On- Farm growth performance evaluation of Abergelle goats under traditional management in Sekota Woreda

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Abstract

The study was conducted at abergelle in the semi arid parts of Sekota Woreda to evaluate growth performance of abergelle goats under traditional management. The result of this study is based on on-farm monitoring data collected from 724 kid's birth for two years. The mean body weight of kids at birth was 1.91 ± 0.04 kg. The body weight at weaning, six month and yearling age were 6.84 ± 0.19, 9.13 ± 0.31 and 16.42 ± 1.20 kg. Kids born single, male and kids from later parity and kids born during wet season were heavier (P<0.001) than twins, females, kids born from first parity and kids born during hot dry season at weaning. The mean weight gain during pre-weaning and post weaning period were 53.44 and 29.26 g/day. Kids born from later parity, single and kids born at wet season had higher (P<0.001) pre-weaning growth rates than kids born from first parity, as twins and kids born during hot dry season, respectively. For the future study improvement of the breed through selection and feeding management is important.

Key words: Growth, reproductive performance, Sekota, Semi arid.

Introduction

The goat population of Ethiopia is estimated to be 18.5 million (CSA, 2007). It is maintained with a very little resource input under the traditional subsistence management system. Goats are important for diversifying production, creating employment, increasing income, building capital, contributing to human nutrition and reducing risk during crop failure, property security and investment. A national systematic breed characterization (phenotype and genotype) of Ethiopian goat types has been conducted by FARM-Africa in collaboration with ILRI and Haramaya University and distinct indigenous goat types were identified and classified into four major families: namely, Nubian, Small Rift Valley, Somali and Small East African (FARM-Africa, 1996). This family classification is based on combination of their morphological appearance.

Abergelle goat types are categorized under the Rift Valley family. They are extensively reared and found widely distributed in the mid altitude of Southern Tigray, North Wollo, and Waghimra Zone and along Tekeze River Valley. The Central Highland goats are categorized under the Small East African family and are found widely distributed in the Central Highlands, west of the Rift Valley escarpment inTigray, Wollo, Gonder and North Shoa.

Goats in the Sekota woreda are managed mainly under mixed crop livestock production system in relatively large flocks. Goat rearing in this woreda is predominantly for milk and meat production (Nigatu, 1994). They serve as an alternative to cash, may be easily converted into cash, provide milk and meat in the poor feed resources areas and harsh environments. Despite their significance, goat research on production and reproductive performance of local goat breed is limited. Identifying constraints limiting the traditional goat production system are important. Evaluation of the genetic merit of adapted local breeds is important for the formulation of sound breeding plans and improvement of genetic potential. Therefore, this experiment was conducted with the objectives to evaluate the growth and reproductive performance of Abergelle goats under traditional management systems

Materials and methods

Study area

The study was conducted in Sekota Woreda, Waghimra Administrative Zone. It is located about 720 km North from Addis Ababa. The Altitude varies from 1340-2200 masl (ZAD, 1995). Annual rainfall ranges between 350-700 mm, falling mainly from July to September. The pattern and distribution of the rainfall is erratic and uneven. Average temperature ranges from 16-27oC (ZAD, 1995).

On-farm flock monitoring

For this study, two peasant associations were purposively chosen for monitoring purpose in semi arid part of the woerda based on the goat population of breeds. Fourteen households

from the semi arid area for monitored Abergelle goats that possessed goats were randomly selected. The age and parity of does of the flock were determined by dentition and interviewed the owners at the beginning of the monitoring. All animals were ear tagged at the beginning and individual were established data were collected by trained enumerators recruited from the locality and supervision carried out on 15 day basis by the researcher for two years from June 2004 to June 2006. Growth data (birth weight, and fortnight weight for pre-weaning kids, monthly BW for adults) were used. Seasons were categorized into three by considering the availability of feed and temperature. Category 1 (July to September) is characterized by rainy season and green natural pasture is available. Category 2 (October to January) has relatively cool temperature with aftermath grazing available. The quantity and quality of natural pasture is depleted in this time. Category 3 (February to June) has a very hot temperature and both the natural pasture and aftermath grazing is scanty. All data were coded and recorded in excel sheet for growth and reproductive traits. The preweaning and post-weaning growth performances were adjusted by the following formulae (Inyangala et al., 1992).

