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## On-farm performance evaluation of Maale goats under agro-pastoral management in Southwest Ethiopia

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### ABSTRACT

This study was conducted in Maale district Southwest Ethiopia with the objective of evaluating the productive and reproductive performance of Maale goats under agro-pastoral management conditions. Thirty households that have flocks numbers of more than ten were purposely selected and monitored from July 2018 to July 2019. Growth data of birth weight, three month, six month, nine month and yearly weight; birth type and parity were collected. The data were analyzed using the General Linear Model (GLM) procedure of SPSS (21). The overall mean birth weight of the kids was  $2.57 \pm 0.05$  kg (males  $2.68 \pm 0.07$  and females  $2.47 \pm 0.07$  kg). The weaning and six months weight of kids was significantly different ( $p < 0.05$ ) between sexes of kids with  $7.66 \pm 0.25$  and  $6.90 \pm 0.23$  kg for male and female kids, respectively. The average body weight of males and females for six months; nine months and yearly were  $11.57 \pm 0.30$ ,  $10.42 \pm 0.28$ ;  $15.42 \pm 0.27$ ,  $14.69 \pm 0.25$  and  $19.03 \pm 0.28$ ,  $18.43 \pm 0.25$  kg, respectively. The birth type showed a significant ( $p < 0.05$ ) difference in birth weight. The result further indicated that the weaning weight of single and twin kids was highly significant ( $p < 0.001$ ) and recorded as  $7.66 \pm 0.25$  and  $6.90 \pm 0.23$  kg, respectively. The overall pre-weaning average daily gain was  $51.64 \pm 1.89$  g day<sup>-1</sup> ( $54.47 \pm 2.81$  male and  $48.93 \pm 2.53$  g day<sup>-1</sup> female). The birth type was significantly ( $p = 0.01$ ) different in pre-weaning growth rate and recorded  $57.24 \pm 1.63$  and  $45.24 \pm 3.59$  g day<sup>-1</sup> for single and twin kids, respectively. Twins had higher post-weaning average daily gain than single and recorded as  $43.61 \pm 1.48$  and  $40.76 \pm 0.70$  g day<sup>-1</sup>, respectively. It was concluded that, along with other management interventions, the reproduction and growth performance of Maale goats is reasonably good and suited for community-based breeding strategies and higher performance could be expected.

**Keywords:** Ethiopia, Maale Goats, Performance, Productive, Reproductive, South Omo

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## Introduction

Livestock production is one of the primary agrarian activities which directly or indirectly employ a large section of the society especially those residing in the rural areas (Belay and Meseretu, 2018; CSA, 2021). Several studies have indicated that the overall productivity of the livestock does not commensurate with their population (Aberra, 2018). Results of the latest livestock census showed that there is huge number of goats, which estimated in 52.5 million, which are reared across the diverse agro-ecological zones and production system of the country (CSA, 2021). Despite huge number and genetically diverse, Ethiopian indigenous goats are genetically less productive as compared to temperate breeds (Mohammed *et al.* 2012).

Goats are deeply embedded in almost every African culture and are true friends to rural people of Sub Saharan Africa in particular (FARM Africa, 2005). Goats can play a vital role in ensuring the food security of a household, often being the only asset possessed by a poor family. In time of trouble, such as crop failure or family illness, goats can be sold and food or medicine purchased (FARM Africa, 2005). Goats also provide their owners with a broad range of products and socio-economic services and have played an important role in the social life of many African people, being used as gifts, dowry, in religious rituals and rites of passage (Peacock, 1996).

Based on phenotypic characterization, the country is endowed with 15 goat populations (IBC, 2004), even though, the recent molecular study regrouped in to seven genetic entities (Mekuriaw, 2016). Goats are the significant species for the rural communities that reared in large flock since they are adaptive to harsh environment than sheep and cattle species (Birhanie et al., 2018). Goats are provided 3.4 and 1.6 times higher gross margin than sheep and cattle, respectively in dry area of the country (Woldu et al., 2016).

Goat production has become very popular in recent years as a path way out of poverty (Ahuya et al., 2003) and has been regarded as a feasible means to improve the income and nutrition of rural communities and to bring these communities into commercial marketing systems (Braker et al., 2002). However while the wide spread cultural acceptance of goat and goat products for development there are many physical, economic, social and political constraints to developing goats in Sub-Saharan Africa (FARM Africa, 2005). Attempts to document indigenous goat breeds of Ethiopia and their performance using different methods have been conducted since long (Deribe, 2009; Hassen et al., 2012; Dereje et al., 2013). However, studies of on-farm performances of a goat breed at community level are quite limited.

