

Performance of the Woyto-Guji Goats under Traditional Management Systems in Konso District, Ethiopia

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Abstract

The study was conducted at lowland part of Konso district to evaluate the performance of Woyto-Guji goat breed managed under traditional management systems. Data on growth performance was collected from 398 kids for two years. The mean values for birth, weaning, six month, nine month and yearling weight of kids obtained were 2.15 ± 0.50 , 9.32 ± 2.28 , 13.32 ± 1.59 , 15.89 ± 2.94 and 18.89 ± 2.86 Kg, respectively. Sex of does, birth type, color type, birth season and parity of kids significantly affected at all ages considered. Male kids were heavier at birth, nine months and yearling weight than females while twin born kids were lighter at all levels of age categories than their single born kids counterparts. Kids born during dry seasons were lighter in body weight from weaning up to yearling weight while white colored kids showed lighter body weight than black and brown colored ones at nine month and yearling weights. Kids from first parity does were lighter at birth of age than kids of higher parity does. The means of pre and post-weaning growth rates obtained were 62.32 ± 24.67 and 28.72 ± 9.79 g day⁻¹, respectively. Sex of does, birth type, color type, birth season and parity of kids significantly affected pre-weaning growth rate. Kids from males, twins, blacks, dry season and second parity were lighter in pre-weaning weight gain. The kidding distribution is affected by seasons. Kids were delivered most frequently from November- January and June-August. The liter size of the study goat breed is 1.13. The significant effect of fixed factors and breeding seasons should be considered for the improvement of the goat productivity in the study areas.

Keywords: Woyto-Guji goat, body weight, growth rate, Konso, traditional management

INTRODUCTION

Goat production is the most important and the living source for people inhabiting in regions not suitable for crop cultivation and cattle production (Daskiran *et al.*, 2006) and are known as the “poor man’s cow” (Ajala, 2004). Goats inhabit in wide range of agro-ecologies and over the whole range of production systems (Payne and Wilson, 1999). The Southern Region, with 5.09 million (17.5%) heads of goat population, ranks 3rd after Amhara (20.83%) and Oromia (26.96%) regions in the country (CSA, 2015).

They contribute significantly for diversifying production to the livelihood of resource-poor farmers in Ethiopian agricultural systems (Sebsibe, 2006). Indigenous goat breeds have special adaptive features for wide range of agro-ecologies and diseases; reproduce and produce at scarce and low quality feed and water resources (Kosgey and Okeyo, 2007), which is ideal to serve as source of income, food (meat and milk), manure and cultural values under traditional production systems (Zelege, 2007).

According to a comprehensive goat breed characterization in Ethiopia, four families were identified based on morphological characteristics (FARM-Africa, 1996). Woyto-Guji goat is classified under Rift-Valley family. They are widely distributed in South Omo, Gamo-Gofa, Southern Sidama and parts of Wolayta zones. They were predominantly managed by pastoral and some by mixed farming systems in semi-arid and arid agro-ecologies (FARM-Africa, 1996).

Growth and reproduction are the most important traits in goat production affecting the contribution of the sector to the households through live animal and meat production. This paper reports the growth and reproduction performance of Woyto-Guji goat under traditional management systems.

MATERIALS AND METHODS

Study Area: The study was conducted in Konso district, in the Southern Nations, Nationalities, and Peoples' Region (SNNPR) of Ethiopia, which is located between at latitude of 5°30 north and a longitude of 37°30 east. Konso is one of the woredas, located in the Great Rift Valley. It is 595 Km, far southwest of Addis Ababa, Ethiopia. Altitude ranges from 610 and 2,000 m.s.l. Unreliable rainfalls not exceeding 800 mm per year with the big rainfall concentrated in March and April. Temperature ranges from below 15 °C at night to 32 °C during the day. Konso is bordered on the south by the Oromia Region, on the west by the Weito River which separates it from the Debub Omo Zone, on the north by the Dirashe special woreda, on the northeast by Amaro special woreda, and on the east by Burji special woreda. The native Konso traditionally practice a distinct and sustainable form of agriculture that involves the building and maintaining of stone terraces, and fertilizing the fields with manure. A central feature of their fields is the endemic tree crop, *Moringa stenopetala*. The main crop is sorghum, along with some root crops and cotton (https://en.wikipedia.org/wiki/Konso_special_woreda).