$$\text{Adjusted weaning weight (kg)} = \frac{90(w2 - w1)}{D} + w1$$

$$\text{Adjusted six months weight (kg)} = \frac{180(w3 - w1)}{D} + w1$$

$$\text{Adjusted yearling body weight (kg)} = \frac{365(w4 - w1)}{D} + w1$$

Where, W2, W3 and W4 = weight at a given age

W1 = birth weight

D= number of days between weighing date and date of birth

$$\text{Average daily BW gain up to weaning (g)} = \frac{(AWWT - BWT)}{90}$$

$$\text{Average daily BW gain from weaning to yearling (g)} = \frac{(AYWT - AWWT)}{275}$$

Where, BWT= Birth weight

AWWT= Adjusted weaning weight at 90 days

AYWT= Adjusted yearling weight at 365 days

Statistical analysis

Birth weight, three month weight, six month weight and yearling weight were analyzed using were analyzed by GLM analysis of variance (SAS, 1999) the following fixed effects model.

Results and discussion

Growth performance

The overall least-squares mean of birth weight of Abergelle kids were 1.91±0.04 kg (Table 1). The result of the current study was in agreement with the value of 1.9±0.14 kg, reported for indigenous goats of Swaziland under traditional management (Lebbie and Manzini, 1989). The observed mean birth weight for Abergelle kids in the present study were lower than 2.29 kg reported by Muluken (2006) for the same breed. It was also lower than reported value (2.34 kg) for Boran Somali, but higher than the value of 1.5 kg for Mid Rift Valley kids (Tesfaye *et al*., 2000). The lower birth weight of Abergelle kids observed in this study may be related to the critical shortage of forage both in quantity and quality which is also caused by recurrent drought of the area.

Birth weight of Abergelle kids born in the first parity was lower (1.77±0.01) as compared to 2nd and higher order of parity (1.92±0.01 to 1.99±0.06). This might be related to the doe weight at kidding. It was stated that an advance in age of doe up to fourth parity was accompanied by increased kid weight at birth and up to weaning (Negi *et al*., 1987; Singh *et al*., 1987). Due to the fact that parity of dam and BW of does at kidding time were strongly positively correlated with milk yield and with the general principle of productive output being proportional to the metabolic weight of the dam (Taylor and Murray, 1987). Wilson (1987) also found that the age of dam has significant effect on birth weight and pre-weaning growth rate of offspring in that young ewes tend to produce smaller lambs at birth. The fact that mothering ability, especially milk production, increases with parity. First parity ewes are still growing and thus must provide for their own growth in addition to the foetal demand (Stobart *et al*., 1986). Contrary to this Zeleke (2007) stated that kids born

from dams of fifth parity had lighter weights at birth compared to kids born from dams of first to fourth parities in Somali goats at Haramaya university.

Table 1. Least-squares means (± SE) of kid birth weight of Abergelle goats.

Class	N	Abergelle KBW (kg)
Overall	724	1.91 ± 0.04
Parity		***
1	153	1.77 ± 0.01[b]
2	173	1.92 ± 0.01[a]
3	167	1.91 ± 0.04[a]
4	142	1.93 ± 0.04[a]
Type of Birth		***
Single	676	2.02 ± 0.04[a]
Twin	48	1.80 ± 0.05[b]
Sex		***
Female	384	1.88 ± 0.04[b]
Male	340	1.96 ± 0.04[a]
Season		***
Cool dry	569	1.96 ± 0.02[a]
Hot dry	146	1.80 ± 0.03[b]
Wet	9	1.960.10[a]

*and*** indicate significant difference at p<0.05 adn p<0.001.Means followed by the same letters are not significantly different. KBW= Kid birth weight; LSM = Least square mean, N = number of observation, SE = standard error.

Single born kids were heavier (P<0.001) at birth than those born as twins (Table 1). This difference may be due to the effect of maternal influence. The reduction in birth weight of lambs for large litter size is related to the fact that as the number of fetuses increases in utero, the number of caruncles attached to each fetus decreases, as a result the feed supply to the fetuses thus reduces (Robinson *et al*., 1977). Any more possible reason for lower birth weight of twins than singles was due to their smaller size and weight in the uterus. After birth, single kids had an advantage over twins as twins had to compete for the milk from their dam. Kids born in the wet and cool dry season were heavier (P<0.001) than

those born in the hot dry season. This is probably due to either the small number of observation (9 vs 569) of wet season or due to doe's nutritional status during the late stage of pregnancy. Doe's kidding during the wet season have got better browses and green pasture at late stage of pregnancy than doe's kidding during the dry season. Eltawil *et al*., (1970) stated that seasonal influence on birth weight functions through its effect on the dam's uterine environment mostly in late gestation. Similarly, Dunn and Moss, (1992) explained that rapid rate of fetal growth occurs at late stage of pregnancy, nutritional stress during this time resulted to BW losses and increased the risk of reproductive wastage due to abortion, retardation of fetal growth and reduced birth weight.