Performance recording is an important tool to suggest for the breeding policy for a given area. However, recording in general is hardly practiced in many livestock species in the country, to identify the performance and management gaps (Tibbo, 2006). Reproductive and productive performances are important indicators of adaptability and management suitability (Abegaz et al., 2002; Getahun et al., 2008). Birth weight, birth type, pre and post-weaning, parity of doe and season of birth are important traits that can affect the profitability of the goat enterprise (Zeleke et al., 2017). These important traits are affected by a number of factors. Genetically and environmental factors are dramatically affect the goat production. Among these factors, 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). It needs a strategic post-survey recording and documentation of the performances of the animals in their native environment under farmer's condition.

Very often, the results obtained from on-station research are of little relevance to traditional production systems and may not contribute much towards understanding of the specific adaptation of animals to farmer's conditions (Rey et al., 1992). Documentations of important productive and reproductive traits related to the Woyto-Guji (locally known as Woyto, Guji or Konso) goat breed at on farm level are very little. However, information is lacking in this regard, and no

study has yet been conducted to identify such factors. Therefore, this study was aimed to evaluate and measure on-farm productive and reproductive performances of Woyto-Guji goats in their breeding tract under agro-pastoral management conditions.

## Materials and Methods

### The study area

Maale woreda is one of the ten woreda's found in South OmoZone, which covers an area of 1432 km<sup>2</sup> and has human population estimated 102,870. The population density of the woreda is 66 persons per km<sup>2</sup>. The woreda is divided in to 23 rural and 1 urban PA. The altitude of the woreda ranges between 600-1500 m.a.s.l. Its astronomical locations are 5.08°N - 6.01°N latitudinally and 36.3°E - 37°E longitudinally. There are two major agro ecologies found in the woreda namely kola and woynadega, which account 85% and 15%, respectively. The mean annual RF ranges between 800-1200 mm and the mean annual temperature ranges between 18-35°C. The woreda has animal resources with an estimated amount of 324,652 cattle, 81,181 sheep, 452,943 goats, 213,456 local and improved poultry, 12,256 equines, 2870 dogs, 3028 cats and 267,216 bee colonies. The average land holding of the woreda ranges from 0.15-2.10 hectare. There is only one ethnic group/Maale/ found in the woreda and their farming system is mixed crop livestock production system (Bizuayehu et al., 2016).

### Data source and management

All collected data were coded and recorded in excel sheet. On farm flock, monitoring was carried out in three kebele's of the woreda. The kebele's were selected purposively based on the goat population and access for infrastructure. Accordingly, thirty households with flocks numbers more than 10 were selected, and a total of 30 Flocks were monitored from July 2018 to July 2019. At the beginning of the study, all flocks were ear tagged. The age of the goats and parity were identified with dentition and information from the rearers.

Data was collected by trained enumerated in the selected kebele's and supervised by researchers in a monthly interval. Data collected on growth include birth weight, three months weight, six months weight, nine and twelve month's weight. In addition, season of birth, type of birth, does parity also taken. Body weight was taken every month using hanging scale balance (50 kg capacity with 200 g precision) for kids until six months of age and with three months interval thereafter.

Growth rate (Average Daily Gain, ADG) was computed as:

$$\text{Pre-weaning ADG (g day}^{-1}\text{)} = (3 \text{ MWT} - \text{Birth Wt})/90$$

$$\text{Post-weaning ADG (g day}^{-1}\text{)} = (\text{Yearly wt} - \text{three months weight})/275.$$

### Milk yield data

Data on milk yield was taken from 61 doe's. After parturition, dam milk production was measured once in a week to 3 month postpartum. Dam was separated from their progeny in the late afternoon when they came in from grazing. Early next morning one-half of the udder was milked out by hand and kids then allowed to suck to satiety and again separated. In the afternoon, 24 hr after the initial separation on the day, half of the udder was again milked out. Total milk recorded at the morning and afternoon milking was doubled to give an estimate of daily milk production.

### Statistical analysis

The collected data was analysed using the General Linear Model (GLM) procedure of SPSS (21). Dependent or response variables in the analysis were birth weight, weight at different ages and pre and post weaning and average daily weight gains. The fixed effects considered were sex of the kid, parity of the doe, birth type and season of birth.