Flock Management: Goat production in the study areas largely depend on native browses on communal lands and household by-product (Cheka: local brewery drink). During the cropping seasons, they largely depend on hillsides and field margins.

Data source and Management: on-farm flock monitoring is carried out in two kebeles of Konso district which were selected purposively based on availability and population of Woyto-Guji goat breed in the kebeles. 398 kids' data was used for two years for analysis.

At the beginning and during the course of monitoring activity, all kids included were identified by plastic ear-tags applied at birth. Age and parity of the does were determined from data recorded and information from the owners. Data were collected by trained enumerators followed by regular supervision of the researchers.

Data collected on growth include: birth date, birth weight, type of birth, color of kids, sex of kids and doe parity were taken within 24 h of kidding. Body weight was taken every three months by using the Salter Scale (50 Kg capacity with 100 g precision) until yearling weight.

Growth rate (Average Daily Gain, ADG) was computed as: Pre-weaning ADG (gram) = (Three Months Weight-Birth Weight)/90 and Post-weaning = (Yearling Weight-Three Months Weight)/275. All data were coded and recorded in to Excel sheet.

Statistical Analysis: The collected data was analyzed using Statistical Package for Social Sciences (SPSS, version 16.0). The response variables in the analysis were weights at different age categories and Pre- and Post-Weaning growth rate.

The fixed effects considered were sex of kid, birth type and parity of doe. Color type was categorized in to three (Black, Brown and White) depending on recorded data while season of birth is classified in to two (Wet: July to December and Dry: January to June) considering the availability of feed and temperature.

The model was:

$$Y_{ijklm} = \mu + S_i + B_j + C_k + P_l + T_m + \varepsilon_{ijklm}$$

Where

Y_{ijklm} = Observation on birth weight, weaning weight, six months weight, nine months weight, yearling weight and pre- and post-weaning growth rate.

μ = The overall mean

S_i = Fixed effects of i^{th} sex (1= male, 2= female)

B_j = Fixed effects of j^{th} birth type (1= single, 2= twin)

C_k = Fixed effects of k^{th} color type (1= black, 2= brown, 3= white)

P_l = Fixed effects of l^{th} parity ($p= 1, 2, 3, >4$)

T_m = Fixed effects of m^{th} season of birth (1= wet, 2= dry)

ε_{ijklm} = Random error

RESULTS AND DISCUSSION

Birth weight and Weight at Different Age Classes: The overall means of birth weight and weight at different age classes of Woyto-Guji goats were presented in Table 1.

Birth weight: The overall mean birth weight of Woyto-Guji kids (2.15 ± 0.50) was higher than the value reported (1.91 ± 0.04 Kg) for Abergelle goat (Mengiste and Belay, 2013). However, it was lower than the value of 2.34 Kg for Boran Somali goat (Tucho *et al.*, 2000).

Sex of kids showed significant differences ($P < 0.05$) on birth weight. Similar with literature (Ahuya *et al.*, 2009; Zeleke, 2007) males were heavier than their female contemporaries.

Twin born kids were lower ($P < 0.05$) at birth than those born as single which might be related to absence of intra-uterine nutritional and space competition in single born kids unlike that of twin born kids. As the number of fetuses increases in utero, the number of caruncles attached to the each fetus decreases, as a result the feed supply to the fetuses thus reduces (Robinson *et al.*, 1977). This effect of sex was similar with literature (Ahuya *et al.*, 2009; Zeleke, 2007).

Color of kids showed significant differences ($P < 0.05$) on birth weight. Black kids were heavier than their brown and white colored contemporaries.