Weaning and post weaning body weights

The least square means of weaning, six month and yearling weight of kids of Abergelle goats are presented in Table 2. The overall mean weaning weight of Abergelle kids were 6.84±0.19 kg. The mean weaning weight of Abergelle kids' was comparable with the value of 6.32 and 6.72 kg for reported for Mid Rift Valley kids and Highland goats (Tesfaye *et al*., 2000). Abergelle kids weaning weight (6.8 kg) was however lower than that of Arsi Bale (8.4 kg) (Tatek *et al*., 2005), Boran Somali kids (7.2 kg) (Tesfaye *et al*., 2000) and Highland kids (9.02±0.18 kg) in the present study.

Analysis of variance of weaning weight showed significant difference on parity. It was lower ($P<0.001$) for first parity than later parity. This indicates that as the does parity increased they are able to provide more milk than first parity does (Eltawil *et al*., 1970). Single birth and male kids were heaver ($P<0.001$) than twin and female kids. Kids born during wet season have heavier weight and retained this rank up to the age of six months.

The value of six month and yearling weight (9.1 and 14.2 kg) of Abergelle goats was comparable with that for Borana Somali goats as reported by Tesfaye *et al*. (2000), who observed that the weight of Borana Somali goats were 9.3 and 13 kg at six month and yearling, respectively, and more than 7.9 and 12.9 kg six month and yearling weight reported for Mid Rift Valley goats. In contrast to these, the six month and yearling weights obtained in this study was less than 11 and 16 kg of Afar goats (Kasshun, 1989).

Pre-weaning growth performance

The mean daily BW gain from birth to weaning for Abergelle kids were 53.44 g/day (Table 3). These are lower than pre-weaning growth rate under traditional managements (104 g/day) of Ethiopian goats reported by Mukassa-Mugerwa *et al*. (1989). The differences in the pre-weaning weight gains are closely associated with the differences in level of milk intake during milk feeding period and the nutritional status of the doe (Negi *et al*., 1987; Singh *et al*., 1987).

Analysis of variance of pre-weaning growth rate showed significant difference ($P<0.001$) on parity. These traits were lower for first parity than later parity. This indicates that as the does parity increase, they were able to provide more milk than first parity does. There was no difference ($P>0.05$) on pre-weaning BW of kids born from 2nd parity and afterwards parity for Abergelle goats at shown in Table 2. The pre-weaning growth rate of kids depends on the dam's milk yield and nutrition status of the dams (Wilson, 1987). Does at first parity may have less mothering ability than those in later parity.

Post weaning growth performance

The mean daily BW gain from weaning to 12 month of Abergelle and Central Highland goats were 29.26 and 43.41 g/day (Table 3). In this study, post weaning growth of kids was not influenced by parity and type of birth. Sex and season of birth had significant effect on post weaning growth of Abergelle kids. Das *et al*. (1993) explained that the rate of growth of kids after weaning was partly determined by the genetic potential of the kids and the level of environmental influences.

The mean daily post weaning BW gain of kids born in the wet season was lower ($P<0.001$) than the kids born in other seasons. The likely reason for this might be kids born during dry season had low growth rate at the pre-weaning growth stage due to the restriction of milk yield of their does, may compensate, growth in the post weaning growth period. Similarly, Hary (2001) explained that kids born to low milking does were able to compensate (g/day) for restriction in milk availability by starting to graze on pasture forage at early stage.

Table 2. Least square means (± SE) of weaning weight, six month weight, and yearling weight of Abergelle goats in Sekota woreda.

