

Demonstration and evaluation of Begait goat breed in comparison of Abergelle goat breed under farmer's management system in Tanqua Abergelle district

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Abstract

The aim of this study was to demonstrate and evaluate the growth and production performance of Begait goat breed and their first generation (F1) kids in comparison Abergelle goat breed managed under traditional management practice. A total of 60 adult Begait goat breed with sex ratio 2:1 (female to male) were randomly distributed for 20 purposively selected beneficiaries. Data on kids' growth performance, survival rate and dams milk yield were collected for one year.

Mean birth weight and weight of at different ages of the sampled Begait kids were (2.85 ± 0.25 , 10.47 ± 1.68 , 13.78 ± 1.85 , 19.64 ± 1.86 and 22.94 ± 1.45) kg for birth weight, weaning weight, six month weight, nine month weight and yearling weight, respectively and the corresponding value for the Abergelle kids were (2.21 ± 0.24 , 6.87 ± 1.39 , 9.51 ± 1.69 , 11.94 ± 1.77 and 14.21 ± 1.32) kg, respectively. Breed had highly significant ($p < 0.0001$) effect on birth weight and weight of at different ages. Average daily weight gain of kids was affected by breed. Kids born from Begait dam goat had larger ($P < 0.000$) average daily weight gain (84.7 ± 6.0 g) than kids born from Abergelle dam goat breed (51 ± 1.0 g). The average milk yield per day of the Begait dam was 0.69 liter, while average milk production of Abergelle dams was 0.32litter. As a result of this the participant farmers had a positive attitude towards the Begait goat breed in almost all the phenotypic characteristics of the Begait goat breed except for the attributes of ear length. So that scaling up and scaling out of this technology has to be strengthened to enhance farmers benefit from Begait goat breed.

Keywords: *body weight, milk yield, management practices, reproductive performance, survival rate*

Introduction

Small ruminant production is important due to the fact that it can easily be managed, requires small initial investments and its short generation interval (Otte, M.J. and P. Chilonda 2002). Indigenous goat breeds constitute over 95% of the small ruminant population in Africa and 99.77% in Ethiopia

(CSA 2012). The recent data from CSA (2012) indicated that country's goat population growth rate is 1.1% with off-take rate of 35%. In Ethiopia goat production accounts for 16.8% of total meat supply (Ameha 2008) and 16.7% of milk consumed in the country (Tsedeke 2007). In general goat and sheep are raised by smallholder farmers as a major source of meat and immediate cash income. Owing to their ability to thrive and reproduce fast even in harsh environments they used as source of risk mitigation during crop failures, property security, monetary saving and investment in addition to many of other socio-economic and cultural function (Markos 2006).

Ethiopia has great potentials to export large number of small ruminant and their byproducts especially to the Middle East and other African markets (Solomon A. and Gemed D. 2002). But growth is the most important traits for small ruminant's production affecting the contribution of the sector to farm household through live animal sale and meat production. Given their number and contribution, efforts made so far to improve the productivity of indigenous goats were very little as compared to the concerns given to other livestock species such as cattle. A number of researches were conducted in research centers and universities in the past to evaluate and improve the productivity of the indigenous goats. However, the information generated from such research works are not systematically compiled and made available to users. Therefore the purpose of this study were compile all necessary information through demonstration and evaluation of growth and production performance of Begait goat breed in comparison of the existing Abergelle goat breed under farmer's management system.

Materials and Methods

Study area

The study was conducted in Tanqua Abergelle district which is located in central zone of Tigray region (**Figure 1**).

Figure 1. Map of the study area.

The study district is far away 110km South East Mekelle (capital city of the region). Geographically the district is located between 10° 27 "N latitude and 39° 01'E longitude with an altitude ranging from 1200 - 1500 a.s.l.

Sampling procedure

Tanqua-Abergelle district has 20 kebeles of which one kebele was selected using purposive sampling technique in consultation with operational research project (OR), district office of agriculture and rural development experts. From the selected kebele (Sheka-Tekli) a total of 20 participants of which 90% female and 10% male headed household safety net beneficiaries were selected purposively. Accordingly the selected beneficiaries were trained overall small ruminant production packages. The Begait goat breeds were reared under extensive management system.

