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On-station Performance of the Konso Goat in Konso zone, South Ethiopia

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ABSTRACT: The current study was aimed to evaluate four years' Konso goat growth and reproduction performances reared under on-station level. About 318 (male = 150 and female = 168) goats were employed. Sex, birth months and years were considered as fixed factors on birth, weaning, six months, nine months and yearling weights. Average daily weight gain, kid mortality, litter size and kidding intervals were used for the reproduction performance evaluation. Means were separated by using Duncan multiple range test and frequency by SPSS (20) software. The overall means for birth, weaning, six months, nine months and yearling weights (kg±SE) were 2.63 ± 0.02 , 11.23 ± 0.16 , 12.81 ± 0.11 , 15.34 ± 0.04 and 16.93 ± 0.07 , respectively. The current findings revealed that almost all body weight categories were significantly affected (P<0.05) by sex, birth months and year. The mean pre and post-weaning average daily weight gain (ADWG) g day⁻¹ were 95.51 ± 1.23 and 17.95 ± 2.12 , respectively. Males showed significant (P<0.05) preweaning ADWG than females whereas the reverse was true for post-weaning ADWG. Almost all kids born were single type and kidding interval (KI) was 368.67 ± 29.79 days. About 17.61% kid mortality was detected at station. Growth and reproduction performances obtained under government managed station were showed lower performances compared with other on-farm goat performances reported by the different scholars. Therefore, further performance evaluation is needed under similar on-station level.

Keywords: Goat, growth, Konso, on-station, production, reproduction.

INTRODUCTION

The total number of goats (Capra hircus) in Ethiopia is estimated to be nearly 52.46 million (CSA, 2021). Due to their small body size, they require lower feed and easily integrate into different farming systems. They also adapt to different climates and have short reproductive cycles. Increasing human population growth is forcing the conversion of many former grazing areas into croplands is becoming increasingly difficult for raising cattle. In such places, the importance of goats in fulfilling the roles of cattle like milk and meat production and income generation (ESGPIP, 2009; Gatew et al., 2019). However, Ethiopian indigenous goats are genetically less productive as compared to temperate breeds (Mohammed et al. 2012; Zeleke et al., 2017) constrained by many biological, environmental and socio-economic factors. Among them, lack of systematic breeding programs is an important constraint (Solomon, 2014; Mezgebu et al., 2022).

Reproductive and productive performances are important indicators of adaptability and management

the performances of economically important traits of the livestock are very useful inputs for planning a breeding program (Aynalem et al., 2011; Solomon, 2014). Productivity performance can be evaluated either at on-farm or at on-station level (Mueller et al., 2021). Evaluating the goat performance at different management systems helps to exploit the potential of a given animal which guides the directions for the end users (Netsanet et al., 2016). The performance of the Konso goat at on-farm level: traditionally managed as baseline (Dereje and Ermias 2018) and under community-based breeding level (Ermias, 2022) were evaluated for the same breed in different circumstances. The majority of goat keepers (50.83%) confirm their goat pregnancy by enlargement of abdomen followed by non return of goat in heat (28.33%) and remaining goat keepers confirm through diagnosis (20.83%) while, maximum goat keepers (63.33%) in the study area practiced to house their pregnant does with their other goats i.e. group housing and 36.66 per cent goat keepers were aware to house pregnant does in a separate house. Present study provides basic knowledge 30

suitability (Getahun and Girma 2008). Evaluations of

about the breeding practices used by goat keepers (Singh et al., 2023).

With promising goat CBBPs in rural areas, finisher crossbreeding with Boar goats is better to attain fast meat demand around urban and peri-urban areas nationally (Damana, 2023).

The findings have revealed that resource-poor participatory goat breeding program should be further monitored and evaluated based on the above mentioned factors' in short and long term plans for the Konso goat breed genetic improvement (Dea, 2024).

Konso goat (Woyto-Guji) is one of the 12 identified in Ethiopia (Tesfaye, 2004). However, the performances under on-station level were not evaluated yet as of other indigenous goat breeds in the country for the policy makers at large. Therefore, the current study was aimed to evaluated production and reproduction performance of the Konso goat breed under on-station level.

