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Original Research

Breeding Practices and Reproductive Performances of Indigenous Goat Population in Southwestern Ethiopia

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Abstract

The main objective of the study was to carry out the breeding practices and reproductive performances of indigenous goats in southwestern Ethiopia. Data were collected through questionnaires, focal group discussion, and secondary data. A total of 210 households were selected for an interview. Descriptive statistics and a ranking index were used to present the findings. Goats were bred for multiple objectives in which the source of income was ranked first. The main source of the breeding buck was raised within the flock and the type of mating was mainly uncontrolled natural mating. Size, prolificacy, and age of sexual maturity; and size, twining ability, and age at first kidding were the first three traits in selecting breeding buck and doe, respectively. The average age at first kidding and kidding interval of goats were 14.6 and 8.08 months, respectively while the goats are prolific with an overall litter size of 1.6. Generally, breeding practices and reproductive performances of goat requires intervention to design breeding program that fits the breeding practices of studied communities. So, better husbandry practices with well-designed breeding program will improve the goat population of the area.

Keywords: Breeding practices; Indigenous goat; Jimma zone; Reproductive performance

Introduction

In Ethiopia, the livestock sector plays a significant role and its contribution to the agricultural GDP accounts for about 25.6%, and 10.5% of total Ethiopian foreign exchange earnings (NBE, 2018). Goats are important components of the livestock sub-sector in the country. Ethiopia has long been recognized as a source of the large diversity of farm animal genetic resources in which an estimated 36.81 million heads of goats are reared (CSA, 2020). The country has a rich biodiversity of goat genetic resources, where distributed over widespread agro-climatic conditions that are kept for a food source, cash income generation, socio-cultural wealth, and source of other valuable non-food products like skin and manure (Abraham *et al*., 2019).

Breeding goats have huge socio-economic importance such as generating cash income, accumulating capital, and also play a vital role as sources of meat, milk, and wool for smallholder keepers in different farming systems and agro-ecological zones of the country (Misbah, 2013 and Yemane, 2020). The small body size, broad feeding habits, adaptation to unfavorable environmental conditions, and their short reproductive cycle provide goats with a comparative advantage over other species to suit the circumstances of especially resource-poor livestock keepers (Matawork, 2016).

In Ethiopia for sustainable management and utilization of AnGR, farmers have different breeding practices and traits preferences due to varying production systems and activities (Ahmed, 2017). Farmers breeding management decision is determined by the merit of livestock species and breed, breeding objectives, and the production environment (Solomon *et al*., 2010). Breeding objectives are affected by many factors and have to consider the needs and priorities of the animal owners, the consumers of animal products, and the food industry. In Ethiopia, goat keepers practiced different selection criteria to select the best-performing animals according to agro-ecology, production system, and culture of the community (Netsanet *et al*., 2016 and Ahmed, 2017).

Indigenous goats in Ethiopia are genetically less productive than temperate breeds (Tesfaye *et al*., 2012). Even though there are large populations of goats, their productivity and the contribution to the country's national economy are far below the potential which could be due to different factors such as lack of technical capacity, inadequate and poor-quality feeds, the prevalence of diseases, poor genetic potential, poor husbandry practices, slow growth rate, high mortality rate, low commercial off-take rate, lack of appropriate breeding strategies, and poor understanding of the production system as a whole (Matawork, 2016; Melesse, 2016 and Haile *et al*., 2019).

The performance of indigenous goat breeds of Ethiopia is highly variable between different management systems and little attention has been paid to the development of goats (Dereje *et al*., 2015). In the country, there is also the absence of pre-evaluation of the genetic and bio-economic feasibility of breeding programs (Gizaw *et al*., 2018). The Southwestern part of Ethiopia is characterized by a cash crop (coffee and chat) and cereal livestock diversified agricultural production system (Samuel and Belay, 2012). As the study area, Jimma zone was located in the southwestern part of the country and it's where there is a long tradition of indigenous goat production was practiced by the community. Little is known about the breeding practices and reproductive performance of indigenous goats in the zone specifically. Understanding the existing goat breeding practices and their performance is vital to design a proper breeding program for further genetic improvement. Therefore, this study was required and carried out to identify breeding management practices and reproductive performances of the indigenous goat population in the study area.