The model used to analyse growth traits was:

$$Y_{ijkl} = \mu + S_i + P_j + B_k + T_{lijkl} + \epsilon_{ijkl}$$

Where,

$Y_{ijkl}$  = observed live weight and weight gain ( $Y_{ijkl}$ <sup>th</sup> individual)

$\mu$  = overall mean

$S_i$  = the effect of the  $i^{\text{th}}$  sex ( $i = 1, 2$ )

$P_j$  = the effect of the  $j^{\text{th}}$  parity ( $j = 1, 2, 3, 4, 5, \geq 6$ )

$B_k$  = the effect of the  $k^{\text{th}}$  type of birth ( $k = \text{single, twin}$ )

$T_l$  = the effect of the  $l^{\text{th}}$  season ( $l = \text{wet, dry}$ )

$\epsilon_{ijkl}$  = random residual error associated to  $Y_{ijkl}$ <sup>th</sup> observation

## Results and Discussion

### Flock monitored

From the studied thirty agro-pastorals in the beginning, there have been 750 goats and after one year, the goat number reached 875. The flock number was increased by 17% in one year. A total of 343 (male 167 and female 176) kids birth data were recorded during the flock monitoring period. Male to female ratio of the new births were 0.95:1.0. The result indicated that sex categories did not appear differently from the expected ratio of 50:50. The mean number of flock at the end of the study period was  $29.17 \pm 12.76$  (Mean  $\pm$  SD) with the range of 14-70 goats per HH.

### Growth performances

Birth weight, three month, six month, nine month and yearly weight of goats in the studied district was presented in table1.

The result in Table 1 showed that sex had a significant effect ( $P < 0.05$ ) on birth weight, weaning weight and six months weight of the kids. The birth weight of males and female kids were  $2.68 \pm 0.07$  and  $2.47 \pm 0.07$  kg, respectively with the overall mean birth weight of  $2.57 \pm 0.05$  kg. The present result was higher than studied by (Alemu, 2015; Belay and Mengistie, 2013) which was reported  $1.98 \pm 0.06$  and  $1.91 \pm 0.04$  kg, respectively for Abergalle goats and comparable with the study of Deribe (2009) for Alaba goats. The type of birth, sex, parity, the development and age of dam, length of pregnancy, feeding, season of kidding, parity and health condition (Mioč et al., 2011) may acclimatize these variations of birth weight.

The sex of the kids had statistically significant ( $p < 0.05$ ) effect on birth weight. Male had a heavier weight as compared to the female kids; this may be due to the effects of sexual-size dimorphism (Liao et al., 2013). The birth weight obtained in the present study was comparable with reports of Mehlet (2008) for Arsi-Bale goats at on-station and Tatek et al. (2004) for Arsi-Bale goats under traditional management conditions. Birth weight is an economic trait, which has a positive relation with kid survival and overall post-natal development.

The effect of the type of birth on kids' birth weight clearly demonstrated that in this study single kids were significantly ( $p < 0.05$ ) heavier than twin kids. According to the result, single and twin kid's birth weight was  $2.67 \pm 0.04$  and  $2.46 \pm 0.09$  kg, respectively. The differences in birth weight in different litter size may be due to the small size and weight of the twin in the uterus (Bushara et al., 2013; Zeleke et al., 2017). Kugonza et al. (2014), confirms these results that birth weight decreased as litter size increased with single kids growing much faster than twins do at all ages. It is probable that single kids consume more colostrum and hence more immunoglobulins than twins or triplets. This means that resistance to disease is stronger in singles and hence the higher possibility of a better growth rate and live body weight (Kugonza et al., 2014). It also means that the higher birth weight of single born kids than those of multiple births is probably due to the sharing of uterine space and uterine nutrient by the fetus of multiple births leading to lowered birth weight (Soundararajan and Sivakumar, 2011). Weaning weight of single and twin kids was highly significant ( $p < 0.001$ ) and was  $7.86 \pm 0.15$  and  $6.60 \pm 0.32$  kg, respectively.

The effect of season of birth on body weight was statistically significant ( $P < 0.05$ ). The kids born during dry season ( $2.67 \pm 0.07$  kg) weighed heavier than wet season ( $2.47 \pm 0.06$  kg). The result was in agreement with Deribe (2009) for

Alaba goats and [Zeleke et al. \(2017\)](#) for Central Highland x Boer crossbred goats. This could be due to the availability of better nutrition (grass and browsing tree) in the later stage of pregnancy i.e. during end of wet season. Besides the same, the doe/kids may not be able to go for browsing due to heavy rains and the only option to feed such doe/kids is through cut and carry system. [Zeleke et al. \(2017\)](#) also explained that, the effect of season might be partly by the climatic conditions and feed availability during mating and pregnancy of dam. The lowest birth weight during wet season may be due to that goats in wet season do not graze well due to the dew and wetness of the environment, which consecutively affect the foetus at pregnancy. According to [Deribe \(2009\)](#), the higher birth weight in kids born in the dry season is related to the better body condition of the dams due to good body reserves during the early dry season.

