0.23 ^a
2015	95	7.16 ± 0.15 ^b
2016	5	8.90 ± 0.19 ^a
Season of Birth		
Autumn	121	7.88 ± 0.17 ^b
Winter	52	9.37 ± 0.39 ^a
Spring	40	8.07 ± 0.36 ^b
Summer	12	7.11 ± 0.55 ^b
Type of birth		
Single	195	8.15 ± 0.16
Twin	30	8.64 ± 0.47
Multiply	-	-
Sex		
Male	118	8.2195 ± 0.20
Female	107	8.2159 ± 0.22

of birth. The lowest weaning weight was recorded in 2015 and the highest in both 2014 and 2016. The highest weaning weight was observed in kids born in autumn season which may related with the availability of feed resource in that season (Table 2). The weaning weight as obtained in this study is in close accordance with the findings of Netsanet et al., (2016) [17] for Woyto-Guji goats.

However, the weaning weight as observed in this study was higher

Table 3: Least squares Mean of six month weight (kg) for goats breed found in Fantale.

Factors/parameters	Trait	
	N	Six month weight
Over means	210	11.35 ± 0.15
Year of birth		
2014	118	11.57 ± 0.20
2015	92	11.06 ± 0.22
2016	-	-
Season of Birth		
Aouthoman	113	11.56 ± 0.20 ^a
Winter	48	11.15 ± 0.30 ^a
Spring	39	11.44 ± 0.42 ^a
Summer	10	9.63 ± 0.44 ^b
Type of birth		
Single	184	11.40 ± 0.16
Twin	26	11.02 ± 0.49
Multiply	-	-
Sex		
Male	109	11.24 ± 0.20
Female	101	11.47 ± 0.23

Table 4: Least squares mean of nine month weight (kg) for goats breed found in Fantale.

Factors/parameters	Trait	
	N	Nine month weight
Over means	184	14.06 ± 0.15
Year of birth		
2014	109	13.84 ± 0.19
2015	75	14.38 ± 0.24
2016	-	-
Season of Birth		
Aouthoman	113	14.57 ± 0.20 ^a
Winter	43	13.33 ± 0.26 ^{ab}
Spring	19	13.37 ± 0.35 ^{ab}
Summer	9	12.61 ± 0.33 ^b
Type of birth		
Single	161	14.18 ± 0.16 ^a
Twin	23	13.23 ± 0.40 ^b
Multiply	-	-
Sex		
Male	90	14.09 ± 0.20
Female	94	14.03 ± 0.22

than those reported by Alubel Alemu (2015) [3] in Abregele and central highland goats. The differences as observed may be ascribed to the management of the sheep besides the genotypes being reared in the studied areas. While the weaning weight of the goats in the studied districts is lower than those reported by Netsanet et al., (2016) [17] for central highland goats and Deribe G. (2009) [18] for Alaba native goats.

Table 5: Least squares means of yearling weight (kg) for goats breed found in Fantale.

Factors/parameters	Trait	
	N	Yearling weight
Over means	169	17.13 ± 0.18
Year of birth		
2014	105	16.61 ± 0.21 ^b
2015	64	17.99 ± 0.230 ^a
2016	-	-
Season of Birth		
Aouthoman	113	17.62 ± 0.24
Winter	36	15.85 ± 0.21
Spring	12	16.38 ± 0.40
Summer	8	17.19 ± 0.60
Type of birth		
Single	146	17.28 ± 0.20 ^a
Twin	23	16.20 ± 0.22 ^b
Multiply	-	-
Sex		
Male	83	17.3084 ± 0.28
Female	86	16.9605 ± 0.23

Six month weight performance

The result ascribed the six and nine month body weight is presented in Table 3. The findings show that the six month weight for the kids did not vary across year of birth, birth type and sex of the kids. This might be ascribed to similar management of the kids and ewes in the studied districts. Whereas the six month weight significantly ($P < 0.05$) vary on the season of birth with highest value observed autumn season which may be due to the availability of feed resource in this season.

The results related to the six month as recorded in this study too indicate similarity from the results obtained by Netsanet et al., (2016) [17] for Woyto-Guji goats. The current result of six month weight was lower than those reported by Netsanet et al., (2016) [17] Woyto-Guji goats and Alubel Alemu 2015 [3] in Abregele and central highland goats.

Nine month weight performance

The results pertaining to the nine month weight of goat reared in the study area born in different season and year are presented in Table 4. The nine month body weight of the goats were higher ($P < 0.05$) in autumn season where lower value were observed in summer. Year do not have effect ($P > 0.05$) on nine month body weight of kids. The results show that there were differences in nine month kid body weight across different birth type and season of kid birth. This result agrees with report of Alemu (2015) [3] in Abregele and central highland goats.

Nine month weight differences by birth type may be ascribed to the genotype of the bucks/does and also the environment in which they were raised [19]. As the growth increase the development of morphological and anatomical part of the kid is higher in single born animals which related to the nursing of the mother. The skeletal dimension is grossly influenced by the mineral available to the livestock especially calcium and phosphorus [20]. The skeletal

dimension also influences the muscle attachment area there by influencing the body weight and also the stability of the animals [21].

Yearling weight performance

The results as presented in Table 5 indicate that yearling weight of goat (kid) in the study area, the findings show that season of kid birth and sex of kid do not have any effect on yearling weight of the kids. Both the year of birth and type of birth have significant effect ($P < 0.05$) on yearling weight of kids. Single born kids were heavier ($P < 0.05$) at yearling weight than those born twins, which might be related to nutritional factors in and out of the mother. As number of fetuses decrease in uterus, the car uncles attached to each fetus increase, as a result the feed supply to the fetuses thus increases [22].

There is also a reduced nutritional stress through the growing periods for single born animals [23]. The yearling weight of the fantale goats as observed in the present study are in close accordance with the findings of Tucho et al., (2000) among rift valley breed of goats. The similarity as observed may be related to the management besides the genotype of the goats. Contrary to the same, lower values of the trait have been reported by [15], for Abergelle goat type.

Conclusions and Recommendation

The result obtained in the current study, in general, showed that the growth performance of goats in fantale areas is medium as compared to other Ethiopian indigenous goat breeds. Different fixed environmental (non-genetic) factors like season of birth of kids, sex of kids, type of birth of kids and year of birth of kids affected weight at different ages. Kids born in dry season needs special attention. In general, in an effort to improve the productivity of this breeds of goats, these fixed factors needs to be considered.

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