

Performance of Boer and Woyto-Guji Crossbred F1 Goats (50%) under Semi-Intensive Management System in Konso District, South Ethiopia

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Abstract: The study was undertaken to evaluate at on-station growth and reproductive performance of F1 crossbred Boer-Woyto Guji goat kids reared under semi-intensive management system in Konso district, south Ethiopia. A total of 57 F1 crossbred kids were used to evaluate two independent variables: birth type and sex and ten dependent variables: age at first mating, gestation length, age at first kidding, birth weight, weaning weight, six-month weight, nine months weight, yearling weight and weight gains to weaning and yearling were analyzed. The study revealed that yearling weight of the crossbred kids was higher for males (30.72 ± 6.29 kg) and single born (30.50 ± 4.46) kids than females (27.74 ± 1.67) and twins (25.67 ± 3.54), respectively. Pre and post-weaning growth rates for Boer- Woyto-Guji F1 kids were 97.73 and 62.99 (g/day), respectively. Average age at first mating, gestation length and age at first kidding of the crossbred were 8.10 ± 1.27 , 5.03 ± 0.02 and 12.91 ± 1.22 months, respectively. Litter size of F1 does was 1.26. The mortality rate was higher during post-weaning (40.81%) than pre-weaning age (10.00%). Although the growth and reproductive performance were faster, the survivability of the F1 crossbred kids was under question. Hence, further comparative performance evaluation is needed with local goats under intensive management system.

Keywords: Crossbred Boer and Woyto-Guji goats, Semi-intensive management, Pre and post-weaning growth rates

1. Introduction

In Ethiopia, there are a number goat breeds that have good potential for meat production (Simret, 2005). However, low emphasis is given in the overall management aspect and genetic improvement of the indigenous breeds. The present productivity of goats is very low. This low level of productivity in Ethiopian goats could be attributed to disease, lack of proper management, poor nutrition and low emphasis given to genetic improvement (Shumuye *et al.*, 2014). According to Philipsson and Rege (2003), the genetic improvement has been a fundamental part of the many goat development programs in the tropics where breeding policies mostly aimed to upgrade local goats by crossbreeding with either temperate or tropical exotic breeds.

Cross breeding is an easy way to get very productive goats within a short period of time. It is also the easiest way to acquire superior stock from elsewhere. Such a breeding scheme is preferred in development programs to attain the desired goal

(Belay *et al.*, 2014). Breed selection is also very important to improve the genetic potential of a given breed. But breed improvement through selection is a slow process (Shumuye *et al.*, 2014).

Boer goats are meat type breed that originated in South Africa and have been introduced to different countries of the world including Ethiopia. They have good resistance to disease and adapt well to hot, dry, semi-desert conditions (http://en.wikipedia.org/wiki/Boer_goat#Crossbreeding). In Ethiopia, this breed has been used in crossing with the indigenous goat breeds to improve their productivity. The Woyto-Guji goat breed is one of the breeds that are used for crossing with Boer goats.

Woyto-Guji goat breeds are kept mainly for meat production. In addition to this, these goats are also kept for manure production and cash income generation. When Woyto-Guji goat breeds are compared with Boer goat breeds, they have great differences in their body weight and growth rate (Mohammed *et al.*, 2012; Dereje and Ermias,

2018). Boer goat is considered to be one of the most desirable goat breeds for meat production (Lu, 2001). It has gained worldwide recognition for excellent body conformation, fast growing rate and good carcass quality. As a result, crossing of Woyto-Guji goats with Boer goats is becoming an important method to improve productivity of indigenous goat breeds (Belay *et al.*, 2015). The crossbred (F1) can get important traits from their parents that enable them to better resist disease and harsh environments. Therefore, the objective of this study was to evaluate the growth and reproductive performance of the first filial generation (F1) of Boer-Woyto-Guji crossbreds.

2. Materials and Methods

2.1. Description of the study area

The study was conducted at Baide goat breeding and dissemination (BED) station, which is situated 565 km from Addis Ababa to the South at 13° 14' 06" N latitude and 38° 58' 50" E longitude. The area is categorized as hot to warm lowland agro ecological zone of the region with an altitude of 1305 meter above sea level. The rainfall is characterized by low, erratic and variable. The area is known for its large livestock population especially cattle followed by goats. The main crops produced in the area are sorghum, teff, maize and pigeon-pea. Cheka (local alcoholic drink prepared from maize and sorghum) is the main Woyto-Guji goat supplementary feed in the study areas.