Factor	N	WWT (kg)	N	SWT (kg)	N	YWT (kg)
Overall	639	6.84 ± 0.19	427	9.13 ± 0.31	195	14.15 ± 1.20
Parity		***		*		NS
1	130	5.99 ± 0.19^{b}	74	9.33 ± 0.32^{b}	40	13.65 ± 1.15^{a}
2	157	6.76 ± 0.19^{a}	100	9.99 ± 0.30^{ab}	53	14.33 ± 1.18^{a}
3	148	6.79 ± 0.18^{a}	111	10.12 ± 0.29^{a}	49	14.69 ± 1.18^{a}
4	121	6.69 ± 0.18^{a}	86	9.61 ± 0.30^{ab}	29	14.72 ± 1.22^{a}
TB		***		NS		NS
Single	599	7.08 ± 0.14^{a}	399	9.89 ± 0.22^{a}	177	14.71 ± 1.11^{a}
Twin	40	6.21 ± 0.23^{b}	28	9.49 ± 0.37^{a}	18	13.60 ± 1.23^{a}
Sex		***		**		***
Female	335	6.49 ± 0.17^{b}	230	9.45 ± 0.27^{b}	122	13.50 ± 1.14^{b}
Male	304	6.80 ± 0.17^{a}	197	9.92 ± 0.28^{a}	73	14.80 ± 1.17^{a}
Season		***		***		***
CD	531	6.56 ± 0.10^{b}	365	8.60 ± 0.18^{b}	162	15.10 ± 1.17^{a}
HD	99	5.30 ± 0.14^{c}	53	9.21 ± 0.28^{b}	33	13.21 ± 1.16^{b}
wet	9	8.07 ± 0.40^{a}	9	11.26 ± 0.59^{a}	-	-

*and*** indicate significant difference at $p<0.05$ and $p<0.001$and NS indicates non significant difference. Means followed by the same letters are not significantly different. CD = Cool dry, HD = Hot dry, LSW = Least square mean, N = Number of observation, SE = Standard error, SWT = Six month weight, TB = Type of birth, WWT = Weaning weight.

Tabe 3. Least squares means (± SE) of pre- and post-weaning average daily BW gain of Abergelle goats.

Class	N	PRBWG(g/d)	N	PWBWG(g/d)
Overall	639	53.4 ± 2.30	176	29.3±4.32
Parity		***		NS
1	127	47.7 ± 2.38^{b}	34	31.0 ± 4.20^{a}
2	158	54.8 ± 2.25^{a}		29.6 ± 4.30^{a}
3	148	54.9 ± 2.15^{a}	41	31.5 ± 4.31^{a}
4	122	53.5 ± 2.18^{a}	28	30.3 ± 4.44^{a}
TB		***		NS
Single	601	58.8 ± 1.67^{a}	161	29.1 ± 4.02^{a}
Twin	38	48.1 ± 2.82^{b}	15	29.4 ± 4.57^{a}
Sex		NS		**
Female	337	52.5 ± 2.02^{a}	111	27.6 ± 4.11^{b}
Male	302	54.4 ± 2.07^{a}	65	30.9 ± 4.25^{a}
Season		***		NS
Cool dry	537	48.9 ± 1.26^{b}	147	29.2 ± 4.24^{a}
Hot dry	93	37.2 ± 1.72^{c}	29	29.4 ± 4.23^{a}

*and*** indicate significant difference at $p<0.05$ and $p<0.001$and NS indicates non significant difference. Means followed by the same letters are not significantly different. LSW = Least square mean, N = Number of observation, POBWG = Post weaning BW gain, PRBWG = Pre-weaning BW gain, SE = Standard error, TB = Type of birth.

Conclusion

Evaluation of growth, reproductive performance and carcass characteristics of Abergelle goats under traditional management system was conducted at Sekota woreda. The study result revealed that the overall mean of weight of kids at birth was 1.91±0.04 kg. Season of birth, type of birth and parity exert effects on birth weight. Kids born single had heavier weight at birth than twins (2.02 vs 1.80) and male kids were heavier than females (1.96 vs 1.88). The overall mean of weaning, six months and yearling weight were 6.8±0.19, 9.1±0.31 and 14.2±1.2 kg for Abergelle goats. The pre-weaning growth rate of Abergelle kids was found to be 53.4±2.3 g/day. The post weaning growth performance was affected by sex and season of birth of the kids. The overall mean of post weaning growth rate was found to be 29.3±4.3 and 43.4±2.9 g/day for Abergelle goats. From the results of evaluation of growth performance of Abergelle goats, the weight of kids at birth is very low. Growth performance is influenced by kid birth of parity, birth type and season of birth. The result of the current study revealed that birth weight of abergelle kids are very low compared to other tropical breeds. Therefore, for future study improvement of the breed through selection and feeding management is important.

Acknowledgement

I would like to express my most sincere gratitude to my major advisor Dr. Solomon Melaku and my co-advisor, Dr. A.K. Sharma, for their guidance and encouragement. I would like to express my thanks to the Amhara Region Agricultural Research Institute (ARARI) for giving this chance and financing the research work. I would like to express my sincere appreciation to Sekota Dryland Agricultural Center for making my research work easy.

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