Materials and Methods

Description of the Study Area

The current study was conducted in Limu Seka, Nono Benja, and Omo Nada districts of Jimma zone, Oromia Regional State of Ethiopia. Jimma zone is one of the administrative zones of the Oromia regional state situated at a distance of 352 km from Addis Ababa, the capital city of Ethiopia. The zone lies between 350 -370 ´ E longitudes and 70 - 80 ´ N latitude at an elevation ranging from 880 to 3360 meters above sea level (JZLFRO, 2017).

Sampling and Data Collection Procedures

Multi-stage sampling techniques were applied to select districts and rural Kebeles (the smallest administrative units

within a district) for the study. At the first stage out of the twenty districts, three districts (Limu Seka, Omo Nada, and Nono Benja) were purposively selected based on their goat population potential in consultation with agricultural experts of the zone and districts. In the second stage of sampling four, three, and two Kebeles were purposively and proportionally selected from Limu Seka, Omo Nada, and Nono Benja districts, respectively. Moreover, care was taken to select a representative sample size by considering goat flock size of at least two female and one male goat per household and willingness of households to participate in the study. In the third stage, the number of households from each selected Kebeles was determined according to the random sampling technique. The sample size of 210 households was determined according to Arsham (2007) using the following formula: $N = 0.25/SE^2$; where: N = sample size, SE = standard error (0.0345) with 95% confidence level. In the sampling process, households that keep at least three matured goats were considered. In addition, both primary and secondary data were used. Primary data collection consisted of key informant interviews, focus group discussions, direct observations, and semi-structured questionnaires for household surveys while secondary data was collected from published and unpublished materials.

Questionnaires and Group Discussion

The general information list of FAO (2012) was used as a checklist in designing the questionnaire. Trained enumerators along with the researcher administrated the questionnaires to the sampled households. In each sampling site, households were briefed about the objectives of the study before the beginning of the data collection and random open-ended discussion was held. A formal interview was carried out with selected respondents from each study site, to get information on household characteristics. General information of the area, topography, and population size was obtained from secondary data. Participatory focus group discussions with goat owners, elderly farmers, village leaders, and socially respected individuals, and extension agents who are known to have better knowledge of the present and past social and economic status of the study area were also made. The questionnaire was designed to address purposes of breeding goats; breeding goat management (buck management practices, selection criteria, mating system, and culling practices), and reproduction performance of goats.

Statistical Analysis

Data gathered through the questionnaire was checked for any error, coded and entered into a spread sheet, and analyzed using the SPSS statistical tool (Version 24). Statistical variations for variables were tested by cross tabs with significant differences at $P<0.05$ between districts. Percentage comparisons for qualitative variables were made using a chi-square test while mean comparisons for quantitative variables were conducted by Tukey's mean comparison test. Ranking indices were calculated to provide a rank of goat breeding purpose, selection criteria of both buck and does according to the following formula: Index = Σ of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] given for particular qualitative variables divided by Σ of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for all qualitative variables considered.

Results

Purpose of Breeding Goats

Purposes of breeding goats in the study area were presented in Table 1. The three primary reasons for breeding goat in Limu Seka district was for income followed by for meat and milk production. In Nono Benja and Omo Nada districts, the primary purposes of breeding goats were for income generation, meat and saving. Even though some farmers in the Limu Seka district bred goat for milk production purposes, the overall result indicated that the major purposes of breeding goats in all districts were primarily for income, meat, and saving.