2.2. Animal management and diet

Mature Woyto-Guji breeding does (N = 70) were intentionally identified and purchased from the local market (Shelle-Mela market). Thereafter, the animals were housed in the barn of the Baide breeding, evaluation and breeding (BED) site. Two pure Boer male goats were introduced from Jinka Agricultural Research Center for crossbreeding purpose.

External parasites were prevalent in the study area. Therefore, both the does and bucks were dewormed using Albendasole at the end of the wet season and beginning of the rainy season. They were sprayed with diazinone against the external parasites three times in a year and were also vaccinated against pasteurellosis and pest des petits ruminants (PPR) which are common diseases of the area. Throughout the year, animals were allowed to graze for 6 hours per day on natural pasture around

the vicinity of the sub-research center. The lactating does also received 200 g/day of wheat bran. In each case, the supplement was given in two equal feeds morning and evening.

From birth up to four months of age, kids were suckled by their dams two times per day in the morning (8:00 am) and evening (5:00 pm). They also received a supplement of 100 g/day of wheat bran and had free access to grass starting from three weeks of age up to weaning at 4 months. After weaning, the supplement of wheat bran was increased to 200 g/day and had access to pasture for 6 hours per day.

2.3. Measurements and observations

Birth weight (BW), weaning weight (WW), six month weight (SMW), nine months weight (NMW) and yearling weight (YW) were recorded in the morning before grazing and watering. All weight measurements were taken monthly using the salter scale with capacity of 50kg. In this study, data from 2015 to 2016 were used for analysis. Out of the 57 F1 kids, 28 were females.

2.4. Data analysis

The BW, WW, 6MW, 9MW and YW, the weight gains of the kids at different ages, age at first mating, gestation length and age at first kidding were taken as dependent variables. Sex and birth type were taken as independent variables. Growth rate (Average daily gain (gm)) was computed as: Pre-weaning ADG (gram) = (Three Months Weight-Birth Weight)/90 and Post-weaning = (Yearling Weight-Three Months Weight)/275. The data were analyzed by using statistical software in SPSS (16.0).

3. Results and Discussion

3.1. Growth performance

The F1 Boer-Woyto Guji goat cross kids growth performance in the study area under semi-intensive management system was indicated in Table 1. The current study showed that the overall birth weight, weaning weight, six month weight, nine month weight and yearling weight were 2.82 ± 0.48 , 11.61 ± 2.74 , 16.18 ± 4.19 , and 22.36 ± 4.21 and 29.18 ± 4.71 kg, respectively. The current finding was higher than the report of Abd-Allah *et al.* (2016) for Boar and Baladi crossbred kids in Egypt at all different age groups. According to Đuričić *et al.* (2012), birth weight for pure Boar goat was

3.48±0.04kg under the same management system. This was higher than the current finding.

Sex and birth type have statistically significant effect on growth performance of crossbred F1 kids, except birth weight (although males weighed higher). Non significant effect of both sex and birth type on birth weight could be attributed to poor feeding system of does during late pregnancy period. The birth weight, weaning weight, six month weight and yearling weight for male born crossbred kids were 2.83±0.58, 11.81±2.78, 16.70±4.96 and 30.72±6.29 kg, respectively. The corresponding values for female were 2.80±0.34, 11.41±2.72, 15.65±3.28 and 27.74±1.67 kg. Except birth weight, both males and single birth crossbred kids have showed statistically higher values at different age categories than females and twin born ones, respectively. The higher body weight of male kids may be attributed to their birth weight; this is because they were born heavier than females. Almost similar result obtained for Boar-Abergelle

crossbred kids reported by Shumiye (2014) under semi-intensive management system. However, growth performance at different age categories were lower for pure indigenous goat breeds as reported by Dereje and Ermias, 2018 on Woyto-Guji goat and Belay and Mengiste, 2013 on Abergelle goat breeds. This could be crossbreds have gained heterosis effect from Boar goat breed for growth trait (Ssewanyana *et al.*, 2004).

The birth weight, weaning weight, six month weight and yearling weight for single born crossbred kids were 2.96±0.40, 12.79±2.06, 17.79±3.58 and 30.50±4.46 kg, respectively. The corresponding values for twin born were 2.44±0.45, 8.51±1.59, 12.71±3.24 and 25.67±3.54 kg. The difference in body weights for different type of births at all age groups may be due to that litter mates had to share the prenatal maternal nourishment in contrast to the single born kids (Zahraddeen *et al.*, 2008). Local, exotic and crossbred goats were presented in Figure 1.