Data Collection Method

A one year monitoring data (2014-2015) on Begait and Abergelle goat breed growth performance like, Birth weight (BW), Weaning weight (WW), Six months weight (SMW), Nine month weight (NMW), Yearling weight (YW) and Average daily weight gains (ADWG) were recorded at empty gut before feeding and watering. All weight measurements except BW were taken at one month's interval using the Salter scale with capacity of 50kg and 50g precision, but birth weight was taken

immediately after 24 hour birth. Average daily weaning weight gain (WWG), was calculated using the following equations.

$$ADG = \frac{(WW \text{ (kg)} - BW \text{ (kg)})}{DBW} \times 1000$$

DBW

Where, ADG= Average Daily Gain

WW= Weaning Weight

BW= Birth Weight

DBW= Days of between Weaning dates

Additionally perception data was collected by using check list from 20 participant goat producer farmers

Data analysis

The collected data were subjected to descriptive statistics using Statistical Package for Social Sciences (SPSS 20.0 for windows, release 20.0 2011). Birth weight, weaning weight, six month weight, nine month weight and yearling weight were used as response variables, whereas breed was used as factor. In addition to descriptive statistics the study also employed narrative analysis to analyze farmers' perception towards the improved Begait goat breed. Indices were calculated for ranked data to provide ranking of major goat diseases and major forage plant species for goat. Indices were calculated as Index = Sum of (3 X number of household ranked first + 2 X number of household ranked second + 1 X number of household ranked third) given for an individual reason, criteria or preference divided by the sum of (3 X number of household ranked first + 2 X number of household ranked second + 1 X number of household ranked third) for overall reasons, criteria or preferences according Musa et al (2006).

Results and discussion

Birth weight and weight at different ages of Begait and Abergelle kids are presented in (**Table 1**). According to this result the average body weight from birth to yearling Begait kids were significantly ($p < 0.0001$) larger than Abergelle kids. This indicated that breed of goats has its own effect on growth performance of the newly born kids. The average weight of Begait kids were (2.85 ± 0.04 , 10.5 ± 0.27 , 13.8 ± 0.24 , 19.6 ± 0.41 and 22.9 ± 0.36) kg for birth weight, weaning weight, six month weight, nine month weight and yearling weight, respectively and the corresponding value for the Abergelle kids were (2.21 ± 0.05 , 6.87 ± 0.14 , 9.51 ± 0.20 , 11.9 ± 0.20 and 14.2 ± 0.20) kg, respectively. The present result in the study district mean body weight value for Abergelle goat kids were similar with the values reported for Abergelle Sokota (1.91 ± 0.04 , 6.84 ± 0.19 , 9.13 ± 0.31 and 14.15 ± 1.20) (Belay and Mengistie 2013), but lower than the mean body weight value of the Begait Kids. Average daily weight gain of kids was affected by breed. Kids born from Begait dam goat had larger ($P < 0.0001$) average daily weight gain (85.0 ± 2.57 g) than kids born from Abergelle dam goat breed (51.8 ± 1.00 g). This result is incomparable with the result of reported in Western Highland goats of Ethiopia average daily weight gain for the newly kids born was (85.0 ± 3.9 g) Chanie D. et al (2014).