Table 1: Purposes of breeding goats as indicated by index values

Purpose of breeding goat	Limu Seka	Nono Benja	Omo Nada	Overall
Income source	0.43	0.47	0.41	0.43
Meat	0.29	0.29	0.31	0.30
Milk	0.14	-	-	0.06
Social/cultural functions	0.02	0.04	0.03	0.03
Saving (Insurance)	0.10	0.20	0.21	0.16
Risk Distribution with other animals	0.03	-	0.05	0.03

Index = sum of ((3 × number of responses for 1st rank + 2 × number of responses for 2nd rank + 1 × number of responses for 3rd rank))/(3 × total responses for 1st rank + 2 × total responses for 2nd rank + 1 × total responses for 3rd rank)

Goat Management and Breeding Ppractices

Buck Management Practices

Breeding buck management practices in the study area were presented in Table 2. The majority of the respondents (61.9%) had their breeding buck and among households having their buck, the main source was born in the flock (77.6%). The average number of breeding buck per household in the study area was 1.37 with an average service period of 3.87 years in the flock. There was a significant (*P<0.05*) difference among districts in which bucks in Omo Nada district served more years in the flock than those of Limu Seka and Nono Benja districts. The main uses of breeding buck in the study area were for mating (88.6%) in which the majority (95.2%) of the respondents did not make special management. The majority (82.9%) of households who have no their buck had used others breeding bucks in the communal grazing areas (random mating on pasture field) to mate theirs does.

Table 2: Buck management practices of households

Parameters	Limu Seka	Nono Benja	Omo Nada	Overall	X^2
	N (%)	N (%)	N (%)	N (%)	
Breeding buck ownership					
Yes	62(66)	28(60.9)	40(57.1)	130(61.9)	
No	32(34)	18(39.1)	30(42.9)	80(38.1)	1.35^{ns}
Source of breeding buck					
Born in the flock	73(77.7)	39(84.8)	51(72.9)	163(77.6)	
Purchased from market	21(22.3)	7(15.2)	19(27.1)	47(22.4)	2.27^{ns}
Average number of a breeding buck (Mean±SD)	$1.41±0.50^{a}$	$1.36±0.54^{a}$	$1.30±0.55^{a}$	1.37±0.52	
Service year of buck in flock (Mean±SD)	$3.77±0.03^{a}$	$3.84±0.04^{a}$	$4.02±0.03^{b}$	3.87±0.02	
Giving special management					
Yes	7(7.4)	-	3(4.3)	10(4.8)	
No	87(92.6)	46(100)	67(95.7)	200(95.2)	3.83^{ns}
Purpose of keeping a buck					
Mating	87(92.6)	42(91.3)	57(81.4)	186(88.6)	
Both mating and fattening	7(7.4)	4(8.7)	13(18.6)	24(11.4)	5.34^{ns}
In the absence of buck, how do your doe mate					
Neighboring buck	14(14.9)	9(19.6)	13(18.6)	36(17.1)	
Communal grazing areas	80(85.1)	37(80.4)	57(81.4)	174(82.9)	0.62^{ns}

Chi square (X^2) value denotes significance difference between *districts, ^{ns} (P>0.05), N = number of respondents; Means with different superscript in a row are significant between districts * (P<0.05), SD = standard deviation*

Mating System and Culling Practices of Goat

The mating system and culling practices of goats in the study area are presented in Table 3. The type of mating was predominantly uncontrolled natural mating (89.5%). The reasons behind this were majorly goats are browsing on communal grazing/browsing areas (70%), followed by lack of breeding bucks (17.1%) and lack of awareness on the effect of inbreeding (12.9%). Farmers in the study areas practice culling of both males and females from the flock for breeding. About 62.9% and 73.8% of respondents across all districts were practiced culling of male and female goats, respectively. Respondents in all the study districts did not allow male goats to reach maximum old age and the reasons for culling goats were mainly for physical defect and undesired physical characteristics, reproductive and health problems, and age in case of females when they get old in the form of slaughtering or selling. In Limu Seka district goat milk users also reported milk productivity problems as other reasons for culling especially for a

female goat because they use milk for family consumption.