Figure 1. Woyto-Guji Does, Boar bucks, and crossbred kids in the study area

Table 1. Growth performance of F1 Boer-Woyto Guji goat crossbred kids

Effect	BW	WW	6MW	9MW	YW
Overall (57)	2.82±0.48	11.61±2.74	16.18±4.19	22.36±4.21	29.18±4.71
Sex	NS	*	*	*	*
M(29)	2.83±0.58	11.81±2.78	16.70±4.96	23.97±5.24	30.72±6.29
F(28)	2.80±0.34	11.41±2.72	15.65±3.28	20.98±2.43	27.74±1.67
Birth Type	NS	*	*	*	*
Single (42)	2.96±0.40	12.79±2.06	17.79±3.58	23.71±4.08	30.50±4.46
Twin (15)	2.44±0.45	8.51±1.59	12.71±3.24	19.65±3.07	25.67±3.54

BW (Birth weight), WW (weaning weight), 6MW (six month weight), 9MW (nine month weight) and YW (yearling weight), NS (non-significant at $P>0.05$) and *(significant at $P<0.05$)

3.2. Pre- and post-weaning weight change

The pre and post-weaning daily growth rate (g day^{-1}) of 50% F1 Boar with Woyto-Guji crossbred kids were presented in Table 3. The overall pre-weaning and post-weaning weight change obtained were 97.73±27.58 and 62.99±14.09 g day^{-1} , respectively. The current result indicated that 50% F1 crossbred kids showed statistically significant fast weight

gain during pre-weaning days than post-weaning. Low growth rate during post-weaning seasons may be due to weaning shock. This daily weight gain finding was lower than that of Boar-Abergelle crossbred kids (Shumuye *et al.*, 2014) where as higher than indigenous Woyto-Guji goat under traditional management system (Dereje and Ermias, 2018).

Both sex and birth type have significant effect on both pre and post weaning growth rate of F1 crossbred kids. Pre and post-weaning growth rate for males were 83.83 ± 39.73 and $64.36 \pm 13.48\%$ where as the corresponding values for females were 106.45 ± 18.37 and $61.12 \pm 15.17\%$, respectively. Females showed fast weight gain during pre-weaning where as the reverse is true for males during post-weaning days. Pre and post-weaning growth rate for single born kids were 109.47 ± 21.02 and 62.72 ± 15.34 and the equivalent parameters for

twin born ones were 67.18 ± 17.25 and $93.33 \pm 12.86\%$, respectively. Single born crossbred kids showed fast weight gain during pre-weaning where as the reverse is true for twin born crossbred kids during post-weaning days. In agreement with this finding, Belay and Mengistie (2013) reported that single birth kids had faster growth rate than kids from multiple births. Alula *et al* (2013) also reported that kids born as singles were heavier than twins and triplets.

Table 2: Pre and post-weaning daily weight gain rate of 50% F1 Boar*Woyto-Guji goat kids in the study area

Effect	Pre-weaning		Post-weaning	
	N	Mean \pm STD	N	Mean \pm SD
Overall	54	97.73 ± 27.58	33	62.99 ± 14.09
Sex		*		*
Male	27	83.83 ± 39.73	19	64.36 ± 13.48
Female	28	106.45 ± 18.37	14	61.12 ± 15.17
Birth Type		*		*
Single	39	109.47 ± 21.02	24	62.72 ± 15.34
Twin	15	67.18 ± 17.25	9	93.33 ± 12.86

N (frequency), SD (standard deviation) and * $P < 0.05$

3.3. Reproductive performance

The reproductive performance and effect of birth type on age at first mating, age at first kidding and gestation length of F1 Boer-Woyto Guji goat crossbred does were illustrated in Table 1.

Overall ages at first mating, age at first kidding and gestation length for does were 8.10 ± 1.27 ,

12.91 ± 1.22 and 5.03 ± 0.02 months, respectively. Except gestation length, birth type had significant effect on age at first mating and age at first kidding. Single born does have fast age at first mating (7.93 ± 1.06 months) and age at first kidding (12.81 ± 1.24 months) than twin born ones.