MATERIAL AND METHODS

A. Description of the study area

Konso is located 595km away from Addis Ababa in the southwest of Ethiopia; it is located at 5°17' 36" N latitude and 37°29' 05" E longitude and lies between 600 to 2100 m.a.s.l (Konso district agricultural office, 2008). The temperature ranges between 12 to 33°C. The annual rainfall variation is between 400 and 1000mm. The rain follows a bimodal pattern where there are two rainy seasons: "*Belg*" big rains with the period starting mid-February and lasts until April and the small rain period "*Meher*" occurring around October and November. The production system is integrated crop-livestock system (Netsanet *et al.*, 2016). Baide goat breeding, evaluation and evaluation site (on-station) was located at altitude of 1202 meter above sea level (N=05°28'15" and E= 037°26'00").

B. Animal and data management

A total of 318 Konso goats (males= 150 and females=168) were used for the performance evaluation for four consecutive years from 2012 to 2015 E.C. Animals were managed by browsing for 8:00 hours perday and occasionally fed with local alcoholic drink by-product 'checka' and concentrate. Water was offered daily.

Records of growth data included: birth weight, weaning weight, six months weight, nine months weight and yearling weight. Body weight was taken every 30 days using graduated spring balance scale (50 kg capacity).

Growth rate (Average daily weight gain, ADWG) was computed as: 90 days ADWG (gram) = birth weight and 90 day weight and 180 days ADWG (gram) = between 91 and 180 day weight.

Reproduction data collected were birth type, sex, birth month, birth year, kidding interval and kid mortality.

C. Data management and analysis

The Statistical Package for Social Sciences (SPSS for windows, version 20, 2011) was used to analyze growth traits. Sex, birth month and birth years were used as fixed effects. The effect of class variables was expressed as (mean \pm SE) and separated by Duncan multiple range test.

(i) The model used for the growth and average body weight gain (gm):

 $Y_{ijk} = \mu + S_i + M_j + Y_k + e_{ijk}$ Where:

 Y_{ijk} = Observation on birth weight, weaning weight, six months weight, nine months weight, yearling weight 90 and 180-day average daily weight gain affected by ith sex, jth birth month and kth birth year.

M = the overall mean

 S_i = Fixed effect of the ith sex (I = male, female) M_j = Fixed effects of the jth birth month (j = Sep-Aug) Y_k = Fixed effects of the kth birth year (k = 2012-2015)

 $e_{ijk} = Random error$

RESULTS AND DISCUSSION

A. Growth performances

Growth performances (Kg) of the Konso goat at onstation level were presented in Table 1. The mean birth weight (BW), three month (3M), six month (6M), nine month (9M) and yearly weight (YW) were 2.63±0.02, 11.23±0.16, 12.81±0.11, 15.34±0.04 and 16.93±0.07, respectively. Almost all growth categories were significantly (P<0.05) affected by sex, birth month and years at on-station level. The low performance reported at on-station level was due to high infrastructure and technical inputs requirements (Solomon, 2014). However, post-weaning weights for the same breed under traditional management (Dereje and Ermias 2018) and community-based breeding program (Ermias, 2022) were higher than station level. BW, 3M, 6M and YW of the Arsi-Bale goat at station level were 1.91, 6.65, 9.00 and 14.32 kg, respectively (Bedhane et al., 2013).

Sex affected (P<0.05) all body weight categories except nine month (P>0.05). Males showed higher body weight than females except at six months. Similar results were reported for the same breed under both traditional and community-based breeding program management systems (Dereje and Ermias 2018; Ermias, 2022).

Birth month has significantly affected (P<0.05) all goat weight groups. September, October, November, April and May are considered as wet months (rainy seasons) in Konso area (Netsanet *et al.*, 2016). The current finding revealed that all body categories were affected by months interchangeably but not based on wet and dry seasons. Finding for the same breed implied that similar effect reported under traditional management practice (Dereje and Ermias 2018) whereas the contradicting findings revealed under the community based breeding program (Ermias, 2022).

Birth year has significantly affected (P<0.05) all goat weight classes. As the experimental years increased, body weight revealed lower performances in almost all

age groups. Similar results were reported for the same breed under community-based breeding program (Ermias, 2022).