Table 1. Comparison of live weight change of Begait and Abergelle kids

Descriptor	Breed		
	Begait N(48)	Abergelle N(48)	P-value
	Mean $\hat{\pm}$ SE	Mean $\hat{\pm}$ SE	
BW(kg)	2.85 $\hat{\pm}$ 0.04 ^a	2.21 $\hat{\pm}$ 0.05 ^b	0.0001
WW(kg)	10.5 $\hat{\pm}$ 0.27 ^a	6.87 $\hat{\pm}$ 0.14 ^b	0.0001
SMW(kg)	13.8 $\hat{\pm}$ 0.24 ^a	9.51 $\hat{\pm}$ 0.20 ^b	0.0001
NMW(kg)	19.6 $\hat{\pm}$ 0.41 ^a	11.9 $\hat{\pm}$ 0.20 ^b	0.0001
YW(kg)	22.9 $\hat{\pm}$ 0.36 ^a	14.2 $\hat{\pm}$ 0.20 ^b	0.0001
ADWG(kg)	85.0 $\hat{\pm}$ 2.57 ^a	51.8 $\hat{\pm}$ 1.00 ^b	0.0001

BW=Birth weight, WW= Weaning weight, SMW= Six month weight, NMW=Nine month weight, YW=Yearling weight, ADWG=Average daily weaning weight
N=Number of sample size, SE=Stander error , p-value= level Significance

Figure 2. The left one is Abergelle female one years old, whereas the right kids are Begait kids three months old

Major goat disease

The major goat diseases in order of their index ranking are present in (**Table 2**). Diseases have numerous negative impacts on production and productivity of herds that is, death of animals, and loss of weight, slow growth rate, poor fertility performance, decrease in physical power and the likes (CSA 2016). Most of the respondents indicated that most common goat diseases from the description of symptoms of diseases (based on index values) and its most frequently occurring Pasteurellosis, Pest des Petit Ruminants, Anthrax, Foot and Mouth diseases and mange mites were reported as major problem for goat productivity and survivability respectively in ranking order. Similar to this result

(Helen et al 2015; Fsahatsion et al 2013; Tajebe et al 2011) also reported that pasturolosis, anthrax and sheep and goat pox were the major diseases hindering productivity and survivability of the goat population in Jijiga, Shinile and east Hararghe zones, Gamogofa zone and Abergelle districts. The occurrences of mange mites, tick and lies in Tanqua-Abergelle, district were higher prevalence. This might be due to the mixed of flock more than one household during browsing and watering and this needs immediate intervention.

Table 2. Major goat diseases in the study district

Tanqua-Abergelle					
Local name	Scientific name	R1	R2	R3	Index
Megerem	Anthrax	2	3	6	0.183
Tselamkebdi	Fascioliasis	3	5	1	0.152
Echilam	FMD	2	1	3	0.1000
Abek	Mange mites	1	2	2	0.084
Tigtgta	Pasteurellosis	8	4	2	0.233
Shilime	PPR	2	3	3	0.132
Kurdidequmal	Tick and lies	2	2	3	0.121

PPR = Pest des Petit Ruminants, FMD = Foot and Mouth Disease, Index = sum of (3 for rank 1 + 2 for rank 2 + 1 for rank 3) for particular diseases divided by sum of (3for rank 1 + 2 for rank 2 + 1 for rank 3) for all diseases

Major Forage Plant Species

Major forage plant species in Tanqua Abergelle district is presented in (**Table 3**). The major forage plant species found in the study districts are different in terms of both abundance and palatability. Data obtained for major forage plant species index values calculation were not based on the special important nature of the plant (i.e. medicinal value or milk quality and quantity effects etc.) but based on abundance and duration. For instance 'Giba, Gonek, Seraw and Tsalwa' were reported by

beneficiaries abundantly throughout the year. Similar report was reported by many authors in different parts of the country (Kedija 2006; Teshome 2006; Endeshaw 2007; Getahun 2008; Tesfaye 2008). Indigenous browses are the major sources of feeds in the study area especially for goats while concentrates were not common. Goats of the study areas are total dependent on natural pasture and tree species for browsing during the days.