Furthermore, goats were in a better body condition irrespective of feed availability when they were free wandering during the dry season, having chance for feed selection. Weaning weight and six months weight of kids was significantly different ( $p<0.05$ ) between sex of kids. Accordingly, weaning weight of male and female kids was  $7.66\pm0.25$  and  $6.90\pm0.23$  kg, respectively.

Six months weight of male and female kids was  $11.57\pm0.30$  and  $10.42\pm0.28$  kg, respectively. The least square mean of nine months weight of male kids was  $15.42\pm0.27$  kg and female goats was  $14.69\pm0.25$  kg, average yearly weight of male and female goats at Maale woreda was  $19.03\pm0.28$  and  $18.43\pm0.25$  kg, respectively. The result was higher than the reports of Abergalle goats at Sekota area ([Belay and Mengistie, 2013](#)).

Table 1. Least square means and standard errors for weights from birth to yearly age of Malle goats.

Factor	Birth Wt (kg)		3mon Wt (kg)		6mon Wt (kg)		9mon Wt (kg)		Yearly Wt (kg)	
	N	LSM(±SE)	N	LSM(±SE)	N	LSM(±SE)	N	LSM(±SE)	N	LSM(±SE)
Overall	343	$2.57\pm0.05$	304	$7.27\pm0.17$	275	$10.97\pm0.21$	259	$15.04\pm0.18$	252	$18.72\pm0.19$
Sex of kid		*		*		*		NS		NS
Male	167	$2.68\pm0.07$	147	$7.66\pm0.25$	132	$11.57\pm0.30$	125	$15.42\pm0.27$	120	$19.03\pm0.28$
Female	176	$2.47\pm0.07$	157	$6.90\pm0.23$	143	$10.42\pm0.28$	134	$14.69\pm0.25$	132	$18.43\pm0.25$
Birth type		*		***		NS		NS		NS
Single	276	$2.67\pm0.04$	244	$7.86\pm0.15$	223	$11.32\pm0.19$	208	$14.97\pm0.17$	203	$18.89\pm0.17$
Twin	67	$2.46\pm0.09$	60	$6.60\pm0.32$	52	$10.50\pm0.41$	51	$15.13\pm0.36$	49	$18.48\pm0.37$
Season of birth		*		NS		NS		NS		NS
Wet season	202	$2.47\pm0.06$	179	$7.32\pm0.24$	161	$11.21\pm0.28$	153	$15.18\pm0.25$	149	$18.88\pm0.25$
Dry season	141	$2.67\pm0.07$	125	$7.22\pm0.25$	114	$10.75\pm0.30$	106	$14.91\pm0.27$	103	$18.56\pm0.27$
Parity of doe		NS		NS		NS		NS		NS
1	46	$2.51\pm0.15$	38	$6.87\pm0.51$	35	$10.68\pm0.55$	34	$14.49\pm0.49$	34	$18.17\pm0.48$
2	74	$2.61\pm0.10$	66	$7.32\pm0.41$	56	$11.09\pm0.53$	53	$15.54\pm0.48$	52	$19.02\pm0.47$
3	63	$2.49\pm0.10$	55	$7.82\pm0.41$	47	$11.34\pm0.47$	44	$14.63\pm0.42$	42	$18.38\pm0.44$
4	50	$2.53\pm0.17$	45	$7.18\pm0.55$	41	$10.44\pm0.67$	36	$15.05\pm0.61$	35	$18.90\pm0.61$
5	38	$2.57\pm0.11$	37	$6.87\pm0.36$	37	$10.90\pm0.45$	36	$14.98\pm0.40$	36	$18.95\pm0.40$
>6	72	$2.71\pm0.09$	63	$7.46\pm0.29$	59	$11.16\pm0.37$	56	$15.30\pm0.34$	53	$18.68\pm0.36$

\* $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ ; Means with different letters within the same column are significantly different at the indicated level. NS: Not Significant; N: number of observations.

According to the studied result, the birth weight of the kids in the parity of the first, second, third, fourth, fifth and more than six were,  $2.51\pm0.15$ ,  $2.61\pm0.10$ ,  $2.49\pm0.10$ ,  $2.53\pm0.17$ ,  $2.57\pm0.11$  and  $2.71\pm0.09$  kg, respectively (Table 1). Although, the weight of the kids through all parities statistically insignificant there were plenty and visual difference in the birth and three months weight. This may be attributed with the advancement of the animal age or it may due to physiological stress experienced by goats. According to study of [Deribe \(2009\)](#), there was non- consistent increment of birth weight as parity advanced. The decline of dam's productivity soon after reaching certain level of threshold, as it was observed from the sharp decrement in fifth parity, might partly be due to the management and aging effect at higher parties ([Deribe, 2009](#)).