Table 1: Effect of sex,	birth month and	l year on birt	h weight,	weaning wei	ight, six months	weight, nine	months
	weight and y	earling of the	e Konso g	oat under sta	ation level.		

Parameters (N)	Birth weight (µ±SE)	Weaning weight	6 months weight	9 months weight	Yearling weight
CV	0.14	0.13	0.15	0.06	0.09
\mathbb{R}^2	0.66	0.71	0.54	0.72	0.75
Overall (318)	159(2.63±0.02)	102(11.23±0.16)	81(12.81±0.11)	75(15.34±0.04)	66(16.93±0.07)
Sex	*	*	*	NS	*
Male (150)	2.74±0.02ª	90(11.54±0.09) ^a	72(12.17±0.16) ^b	66(15.19±0.06)	54(17.38±0.11) ^a
Female (168)	2.64±0.02 ^b	114(10.97±0.08) ^b	90(13.38±0.15) ^a	84(15.47±0.05)	78(16.63±0.10)b
Month	*	*	*	*	*
Sep (12)	2.50±0.06 ^{bc}	12(10.75±0.22) ^{cd}	12(12.50±0.38) ^{de}	12(15.25±0.13) ^{cd}	6(21.00±0.32) ^a
Oct (12)	2.25 ± 0.06^{d}	12(9.75±0.22) ^e	12(14.50±0.38)ab	12(16.50±0.13) ^a	12(16.25±0.23) ^d
Nov (30)	2.76±0.04ª	6(9.00±0.31) ^f	6(14.00±0.54) ^a	6(16.00±0.18) ^b	6(17.00) ±0.32)°
Dec (24)	2.62±0.05 ^{ab}	18(11.88±0.19) ^b	18(13.75±0.33) ^{bcd}	18(15.13±0.11) ^{ef}	18(17.75±0.20)bc
Jan (24)	2.75±0.05 ^{ab}	18(12.75±0.19) ^a	18(13.25±0.33) ^{bcd}	18(15.63±0.11)°	18(16.38±0.21) ^d
Mar (18)	2.63±0.05ª	6(13.00±0.31) ^a	-	-	-
Apr (12)	2.50±0.06 ^{bc}	12(10.75±0.22) ^{cd}	12(13.00±0.38) ^{bcd}	12(15.00±0.16)de	12(16.00±0.23) ^d
May (66)	2.76±0.03ª	54(11.44±0.12) ^{cd}	24(11.63±0.27) ^e	12(14.50±0.13) ^f	12(15.00±0.23) ^e
Jun (12)	2.25 ± 0.06^{d}	6(13.00±0.31) ^a	12(13.75±0.38) ^{abc}	12(14.50±0.13)f	6(15.00±0.32)ce
Jul (30)	2.44±0.05 ^{ca}	24(10.08±0.18)de	18(12.83±0.32) ^{cd}	18(15.00±0.11) ^{de}	18(17.67±0.18) ^b
Aug (78)	2.83±0.03ª	36(10.78±0.14)bc	30(12.00±0.25) ^e	30(16.00±0.09)b	24(17.58±0.17)b
Year	*	*	*	*	*
2012(12)	3.00±0.06ª	12(9.50±0.22)°	6(14.00±0.54) ^a	6(16.00±0.18) ^a	6(18.00±0.32) ^a
2013 (162)	2.51±0.12°	138(11.48±0.07) ^a	138(13.22±0.12) ^a	138(15.28±0.04)b	126(16.85±0.08)b
2014 (126)	2.74±0.02b	54(11.19±0.12)b	18(10.33±0.31)b	6(15.50±0.18)b	-
2015 (18)	2.88±0.05 ^b	-	-	-	-

 μ = mean; SE= standard error of the mean; NS= non-significant (P>0.05); *= significant (P<0.05); N= number of the observations; CV= coefficient of variation

B. Body weight gain

Pre-weaning and post weaning average daily weight gain of the Konso goat under on-station level were presented in Table 2. Pre-weaning ADWG g day⁻¹ was 95.51 ± 1.23 whereas post-weaning ADWG g day⁻¹ was 17.95 ± 2.12 . Average daily body weight gain was significantly affected (P<0.05) by sex at on-station

level. Males revealed higher pre-weaning ADWG g day⁻¹ than females whereas females have showed higher post-weaning ADWG g day⁻¹ than males. In general, the current findings were in line with for both preweaning and post-weaning ADWG g day⁻¹ (Dereje and Ermias 2018; Ermias, 2022) for the same breed under traditional and community-based breeding program.