Table 3: Mating system and culling practices of goat in the study area

Parameters	Limu Seka	Nono Benja	Omo Nada	Overall	X^2
	N (%)	N (%)	N (%)	N (%)	
Mating types					
Natural mating with selective buck	12(12.8)	5(10.9)	5(7.1)	22(10.5)	
Natural mating without selective buck	82(87.2)	41(89.1)	65(92.9)	188(89.5)	1.36^{ns}
Reason for uncontrolled mating					
Lack of awareness on the effect of inbreeding	10(10.6)	5(10.9)	12(17.1)	27(12.9)	
Communal grazing/browsing area	69(73.4)	31(67.4)	47(67.1)	147(70)	
Lack of breeding buck	15(16)	10(21.7)	11(15.7)	36(17.1)	2.51^{ns}
Culling Practices					
Male					
Yes	59(62.8)	28(60.9)	45(64.3)	132(62.9)	
No	35(37.2)	18(39.1)	25(35.7)	78(37.1)	0.14^{ns}
Female					
Yes	68(72.3)	33(71.7)	54(77.1)	155(73.8)	
No	26(27.7)	13(28.3)	16(22.9)	55(26.2)	0.60^{ns}

Chi square (X^2) value denotes significance difference between *districts, ^{ns} (P>0.05); N=Number of respondents*

Selection Criteria of Breeding Buck

Traits like size/appearance, color, horn, conformation/shape, adaptability, growth rate, age, libido, and prolificacy were all important traits in the study area and emphasized in the selection of breeding bucks (Table 4). In Limu Seka district size/appearance, prolificacy, and age at first sexual maturity of breeding buck ranked first, second and third with an index of 0.30, 0.18, and 0.17, respectively. In Nono Benja district, size/appearance, growth rate, and prolificacy of breeding buck ranked first, second and third with an index of 0.40, 0.22, and 0.21, respectively. As well as in Omo Nada district, size/appearance, prolificacy, and adaptability of breeding buck ranked first, second and third with an index of 0.34, 0.15, and 0.14, respectively.

Table 4: Selection criteria of the breeding buck as evaluated by index

Criteria	Limu Seka	Nono Benja	Omo Nada	Overall
Size/appearance	0.30	0.40	0.34	0.34
Color	0.03	0.02	0.03	0.03
Horn	0.05	-	-	0.02
Conformation/shape	0.01	-	0.04	0.02
Adaptability	0.06	0.01	0.14	0.08
Growth rate	0.12	0.22	0.13	0.14
Age at first maturity	0.17	0.14	0.12	0.15
Libido	0.08	-	0.05	0.05
Prolificacy/being one of the twin	0.18	0.21	0.15	0.17

Index = sum of ((3 × number of responses for 1st rank + 2 × number of responses for 2nd rank + 1 × number of responses for 3rd rank))/(3 × total responses for 1st rank + 2 × total responses for 2nd rank + 1 × total responses for 3rd rank)

Selection Criteria of Breeding Doe

Traits like size, color, kid survival and growth, mothering ability, age at first kidding, short kidding interval, twining ability, offspring size, and family history were all considered in all the study districts and emphasized in selecting

of breeding does except high milk yield which is only for goat milk users in Limu Seka district (Table 5). In Nono Benja and Omo Nada districts size, twining ability, and short kidding interval were the first three doe selection criteria with an index of 0.38, 0.30, 0.13 and 0.35, 0.26, 0.16, respectively. However, in Limu Seka district, size/appearance, twining ability, and age at first kidding ranked first, second and third with an index of 0.40, 0.23, and 0.13, respectively.