Kids born in the wet season were heavier ($P < 0.05$) than those born in the dry season. This is probably due to nutritional status of the does during the late stage of pregnancy. Does kidding during wet seasons have better browses and green forages at late stage of pregnancy than does delivered during dry season. Seasonal influence on birth weight of kids functions through its effect on the mothers' uterine environment mostly in late pregnancy stage (El-Tawil *et al.*, 1970). The rapid fetal growth occurs during late pregnancy stage and nutritional stress during this stage resulted birth weight loss and reproductive wastage through abortion (Dunn and Moss, 1992).

Parity of doe had significant effect on birth weight ($P < 0.05$) of kids that kids from first parity does have lighter weight than kids born from other higher parity dams. Both Ahuya *et al.* (2009) and Jimenez-Badillo *et al.* (2009) reported this type of effect. This might be related to doe weight. It was stated that an advance in age of doe up to fourth parity has increased kid weight (Negi *et al.*, 1987).

Weight at different ages: the overall mean three months weight of Woyto-Guji kids obtained in current study (9.32 ± 2.28) was higher than the values of Arsi-Bale kids (8.4 kg) reported by (Tatek *et al.*, 2004) and Highland kids (9.02 ± 0.8 kg) (Tucho *et al.*, 2000).

Single born, males, wet season and later parity were heavier ($P < 0.05$) than twins, female, dry and first born kids. After birth, single born kids have better weight than their twin contemporaries in which twins compete for the milk from single dam. Increased growth of wet season born than dry season born kids was related with dam's nutrition at kidding which in turn influences later age stages (Jimenez-Badillo *et al.*, 2009). Parity increases mothering ability and milk production. This result is in line with literature (Dadi *et al.*, 2008).

Yearling weight of Woyto-Guji goats obtained in current study (18.89 kg) was higher than for Abergelle goats (14.2 kg) reported by (Mengiste and Belay, 2013). It is natural that males have heavier weight than females after puberty.

Table 1: Means of birth, weaning, six month, nine month and yearling weight of Woyto-Guji goats in Konso district

Factors	Birth Weight (Kg)		Weaning Weight (Kg)		Six month Weight (Kg)		Nine month Weight (Kg)		Yearling Weight (Kg)	
	N	Mean±STD	N	Mean±STD	N	Mean±STD	N	Mean±STD	N	Mean±STD
Overall	398	2.15±0.50	283	9.32±2.28	111	13.32±1.59	305	15.89±2.94	180	18.89±2.86
Sex of Kid		*		*		*		*		*
Male	204	2.16±0.47 ^a	131	9.12±2.02 ^a	58	13.42±1.60 ^a	135	15.69±3.06 ^b	106	18.06±2.83 ^a
Female	194	2.14±0.53 ^b	152	9.49±2.48 ^b	53	13.21±1.59 ^b	170	16.06±2.84 ^a	74	15.86±2.87 ^b
Birth Type		*		*	NS			*		*
Single	237	2.31±0.46 ^a	148	9.12±2.54 ^a	2	13.50±2.12	117	17.53±2.77 ^a	59	20.17±3.33 ^a
Twin	35	2.29±0.44 ^b	23	8.49±1.86 ^b			21	16.71±3.13 ^b	17	19.18±3.24 ^b
Color Type		*		NS		*		*		*
Black	21	1.97±0.35 ^a	19	9.08±1.44	19	12.94±1.79 ^b	15	16.03±4.18 ^a	12	17.68±3.06 ^a
Brown	43	1.74±0.53 ^c	39	9.24±1.24	39	13.64±1.23 ^a	35	16.28±1.25 ^a	31	17.86±1.08 ^a
White	62	1.82±0.41 ^b	54	9.29±1.51	51	13.21±1.75 ^a	47	15.25±1.48 ^b	36	17.54±1.22 ^b
Birth Season		*		*		*		*		*
Wet	132	2.07±0.44 ^a	59	9.42±1.36 ^a	57	13.85±1.30 ^a	53	16.75±2.13 ^a	45	18.36±1.60 ^a
Dry	96	1.98±0.53 ^b	53	9.04±1.43 ^b	52	12.73±1.70 ^b	44	14.53±1.09 ^b	34	16.79±0.95 ^b
Parity		*		*		*		*		*
1	32	1.73±0.43 ^d	29	8.59±1.45 ^a	27	13.54±1.67 ^a	27	16.13±3.33 ^a	20	18.11±2.40 ^a
2	23	1.84±0.47 ^b	22	9.35±1.18 ^b	22	12.79±1.63 ^b	20	15.38±1.77 ^b	17	17.04±1.07 ^b
3	29	1.91±0.39 ^a	24	9.50±1.25 ^a	24	13.12±1.46 ^a	19	15.45±1.18 ^b	17	17.55±1.04 ^b
≥4	42	1.83±0.49 ^c	37	9.32±1.39 ^a	36	13.60±1.59 ^a	31	15.83±1.14 ^b	25	17.87±1.20 ^b