 Table 2: Average (LSM±SE) daily weight gain (birth-90 and 91–180 days) for both male and female Konso goat under station.

Factors	Pre-weaning ADWG g day ⁻¹ (birth – 90 days)		Post-weaning ADWG g day ⁻¹ (90 – 180 days)		
	Ν	μ±SE	Ν	μ±SE	
Overall	156	95.51±1.23	156	17.95±2.12	
Sex	*		*		
Male	66	100.71±1.60a	66	4.55±2.77b	
Female	90	91.70±1.67b	90	27.78±2.63a	

Means in the same column with different superscripts are significantly different. μ = means, SE= standard errors, ADWG= average daily weight gain, N =number of observation, NS =non-significant, * = P < 0.05; g day-1= gram per day

C. Reproduction performance

The reproduction performances of the Konso goat at on-station level were depicted in Table 3, Fig. 1 and 2. Litter size for kids born at on-station level were almost single type. However, contradicting findings reported for Arsi-Bale goat at on-station level litter size were 1.64 (Dadi *et al.*, 2008) and 1.60 (Kebede *et al.*, 2012a). Additionally, higher prolificacy was reported for the

same breed at on-farm level (Dereje and Ermias 2018; Ermias, 2022). The overall kidding interval was about 368.67±29.79 days. Lower kidding interval was reported for Arsi-Bale goat 293 days (Dadi *et al.*, 2008) and 280 days (Kebede *et al.*, 2012a). About 245 days' was an optimum kidding interval reported by different scholars for small ruminant. Better nutrition and early weaning impacts prolificacy and kidding interval (ESGPIP, 2009).

The mean mortality observed was 17.61%. Pre-weaning mortality (12.58%) was higher than post mortality

(5.03%). Pre-weaning mortality of young kids is the essential problem for the breeders. Mortality is documented as the main factor adversely affecting goat production in the tropics (Zeleke *et al.*, 2017).

Parameters	Ν	Measurement
Litter size (%)		
Single	318	100%
Twin	-	-
Kidding interval (day) [mean \pm SE]	38	368.67 ± 29.79
Kid mortality (%)	56	17.61%
Pre-weaning mortality (%)	40	12.58%
Post-weaning mortality (%)	16	5.03%

Table 3: Reproduction performance (N = 318).

N= number of the observation; SE= standard error of mean



Fig. 1. Konso goats at on-station (left) and kids' pedigree (right).



Fig. 2. Kidding months of Konso goat at on-station level.

Kidding has occurred almost all year round as similar finding reported in Ethiopia (ESGPIP, 2009). Under traditional management, Konso goat frequent frequency was observed in January and July (Dereje and Ermias 2018). The highest birth frequency Illustrated in August and May. Peak kidding is observed in May–June on research stations and in August under farm conditions (ESGIP, 2009).

Most results show that in the absence of nutritional stress, there are no periods of the year when the whole flock is anestrus (ESGIP, 2009).

CONCLUSION AND RECOMMENDATION

An overall means for birth, weaning, six months, nine months and yearling weights (kg) were 2.63, 11.23, 12.81, 15.34 and 16.93, respectively. Almost all body weight categories were affected by sex, birth months and year. The mean preweaning weight ADWG g day⁻¹ was higher than postweaning. Males showed significant (P<0.05) pre-weaning ADWG than females whereas the reverse was true for postweaning ADWG. Almost all kids born throughout the years were single type and an average kidding interval of the does' was 368.67 days. Finally, about 17.61% kid mortality was detected in station. Growth and reproduction performances obtained under government managed station showed lower performances compared with similar breed at on-farm level reported by the scholars. Therefore, further performance verification is needed under similar government stations.

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