Table 5: Selection criteria of breeding doe as expressed by index values

Criteria	Limu Seka	Nono Benja	Omo Nada	Overall
Size/appearance	0.40	0.38	0.35	0.38
Color	0.02	-	-	0.01
Kid survival	0.03	0.02	0.02	0.02
Kid growth	0.04	0.02	0.03	0.03
Mothering ability	0.03	0.01	0.03	0.03
Age at first kidding	0.13	0.08	0.09	0.11
Short kidding interval	0.02	0.13	0.16	0.09
Twining ability	0.23	0.30	0.26	0.25
Offspring size	0.09	0.05	0.06	0.07
High milk yield	0.02	-	-	0.01
Family history	0.01	0.02	0.02	0.01

Index = sum of ((3 × number of responses for 1st rank + 2 × number of responses for 2nd rank + 1 × number of responses for 3rd rank))/(3 × total responses *for 1st rank + 2 × total responses for 2nd rank + 1 × total responses for 3rd rank)*

Reproductive Performances of Goats

The overall reproductive performances of goats in the study area are summarized in Table 6. The overall mean age at first service (AFS) of male goats was 7.84 months. Age at first service of females was different ($P<0.05$) between districts. The AFS of females in Nono Benja was greater ($P<0.05$) than that of Limu Seka and Omo Nada districts. According to the respondents, the overall maximum, minimum, and average age at first kidding (AFK) were 15.68, 13.61, and 14.68 months, respectively.

The overall mean reproductive lifetime of does in the study area was 7.74 years, within these years; a doe could produce around 12.92 kids per her lifetime. However, there was a significant difference ($P<0.05$) among districts that does in Omo Nada produced a significantly lower number of kids per lifetime than in Limu Seka and Nono Benja districts. As reported, the overall average reproductive lifetime of buck in the study area was 6.17 years.

The overall maximum, minimum, and average kidding interval (KI) of goats in the study area was 8.71, 7.45, and 8.08 months, respectively. The average KI of goats was different ($P<0.05$) between districts and goats in Nono Benja have long KI than those kept in Limu Seka and Omo Nada districts. The overall average number of kids (litter size) that females give per kidding was 1.60 in which 47.1, 45.7 and 7.1% of the respondents reported that litter size of single, twin, and triple birth, respectively. The households reported that the overall mean weaning age of male and female goats was 4.41 and 4.42 months, respectively.

Table 6: Reproductive performances of goats in the study area (Mean±SE)

Reproductive traits	Limu Seka	Nono Benja	Omo Nada	Overall
Age at first service				
Male (M)	7.88±0.06^{a}	7.93±0.06^{a}	7.72±0.05^{a}	7.84±0.04
Female (M)	8.50±0.05^{a}	8.81±0.06^{b}	8.52±0.05^{a}	8.61±0.03
Age at first kidding				
Maximum (M)	15.73±0.03^{a}	15.82±0.06^{a}	15.52±0.23^{a}	15.68±0.08
Minimum (M)	13.59±0.05^{a}	13.83±0.05^{b}	13.50±0.05^{a}	13.61±0.03
Average (M)	14.66±0.04^{a}	14.83±0.05^{b}	14.61±0.04^{a}	14.68±0.02

Average reproductive life time of does (Y)	7.76±0.03[a]	7.80±0.04[a]	7.67±0.05[a]	7.74±0.02
Average number of kids per does life time	13.27±0.10[b]	13.00±0.18[b]	12.40±0.17[a]	12.92±0.09
Average reproductive life time of bucks(Y)	6.19±0.06[a]	6.17±0.07[a]	6.13±0.05[a]	6.17±0.03
Litter size	1.64±0.06[a]	1.60±0.10[a]	1.52±0.07[a]	1.60±0.04
Kidding interval				
Maximum (M)	8.74±0.05[ab]	8.91±0.07[b]	8.54±0.07[a]	8.71±0.03
Minimum (M)	7.35±0.05[a]	7.65±0.07[b]	7.45±0.05[ab]	7.45±0.03
Average (M)	8.05±0.04[a]	8.28±0.06[b]	8.0±0.06[a]	8.08±0.03
Average weaning age of kids				
Male (M)	4.44±0.05[a]	4.39±0.05[a]	4.38±0.05[a]	4.41±0.03
Female (M)	4.42±0.05[a]	4.36±0.07[a]	4.47±0.06[a]	4.42±0.03

[a-b] *Different superscripts within a row denote significant differences between* districts * *P<0.05; M-Month, Y-Year*