Kidding distribution: The frequent kidding months of Woyto-Guji goats observed in this study was from November to January and June to August although throughout kidding was shown in figure 1. According to Simões (2015) in the tropics, does ovulate and exhibit estrus almost the whole year round although some short periods of anestrus are detected depending on several factors such as latitude, thermal stress, breed, feed scarcity, physiological stage and buck effect.

Prolificacy: the liter size of Woyto-Guji goats in the current study was 1.13. This finding was higher than the value of 1.04 for Abergelle goat (Deribe, 2008). However, the current result is lower than the value of 1.16 for Central Highland goat (Deribe, 2008).

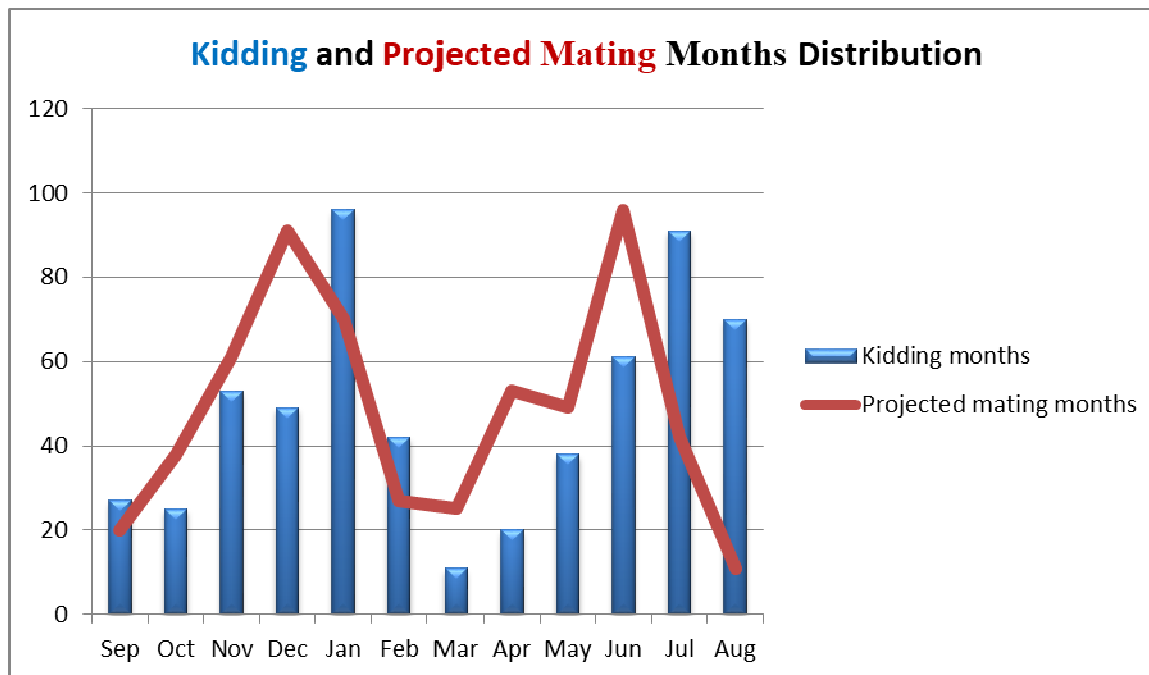


Figure 7: kidding and projected does mating months' distribution of Woyto-Guji goats in Konso district
Growth rate: Pre-and post-weaning growth rate of Woyto-Guji goats was presented in Table 2.