Table 3: The reproductive performance and effect of birth type on age at first mating, age at first kidding and gestation length (month) of F1 Boer-Woyto Guji goat crossbred does

Effect	AFM (32)	AFK (15)	GL (15)
Overall	8.10 ± 1.27	12.91 ± 1.22	5.03 ± 0.02
Birth Type	*	*	NS
Single (42)	7.93 ± 1.06	12.81 ± 1.24	5.03 ± 0.02
Twin (15)	8.55 ± 1.69	13.58 ± 1.17	5.03 ± 0.00

AFM (age at first mating), AFK (age at first kidding) and GL (gestation length)

3.4. Prolificacy

The liter size of the F1 Boar X Woyto-Guji goat crossbred does was 1.26. However, the does were largely dependent on low quality pasture and scarce availability of browse plants and were supplemented with poor quality hay in the current study. This finding was slightly higher than for Boar-Abergelle crossbred does (1.11) under similar management system reported by Belay and Mengistie (2013). However, it was lower than the report of (1.76) Đuričić *et al.* (2012) for pure Boar

goat in Croatia in semi-intensive management system.

3.5. Mortality rate of cross Boer-Woyto Guji F1 kids

Mortality of the F1 crossbred kids was higher during post-weaning (40.81%) than pre-weaning (10%). This could have been the result of a lower nutritional plane after weaning as suckled milk was replaced by poor quality grazing (Kanwaldeep *et al.*, 2015). The current finding was higher than the

report of Belay and Mengiste (2013) for Boar-Abergelle crossbred kids in which an average pre-weaning mortality rate was 6.73% and post-weaning mortality was 16.6% although post-weaning mortality was also higher than pre-

weaning mortality. Some of disease clinical signs observed were diarrhea, bucks scrotum and lung (after postpartum) infection and physically low performing boar bucks as illustrated in Figure 2.

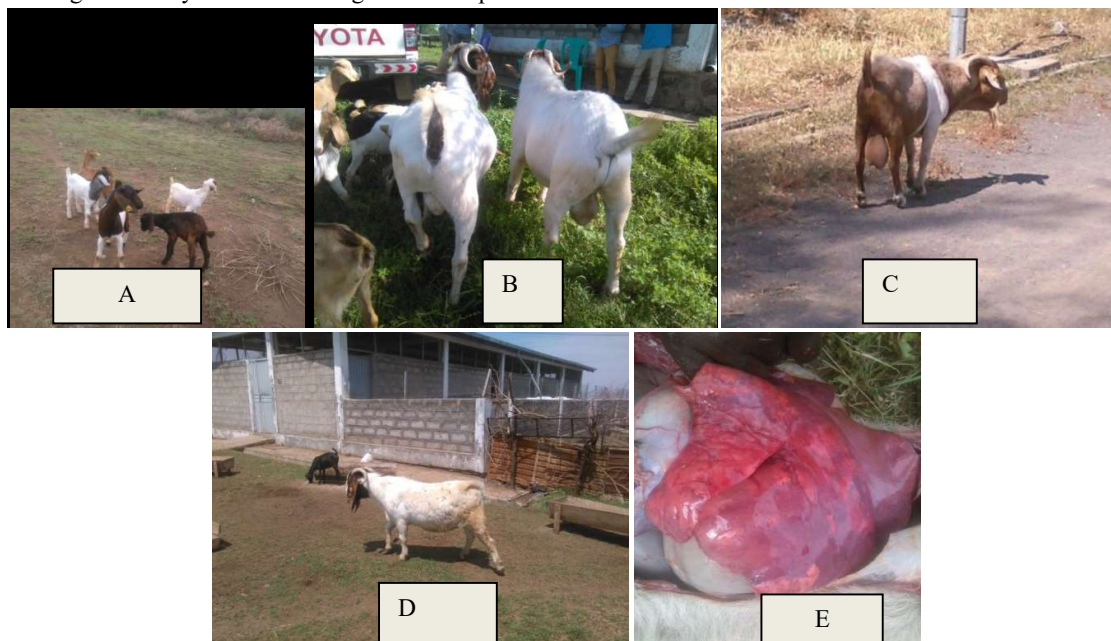


Figure 2. Kids with diarrhea, buck with infected scrotum, low performing and infected lung in the study area (A-E).

4. Conclusions

Boer-Woyto Guji F1 crossbred kids had high growth performance at all age groups. However, growth rates were high during pre-weaning than post-weaning. Additionally, post weaning kid mortality was high under semi-intensive management conditions. So that it is better to undertake comparative performance evaluation under intensive management systems in the future.

Conflicts of Interests

The authors declared that there is no conflict of interests.

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