Discussion

Purpose of Breeding Goats

Goats were kept for various objectives including income source, meat, milk; social functions, and saving that enable them to sell and cover their agricultural inputs and children's school facility expenditure. In the study area, the major purposes of breeding goats in all districts were primarily for income. Similar to the current result, the primary breeding objectives of goat keepers in many parts of Ethiopia are for generating income (Alubel, 2015; Ahmed *et al*., 2015; Behailu *et al*., 2016; Netsanet *et al*., 2016; Tegegn and Askale, 2017 and Hulunim *et al*., 2017). In contrast to the current result, milk production was reported as a primary objective in other parts of the country (Tesfaye, 2010; Gebreyesus *et al*., 2012; Belete, 2013; Feki and Berhanu, 2016). On the other hand, Biruh *et al*. (2017) reported that the primary purpose of breeding goats was for social prestige in Benatsemay and Hamer districts.

Goat Management and Breeding Practices

Buck Management Practices

The current study result of breeding buck ownership is greater than the findings of (Dhaba *et al*., 2013) in the Ilu Aba Bora zone, (Demissie *et al*., 2014) in the East Gojjam zone and (Ahmed *et al*., 2015) in Horro Guduru Wollega zone of Ethiopia who reported that 26%, 49.3% and 32.35% of farmers had their breeding buck, respectively. However, the current result is lower than the report of (Alubel, 2015) which reported that goat keepers of 97.1% in Ziquala, 98.7% in Tanqua Abergelle, and 66.8% in Lay Armachiho districts had their indigenous breeding buck. Netsanet *et al*. (2016) also reported that 89.1% of households in Konso and 74.8% in Meta-Robi had their breeding buck.

Among households having their buck, the main source was born in the flock which is in agreement with (Tesfaye *et al*., 2011b; Belete, 2013 and Netsanet *et al*., 2016) who reported that the main source of a breeding buck was born in the flock. The current result may lead to the increment of the inbreeding effect in which farmers are utilizing the same breeding buck born in their flock for mating purposes. The increment of inbreeding was also reported by (Netsanet *et al*., 2016) that the level of inbreeding might be high in the mixed crop-livestock system due to using of bucks for breeding that is born within the same flock reared by a single household.

Netsanet *et al*. (2016) reported 1.7 bucks/household which is above the study area breeding buck/household. The main uses of breeding buck in the study area were for mating in which the majority (95.2%) of the respondents did not make special management. The current result contradicted with the report of (Netsanet *et al*., 2016) those respondents from Konso (42.5%) who owned buck provided special management for a breeding buck.

Mating System and Culling Practices of Goat

The type of mating in the study areas was predominantly uncontrolled natural mating. Uncontrolled natural mating

of the goat population in Ethiopia has been reported by various scholars (Solomon *et al*., 2010, Belete, 2013, Ahmed *et al*., 2015 and Netsanet *et al*., 2016). The mating system practiced by the respondents in the study area bespeaks that respondents may not have knowledge of the negative effect of inbreeding which is an intervention gap that should be addressed by the concerned stakeholders. The majority of respondents in the study area practiced goat culling from the flock. Ahmed *et al*. (2015) reported that all farmers in three districts of Horro Guduru Wollega practiced goat culling which is above the current result.

Selection Criteria of Breeding Buck

The choice of good breeding buck is an important factor in goat production and the main driver of ongoing genetic improvement in the flock (Ahmed, 2017). In all districts, body size/appearance was the primary criteria to select breeding buck as a parent of the next generation which is in good agreement with the report of (Solomon, 2014; Tsigabu, 2015; Yadeta, 2016 and Tegegn *et al*., 2016). This may be because goat producers in the study area prefer large body sizes and good appearance. After all, body size is an important economic trait that influences the traditional market price, and believes that a large body-sized buck will fetch a greater price and large-sized kids.