The mean daily pre-weaning weight gain of Woyto-Guji goat obtained ($102.32 \text{ g day}^{-1}$) was higher than the value (53.44 g day^{-1}) reported for Abergelle goat (Mengiste and Belay, 2013).

Table 2: Means of pre- and post-weaning daily weight gain of Woyto-Guji goats in Konso district

Variables	Pre-weaning ADG (g day^{-1})		Post-weaning ADG (g day^{-1})	
	N	Mean \pm STD	N	Mean \pm STD
Overall	283	62.32 \pm 24.67	154	28.72 \pm 9.79
Sex of Kid				
Male	131	64.13 \pm 26.81 ^a	81	29.79 \pm 10.03 ^a
Female	152	60.22 \pm 21.84 ^b	73	27.75 \pm 9.54 ^b
Birth Type				
Single	148	68.70 \pm 28.32 ^a	58	30.97 \pm 12.99 ^a
Twin	23	62.39 \pm 21.96 ^b	17	25.88 \pm 11.84 ^b
Birth Season		*		*
Wet	59	56.99 \pm 14.98 ^a	45	29.54 \pm 5.42 ^a
Dry	53	49.72 \pm 17.49 ^b	34	25.45 \pm 4.58 ^b
Color type				
Black	19	54.88 \pm 14.65 ^a	31	28.29 \pm 5.29 ^a
Brown	39	54.40 \pm 17.69 ^{ab}	35	28.30 \pm 7.55 ^a
White	54	50.32 \pm 14.93 ^b	12	27.01 \pm 4.80 ^b
Parity				
1	29	44.14 \pm 15.04 ^d	17	27.46 \pm 6.53 ^b
2	22	58.88 \pm 16.11 ^a	20	27.24 \pm 7.13 ^b
3	24	55.40 \pm 14.42 ^b	17	27.03 \pm 4.36 ^b
≥ 4	37	54.75 \pm 16.13 ^c	25	28.59 \pm 4.65 ^a

* $P < 0.05$; ^{a,b,c} Means with different letters within the same column are significantly different at the indicated level; N= Number of observations, NS= Not Significant

Male kids have showed faster pre-weaning growth rate ($P < 0.05$) than their female counterparts. This was related to their natural efficiency.

Single and wet season born kids had faster ($P < 0.05$) growth rate than their multiple and dry season born kids. The effect of birth type and season had reported by (Ahuya et al., 2009; Zeleke, 2007). The effect of birth type is due to higher consumption of milk/kid since there is no competition of milk with single born kids.

Parity of does affected ($P < 0.05$) the pre-weaning weight gain of kids. First parity does kids grow slower than the higher parity does kids because does parity increases milk production and nursing ability. The pre-weaning weight gain of kids depends on their mothers' milk production and nutritional status of dams (Gurmej et

al., 1987; Wilson, 1987).

The mean daily post-weaning weight gain for Woyto-Guji goats was 28.72 ± 9.79 g day⁻¹. Sex, birth type and season of birth significantly affected ($P < 0.05$) post-weaning weight gain of Woyto-Guji kids. Growth rate of kids after weaning is determined by the genetic potential and the level of environmental influences (Das *et al.*, 1996).

CONCLUSION

The result obtained in the current study, in general, showed that the growth performance of Woyto-Guji goat is comparable with other Ethiopian goat breeds. Different fixed environmental factors like sex of kid, birth type and birth season of kid and parity of does affected weight at different age classes and growth rate of kids. Generally, Woyto-Guji goats breed throughout year although some pick months exist and are also low prolific. Any effort to improve the productivity of Woyto-Guji goat should consider the above fixed factors.

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