#### Weight Gain (ADG) performance of the kids

The overall pre-weaning average daily gain for the studied goats was  $51.64\pm1.89$  g (Table 2). The pre-weaning average daily gain obtained in this study was comparable with Abergalle goats ([Belay and Mengistie, 2013](#)). Pre-weaning ADG of male and female kids was  $54.47\pm2.81$  and  $48.93\pm2.53$  g, respectively. However, there was no significant difference in average daily weight gain between male and female kids. Similar result was also observed by [Zeleke et al. \(2017\)](#), sex of kids had no influence on pre weaning and post weaning kid survival rates for Central Highland x Boer crossbred goats. The present study disagreed with the study by [Gatew et al. \(2019\)](#) who reported that sex of kids affected significantly by total daily weight gain in Bati goats. Sex of kids, season of birth and parity of doe were non-significant ( $p > 0.05$ ) on the average daily weight gain of Maale goats and similar results was reported by [Gatew et al. \(2019\)](#) in Bati goat.

The result further indicated that, birth type was significantly ( $p<0.01$ ) different in pre-weaning ADG and recorded as  $57.24\pm1.63$  and  $45.24\pm3.59$  g for single and twin kids, respectively. Kids born as single were higher in pre weaning daily body weight gain than twins; this result was in agreement with (Zeleke et al., 2017; Bushara et al., 2013). According to those authors, this difference is probably due to the intrauterine environment where a higher availability of nutrients to the single kid, lack of competition as well as more space may facilitate growth. The uterine space and available nutrient shared by more than one kid may be responsible for the reduced birth weight with increasing litter size.

Table 2. Least square means and standard errors for pre and post average daily gain from birth to yearly age of Maale goats.

Factors	Pre-weaning ADG (g day <sup>-1</sup> )			Post-weaning ADG (g day <sup>-1</sup> )	
	N	LSM(±SE)	N	LSM(±SE)	
Overall	305	$51.64\pm1.89$	252	$41.98\pm0.75$	
Sex of kid		NS		NS	
Male	147	$54.47\pm2.81$	120	$42.28\pm1.11$	
Female	158	$48.93\pm2.53$	132	$41.71\pm1.01$	
Birth type		**		NS	
Single	245	$57.24\pm1.63$	203	$40.76\pm0.70$	
Twin	60	$45.24\pm3.59$	49	$43.61\pm1.48$	
Season of birth		NS		NS	
Wet season	180	$52.96\pm2.60$	149	$42.30\pm1.02$	
Dry season	125	$50.38\pm2.73$	103	$41.69\pm1.10$	
Parity of doe		NS		NS	
1	38	$48.07\pm5.61$	34	$40.39\pm1.95$	
2	67	$50.07\pm4.51$	52	$42.87\pm1.91$	
3	55	$58.85\pm4.48$	42	$40.33\pm1.76$	
4	45	$51.68\pm6.10$	35	$42.05\pm2.43$	
5	37	$47.75\pm4.01$	36	$44.21\pm1.60$	
>6	63	$52.55\pm3.18$	53	$41.27\pm1.44$	

\*\*  $p<0.01$ , Means with different letters within the same column are significantly different at the indicated level.  
NS: Not Significant; N: number of observations; ADG = Average Daily Gain; g day<sup>-1</sup> = gram per day.

### Milk production of Maale goats

Milk yield increased gradually with the progress of parity (lactation number) in the present study. Milk yields were  $293.5\pm17.60$ ,  $322.4\pm18.90$ ,  $327.6\pm18.80$ ,  $326.1\pm18.90$ ,  $320.8\pm18$ ,  $313.5\pm16.80$ ,  $301.7\pm16.20$ ,  $297.8\pm16.60$  and  $289.4\pm16.2$  g from the first to the 9<sup>th</sup> week of the studied period, respectively. It shows that gradually increased up to week 5 and decreased then afterwards. The yield was also gradually increased with parity number. The present result

However, the pre-weaning ADG was not affected by season of birth in this study, many researchers, indicated that there have been factors of birth season on ADG (Zeleke et al., 2017; Gatew et al., 2019). The overall Post-weaning ADG was  $41.98\pm0.75$  g day<sup>-1</sup>. Post-weaning ADG was non-significant for the studied fixed effects. However, twins have higher post-weaning ADG than singles and recorded as  $43.61\pm1.48$  and  $40.76\pm0.70$  g day<sup>-1</sup>, respectively. According to the current result wet and dry season birth post weaning weight ADG was recorded as  $42.30\pm1.02$  and  $41.69\pm1.10$  g day<sup>-1</sup>, respectively.