Selection Criteria of Breeding Doe

Households in the study area try to select the best-performing animals and cull the least performers. However, the selected animals are not certainly mating each other because they freely grazed/browsed on the field. In all the study districts, size and twinning ability were the first two selection criteria of a breeding doe which implies goats that had a large size and twin kids are more preferred by the households. This result disagrees with that of (Tesfaye *et al*., 2011b; Belete, 2013) who reported the farmers did not appreciate goats that gave twin because it creates competition between the twin kids and milk consumption by the owners. Additionally, milk yield is not the first three criteria of breeding doe in all study districts which agrees with the report of other scholars (Ahmed *et al*., 2015; Alubel, 2015 and Yadeta, 2016). The present study indicated that farmers were concerned more about observable traits or a subjective selection criterion because size or appearance was the primary criteria to select both buck and doe. The possible reason may be the absence of a record on production and reproduction performance traits.

Reproductive Performances of Goats

The overall average age at first kidding (AFK) of the current study result was lower than the report of (Solomon, 2014) and (Assen and Aklilu, 2012) who reported that the AFK of Abergelle goats and goats in the central Tigray region were 15.5 and 15 months, respectively. However, the current result of AFK was greater than the report of (Solomon, 2014) for Western low land goats, (Ahmed *et al*., 2015) for western highland goats, and (Taju, 2018) for goats in southern Ethiopia with the respective values of 12.4, 12.1 and 13.1 months. The current result is also in the range of those reported by (Dereje *et al*, 2015). The reproductive lifetime of does in the study area indicates that goats are used continuously as long as the animal has not died, slaughtered, or sold. However, kids produced per her lifetime were lower which could be resulted from less management of goat producers and abortion cases that occurred in the flock.

The average kidding interval (8.08 months) of goats in the study area is greater than (Ahmed *et al*., 2015) who reported 5.76 months for Western highland goats, and (Solomon, 2014) who reported 6.29 months for Western Lowland goats of Ethiopia. However, it was lower than that of (Solomon, 2014), and (Taju, 2018) who reported 8.28 months for Abergelle goats, and 9 months for goats in southern Ethiopia. The current result revealed that the possibility of goats in the study area to have three kidding in two years which is in good agreement with the findings of (Getahun, 2008) and (Deribe, 2009) who reported 8 months of KI for some indigenous goat breeds of Ethiopia.

The higher twinning rate in the study area may be due to goat keepers' selection criteria for the twinning ability of female goats as discussed earlier. This implies that female goats in the study areas are prolific. The twinning rate of the current study is greater than those of (Dhaba *et al*., 2013) who reported that 58, 40 and 1.1% of the respondents obtain single, twin, and triple birth in the Ilu Aba Bora zone of Oromia region. Dereje and Ermias (2018), Belete *et al*. (2015), Samuel and Belay (2012), and Abraham *et al.* (2019) reported 1.13 for Woyto Guji goats in Konso district, 1.33 for Arsi-Bale goat, 1.58 for goat in Jimma town, and 1.52 for Begait goat, respectively, which were lower than observed in the current study. The current finding is; however, lower than that of (Demissie *et al*., 2014) who reported 1.87 litter sizes in the East Gojjam zone, and also (Ahmed *et al*., 2015) who reported 1.77 litter sizes

in Horro Guduru Wollega zone. The overall mean weaning age of male and female goats in the study area is lower than (Yadeta, 2016), and (Assen and Aklilu, 2012) who reported 4.67 months and 4.7 months, respectively, in various agro-ecological zones of Ethiopia. The possible reason for the observed lower weaning age may be because does are restricted to suckle their kids for only a short time to influence does to come into estrus within the shortest possible time.

Conclusion

From this study, it could be concluded that indigenous goats in the study area were kept primarily for income source; goat management and breeding system practiced was traditional (respondents may not know the negative effect of inbreeding) with low reproductive performances. Therefore, such practice requires an intervention gap that should be addressed by the concerned stakeholders.

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Contribution of Authors

During the writing of the manuscript, all of the authors contributed equally. They read the final manuscript and gave it their approval for publishing.

Conflict of Interests

There is no conflict of interest.

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