Table 3. Major forage plant species for goat in the study districts

Tanqua-Abergelle						
Local name	Scientific name	R1	R2	R3	I	Season of availability
Giba	Ziziphusspina Christi	6	7	8	0.351	From Sep-Jan
Seraw	Acacia etsica	1	3	1	0.082	From Mar-Jun
Chea	Acacia abyssinica	0	2	2	0.071	From Mar-Jun
Wayba	Terminaliaglaucescens	3	3	2	0.133	From Mar-Jun
Tsalwa	Acacia asak	2	4	1	0.122	From Mar-Jun
Mekie	Balanitesaegyptica	3	0	2	0.081	From Mar-Jun
Gonek	Dicrostachyscinerea	5	1	4	0.172	Oct-Dec

Index = sum of (5 for rank 1 + 4 for rank 2 + 3 for rank 3 +2for rank 2 +1for rank 1) for particular plant species divided by sum of (5 for rank 1 + 4 for rank 2 + 3 for rank 3 +2for rank 2 +1for rank 1) for all plant species, Sep=September, Jan=January, Mar=March, Jun=June, Oct=October

Average daily milk yield and fertility rate of Begait dams

The milk production potential of Ethiopian indigenous goats has not been adequately studied in the past and most of the studies are done on-station. The result of this study is present in (**Table 4**). The average daily milk yield of Begait and Abergelle goat breed were vary across early, mid and late the lactation stages (0.84,0.68 and0.55) litter, respectively for the Begait dams and the corresponding value for Abergelle goats were (0.47, 0.35 and 0.15) litter, respectively. This indicated that the milk production of Begait goat breed is higher than that of Abergelle breed. In agreement of this finding Berhane and Eirk (2006); Degen (2007) reported that daily milk yield for Begait and Long-eared Somali were (0.63 and 0.33) litter respectively, but in contrast with this finding of (Mestawet et al 2012) reported daily milk yield of Somali goat breed was 0.93litter.

Table 4. Daily average milk yield

Milking stages (in litter)	Begait Dams	Abergelle Dams
Early stage	0.841	0.472
Medium stage	0.683	0.353
Late stage	0.552	0.152
Daily average milk yield	0.691	0.324

Survival rate of Begait and Abergelle kids in Tanqua-Abergelle district.

Survival rate of Begait and Abergelle kids are presented in (**Table 5**). Kids born from Abergelle goat breed had higher percentage of survival rate from kids born from Begait goat breed. This might be due to slightly having niche difference. Twin born kids had similar survival rate with single born kids within the Begait kids, which might be due to their sufficient milk production of their dams.

Table 5. Survival of Begait and Abergelle goats in Tanqua-Abergelle district

Descriptor

Breed

	Begait		Abergelle	
	N	Survival to one year age (%)	N	Survival to one year age (%)
Type of birth				
Single	30	83.3	48	95.8
Twin	10	80	-	-
Sex				
Male	18	66.7	21	90.5
Female	30	83.3	27	85.2

Farmers' perception

The beneficiary farmers of Sheka-Tekli in collaboration Abergelle agricultural research center Begait goat kids were evaluated as compare to their own local Abergelle goat kids in overall performance. According the idea of the participant farmers perceive that Begait goat breed have additional attributes over the local breed (Abergelle goat bred)in their non- selective feed browsing, high milk yielder and fast grower and their litter size. The only opposition raised by the participant farmers over Begait goat breed was their low market demand due to their ear largeness and slow adaptation to the environment. As part of the qualitative analysis, field days were prepared and all the participants were soundly appreciated the effort made to enhance the production and productivity of goat in the study area.

Conclusions

- Feed shortage in terms of both quantity and quality are among the main constraints of goat production across the beneficiaries farmers.
- Average body weight from birth to yearling Begait kids were significantly ($p < 0.0001$) larger than Abergelle kids.

- Pasteurellosis, Pest des Petit Ruminants, Anthrax, Foot and Mouth diseases and mange mites were reported as major problem for goat productivity and survivability respectively in ranking order.
- Milk production of Begait goat breed is higher than that of Abergelle breed.
- Kids born from Abergelle goat breed had higher percentage of survival rate from kids born from Begait goat breed. This might be due to slightly having niche difference.
- The goat keepers had a positive attitude towards the Begait goat breeds in overall parameters except for the attributes of ear length.
- Therefore scaling up and scaling out of the Begait goat breed enhances the speed of transmission from nonfood secure households to food secure households.

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