Table 3. The result of the daily milk yield of doe's for nine weeks of the monitoring period.

Parity	Mean (±SEM) of milk of doe (ml)								
	Week1	Week2	Week3	Week4	Week5	Week6	Week7	Week8	Week9
1	$261.75\pm34.0$	$300.0\pm44.2$	$301.5\pm34.5$	$302.25\pm32.1$	$300.0\pm33.2$	$287.25\pm32.6$	$276.0\pm29.2$	$282.0\pm33.1$	$273.0\pm30.5$
2	$280.20\pm43.9$	$300.7\pm44.3$	$303.4\pm40.4$	$305.70\pm46.1$	$296.6\pm60.3$	$295.90\pm40.1$	$285.7\pm38.4$	$268.6\pm40.3$	$275.5\pm38.4$
3	$286.40\pm36.8$	$307.5\pm42.7$	$332.7\pm44.2$	$315.70\pm44.5$	$321.8\pm40.6$	$304.10\pm38.3$	$304.8\pm37.2$	$306.1\pm36.3$	$292.5\pm35.5$
4	$282.00\pm42.7$	$339.8\pm48.2$	$321.3\pm49.5$	$326.00\pm52.1$	$306.0\pm45.1$	$316.50\pm41.8$	$292.5\pm40.6$	$300.8\pm40.7$	$287.3\pm41.9$
5	$273.30\pm49.1$	$295.3\pm52.7$	$310.8\pm56.9$	$310.00\pm54.0$	$305.8\pm55.9$	$307.50\pm50.0$	$284.2\pm48.5$	$285.0\pm50.1$	$267.5\pm48.9$
6	$377.30\pm51.2$	$392.3\pm52.5$	$396\pm54.9$	$398.30\pm53.3$	$395.2\pm53.1$	$372.00\pm49.3$	$366.8\pm46.2$	$345.0\pm48.9$	$339.8\pm47.8$
Overall	$293.5\pm17.6$	$322.4\pm18.9$	$327.6\pm18.8$	$326.1\pm18.9$	$320.8\pm18.0$	$313.5\pm16.8$	$301.7\pm16.2$	$297.8\pm16.6$	$289.4\pm16.2$

## Summary and Recommendations

Small ruminants have socio-economic and cultural values other than their physical products meat, milk, skin, manure, etc. They are considered as a risk averters for a family through sale for quick and seasonal needs. The objective of the study was to evaluate the productive and reproductive performance of goats in Maale agro-pastoral woreda, Southern Ethiopia. On farm flock monitoring was carried out in three kebele's of the woreda. The kebele's were selected purposively based on the goat population and access for infrastructure. Thirty households with flocks numbers more than ten were selected, and a total of 30 flocks were monitored from July 2018 to July 2019. Data was collected by trained enumerated in the selected kebele's and supervised by researchers in a monthly interval. The mean number of flock at the end of the study period was  $29.17 \pm 12.76$  (mean $\pm$ SD) with the range of 14-70 goats per HH.

The birth weight of males and female kids was  $2.68 \pm 0.07$  and  $2.47 \pm 0.07$  kg, respectively with the overall mean birth weight of  $2.57 \pm 0.05$  kg. According to the result, single and twin kid's birth weight was  $2.67 \pm 0.04$  and  $2.46 \pm 0.09$  kg, respectively. Weaning weight of single and twin kids was highly significant ( $p < 0.001$ ) and was  $7.86 \pm 0.15$  and  $6.60 \pm 0.32$  kg, respectively. These weights and growth rates at specific ages pointed out that goat of the area express better productive capacity. These situations indicate the opportunity for further improvement of the reproductive and growth performances of the animals through appropriate strategies of community based improvement, disease prevention and control, water development, feeding and husbandry practices. The milk production potential of Maale goats was low. However, there is a good potential to increase the DMY to about 1 kg through improved management system. It is concluded that performance level of the goats of Maale area as measured by reproduction and growth parameters is reasonably good and if appropriate community based breeding strategies designed, higher performance could be expected. The contribution of goats to the agro-pastorals enterprise is also satisfactory and could be further improved if modest interventions are undertaken to reduce the barriers.

## Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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## References

Abegaz, S., Negussie, E., Duguma, G. and Rege, J.E.O. 2002. Genetic parameter estimates for growth traits in Horro sheep. *Anim. Breed. Genet.* 119(1): 35-45. <https://doi.org/10.1046/j.1439-0388.2002.00300.x>

Aberra, J. 2018. Assessment of resilience of dairy farming in Bishoftu and Asella areas, Oromia regional state, Ethiopia. MSc. Thesis, College of Veterinary Medicine and Agriculture, Addis Ababa University, Addis Ababa, Ethiopia. 77p.

Ahuya, C.O., Okeyo, A.M. and Murithi, F.M. 2003. Productivity of crossbred goats under smallholder production system in the Eastern highlands of Kenya. *Anim. Sci.* 76 (Suppl): 284 (Abstr).

Alemu, A. 2015. On-farm phenotypic characterization and performance evaluation of Abergalle and central highland goat breeds as an input for designing community based breeding program. MSc thesis, Haramaya University, Ethiopia. pp 82-85

Belay, D. and Mengistie, T. 2013. Evaluation of growth performance of Abergalle goats under traditional management system in Sekota District, Ethiopia. *Pakistan J. Biol. Sci.* 16(14): 692-696. <https://doi.org/10.3923/pjbs.2013.692.696>

Belay, Z. and Miseret, M. 2018. Assessment of traditional goat husbandry practices in GamoGofa Zone, Southwestern Ethiopia. *Global Vet.* 20(1): 11-18.

Berhane, G. and Erik, L.O. 2006. Effect of Vetch(*Vicia sativa*) hay supplementation to Begait and Abergelle goats in northern Ethiopia II. Reproduction and growth rate. *Small Ruminant Res.* 64: 233-240. <https://doi.org/10.1016/j.smallrumres.2005.04.020>

Birhanie, M., Alemayehu, K. and Mekuriaw, G. 2018. Performance evaluation of Abergelle goat under community based breeding program in selected districts, northern Ethiopia. *Livestock Res. Rural Dev.* 30(4): Article #64. <http://www.Irrd.org/Irrd30/4/msmi30064.html>

Bizuayehu, A., Mekete, G., Tegegn, T. and Yidnekachew, A. 2016. Assessment of livestock production constraints and technology need identification of pastoral and mixed crop-livestock production system in Malle and Benatsemay Districts of South Omo Zone Southern Ethiopia. *Food Sci. Quality Manage.* 49: 1-13.

Braker, M.J.E., Udo, H.M.J. and Webb, E.C. 2002. Impacts of intervention objectives in goat production in subsistence farming. *South African J. Anim. Sci.* 32(3): 185-191. <https://doi.org/10.4314/sajas.v32i3.3745>

Bushara, O.M.A., Abdelhadi, M.B., Elelam, A.O., Idris, D.M., Mekki, Muna, M.M., Ahmed, A.M., Abu Nikhiala and Ibrahim Elimam. 2013. Effect of sex of kids and Litter size on Taggar goat kids performance. *Archiva Zootechnica* 16(2): 5-14.

CSA. 2021. Federal Democratic Republic of Ethiopia Central Statistics Authority: Agricultural sample survey 2021, vol. II:

Report on livestock and livestock characteristics. Statistical bulletin-589, Addis Ababa, Ethiopia. pp. 16-20

Dereje, T., Berhanu, B. and Aynalem, H. 2013. Morphological characterization of indigenous Haraghe goat breed in their native environment. *Am. Eur. J. Sci. Res.* 8(2): 72-79.

Deribe, G.T. 2009. On-farm performance evaluation of indigenous sheep and goats in alaba, southern Ethiopia. MSc Thesis. Hawassa University, Awassa, Ethiopia. pp. 83-95.

FARM Africa. 2005. Goats: Unlocking their potential for Africa's farmers: Working Papers series. Paper presented at the Seventh Conference of Ministers Responsible for Animal Resources Kigali, Rwanda, 31<sup>st</sup> October - 4<sup>th</sup> November 2005.

Gatew, H., Hassen, H., Kebede, K., Haile, A., Lobo, R.N.B. and Rischkowsky, B. 2019. Early growth trend and performance of three Ethiopian goat ecotypes under smallholder management systems. *Agric. Food Secur.* 8: 4. <https://doi.org/10.1186/s40066-018-0249-2>

Getahun, L., Girma, A., Siegmund, M. and Valle, Z.A. 2008. Small ruminant production in two-farming systems of southern Ethiopia, University of Hawassa, Ethiopia. pp. 399-412

Hassen, H., Lababidi, S., Rischkowsky, B., Baum, M. and Tibbo, M. 2012. Molecular characterization of Ethiopian indigenous goat populations. *Trop. Anim. Health Prod.* 44(12): 39- 46.

Hossain, S.M.J., Alam, M.R., Sultana, N. and Amin, M.R. 2004. Milk Production from Indigenous Black Bengal Goat in Bangladesh. *J. Biol. Sci.* 4(3): 262-265. <https://doi.org/10.1007/s11250-011-0064-2>

IBC. 2004. The state of Ethiopia's farm animal genetic resources. Institute of biodiversity and conservation, country report for a contribution to the first report on the state of the world's animal genetic resources, Addis Ababa, Ethiopia. Pp. 11

Kugonza, D.R., Stalder, K.J. and Rothschild, M.F. 2014. Effects of buck and doe size on the growth performance and survival of their progeny. *Livestock Res. Rural Dev.* 26(3): Article #47. <http://www.lrrd.org/lrrd26/3/kugo26047.html>

Liao, W.B., Zeng, Y., Zhou, C.Q. and Jehle, R. 2013. Sexual size dimorphism in anurans fails to obey Rensch's rule. *Frontiers in Zool.* 10: 1-7. <https://doi.org/10.1186/1742-9994-10-10>

Mehlet, S. 2008. Reproduction in Arsi-Bale female goats and growth performances of Toggenburg X Arsi-Bale crosses. MSc. Thesis. University of Hawassa, College of Agriculture, Ethiopia.

Mekuriaw, G. 2016. Molecular Characterization of Ethiopian indigenous goat populations: genetic diversity and structure, demographic dynamics and assessment of the kisspeptin gene polymorphism. PhD Thesis, Addis Ababa University, Addis Ababa, Ethiopia. pp. 141-142.

Mengistu, U., Dahlborn, K. and Olsson, K. 2007. Effect of intermittent watering on growth, thermoregulation and behaviour of Ethiopian Somali goat kids. *Small Ruminant Res.* 72: 214-220.

Mioč, B., Velimir, S., Zvonko, A., Zvonimir, P., Ivan, V. and Ante, K. 2011. Study on birth weight and pre-weaning growth of Croatian Study on birth weight and pre-weaning growth of Croatian multicolored goat kids. *Veterinarski Arhiv.* 81(3): 339-347.

Mohammed, B., Aynalem, H., Hailu, D. and Tesfaye, A.T. 2012. Estimates of genetic and phenotypic parameters for milk traits in Arsi-Bale goat in Ethiopia. *Livestock Res. Rural Dev.* 24: Article #98. <http://www.lrrd.org/lrrd24/6/bedh24098.htm>

Peacock, C.P. 1996. Improving Goat Production in the Tropics. A manual for development workers. FARM-Africa/Oxfam, Oxford. pp. 9-13.

Rey, B., Lebbi. S.H.B and Reynolds (eds). 1992. Small ruminant research and Development in Africa. Proceedings of the 1st Binnal Conference of the African Small ruminant Research. ILCA (international Livestock Centre for Africa), Nairobi, Kenya. pp. 425-437.

Soundararajan, C. and Sivakumar, T. 2011. Factors affecting birth weight of kanni kids and sex ratio of Boer X Kannai crossbred goat. *Tamil Nadu J. Vet. Anim. Sci.* 7(3): 144-149.

Tatek, W., Hailu Dadi, Mieso Guru and Dadi Gelashe. 2004. Productivity of Arsi Bale goat types under farmers' management condition: a case of Arsi Negelle. pp. 67-71. In: Tamrat Degefa and Fekede Feyissa (eds). Proceedings of the 13<sup>th</sup> Annual Conference of the Ethiopian Society of Animal Production (ESAP) held in Addis Ababa, Ethiopia, August 25-27, 2004. ESAP, Addis Ababa.

Tibbo, M. 2006. Productivity and health of indigenous sheep breeds and crossbreds in the central Ethiopian highlands. PhD dissertation. Department of Animal Breeding and Genetics, Faculty for Veterinary Medicine and Animal Sciences, Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden. pp. 38-39.

Woldu, T., Markemann, A., Reiber, C., Philipp, C.M. and Valle Zárate, A. 2016. Optimizing contributions of goat farming to household economic success and food security in three production systems in Ethiopia. *J. Agric. Rural Dev. Trop. Subtrop.* 117: 73-85.

Zeleke, T., Mekkonen, T., Belay, D., Mesfin, L., Nigus, B., Asres, Z. and Desalegn, A. 2017. Effect of non-genetic factors on pre-weaning growth, survivability and prolificacy of Central Highland x Boer crossbred goats in North Eastern Ethiopia. *Livestock Res. Rural Dev.* 29(7): Article #136. <http://www.lrrd.org/lrrd29/7/zele29136.html>