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Research Article

Sheep breeding practices and reproductive performances in Arba Minch Zuria district of Gamo zone, Southern Ethiopia

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Abstract

The study was carried to characterize sheep breeding practices and reproductive performances in Arba Minch Zuria Woreda of Gamo zone, Southern Ethiopia. The district was selected based on its potential for sheep production and distribution of different sheep breeds in the most of villages of the district. It was stratified in to three distinctive agro-ecologies; highland, midland and lowland. A total of 138 households were interviewed using structured questionnaire and probability proportional to size sampling technique was used to select respondents. Data were analyzed using statistical procedures for social science version 20. The overall purpose of sheep rearing across all AEZs was source of income, saving, meat production, sharing the risk and manure production which were ranked first to fifth in the given order. Observed sheep breeding system was generally uncontrolled and no planned selection of breeding stock is practicing. Rams are herding together with ewes. Body size, coat color and long and fatty tail type (from Bonga/Dawuro and Doyagana/Wolaita) were the most frequently reported traits in selecting breeding rams; whereas size, color, tail size and twining rate were mentioned as traits given due emphasis in choosing future breeding ewes. The overall age at first lambing was 12.81±0.14 months, lambing interval was 7.52±.08 months and litter size were 1.50±.08 lamb per sheep ($P<0.05$). A high lambing month was extended from April to May. As per the current findings, the reproductive performance the sheep of the study area could be categorized as medium level of productivity. Therefore; further confirmatory study is recommended to identify and select the superior breeding animals based on well documented information for economically important traits.

Keywords: Arba Minch Zuria district, Breeding practice, Reproductive performance, Sheep

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1. Introduction

Ethiopia is believed to have the largest sheep population in Africa, which is estimated to be 30,697,942 million heads (CSA, 2017). Sheep are highly adaptable to a broad range of

environments owned by smallholder farmers as an integral part of the livestock sub-sector (Zelalem, 2016). Approximately 75% of the sheep are kept in smallholder mixed farms in the highland areas, which cover areas of over 1500 altitude and receive over 700 mm of annual rainfall, while the remaining 25% are found in the lowlands. Sheep are traditionally kept in smallholdings and are associated with the small-scale resource poor livestock keepers (Zewdu, 2008).

Indigenous sheep in Ethiopia have a multipurpose role for smallholder farmers as sources of income, meat, milk, skin, manure and coarse wool or long hairy fleece. They are also a means of risk avoidance during crop failure. Thus, increasing the current level of productivity of sheep is essential to meet the demands of the ever-increasing human population (Mengesha & Tsega, 2012). Sheep serve as living bank for their owners and serve as source of immediate cash need and insurance against crop failure especially where land productivity is low and unreliable due to erratic rainfall, severe erosion, frost, and water logging problems. According to Zewdu (2008), sheep also play an important role in cultural, social livelihoods and religious values for large and diverse human population.

Based on research finding of (Kassahun, 2000; Edea, 2012), adaptive traits such as tolerance to diseases and feed shortage were given low emphasis in selecting replacement stocks in highland sheep breeds. Disease, feed and grazing land shortage identified several constraints such as early disposal of breeding stocks, small flock sizes with only a few breeding males, uncontrolled mating, communal grazing in wet season and free roaming during dry season that make controlled breeding or mating very difficult.

Traditional breeding practices such as sharing of breeding rams should be further strengthened. This in turn requires the full participation and long-term commitment of sheep keepers and other livestock development actors. To realize full benefits of a breeding strategy; approaches should be holistic with concurrent improvement in the non-genetic factors (disease resistance and feed efficiency) as well. The productivity of indigenous breeds is low compared to temperate breeds, but their ability to survive and produce in the harsh and mostly unpredicted tropical environment is remarkable. Reproductive performances are important early indicators of adaptability and management adequacy (Abegaz et al., 2002; Getahun, 2008).

The most important components of reproductive performance in sheep are age at first service, age at first lambing, lambing interval, litter size, slaughter age, ewe productive life and

ewe life time lamb crop. Puberty in the ewe lamb is the point in which she first exhibits estrus. From the point of farmers view, puberty is the age at first service. Studies revealed that age at first mating for both sexes is not fixed and sheep are left to nature to reproduce (Zewdu, 2008).

Characterizing the current production systems, breeding practices, and productivity level of the breed/ type in their habitat are prerequisites to set up an improved management program at the smallholder and pastoral levels (Kosgey et al., 2004). Since, availing basic information is important to improve the small ruminant sector in general and sheep production system in particular with the focuses of improved breeding management practices, it is important to carry out research in this regard to filling the information gap in the study area. Therefore, the present study is planned with the following specific objectives: to assess the existing breeding management practice and breed/trait preferences and reproductive performances of different sheep types/breeds in the study area.

2. Materials and Methods

2.1. Description of the study area

The study was conducted in Arba Minch zuria woreda of Gamo zone, Ethiopia. The woreda is selected based on its high sheep production potential, large sheep population, pioneer in introducing of well productive Bonga, Dawuro and Doyogena local sheep breeds and have suitable agro-ecology. Arba Minch zuria woreda is characterized here under in the Table 1.

Table 1. The brief description of the study area

Climatic conditions	Arba Minch *Zuria woreda,* Gamo Zone
Major agroecological zones based on elevati on of meter above sea level (m)	Below 1500 (27.6%) (Low land), 1500- 2300 (41.4%) (Mid land) and 2300 – 3300 (31%) (highland)
Mean annual temperature (^{0}C)	16.3-30.6
Mean annual rainfall (mm)	800 – 1600
Sheep farming system	Mixed with crop production

2.2. Sampling technique and sample size

Multi-stage sampling procedures were followed at three different stages. In the first stage, three distinctive agro-ecologies that are potential for sheep farming were purposive selected. These three strata are low lands (<1500 m.a.s.l.), midlands (1500-2300 m.a.s.l.) and high lands (>2300 m.a.s.l.) (MoA, 2000).

In the second stage, based on reconnaissance survey and participatory rural appraisal (PRA) information; one representative farmer's administrations (*kebeles)* from each stratum,

three from the *woreda,* were selected following stratified random sampling technique. In the third stage, individual household heads having sheep of any breed and size and/or adopted improved sheep farming practices were identified and selected using systematic random sampling technique.

A list of households in each survey site was identified with the help of the chief of *kebeles* and agricultural development agents. The identified household heads were questioned using a pretested structured questionnaire. The total sample size for household interview was determined using probability proportionate (Eq. 1) to size-sampling technique Cochran (1977).

$$n = \frac{Z^2 * (p)(q)}{d^2} \quad (1)$$

Where, n= Desired sample size when population (household, HH) greater than 10,000; Z= Standa rd normal deviation (1.96 for 95% confidence level); P = 0.1 (proportion of population to be incl uded in sample i.e., 10%); q = is 1-P i.e. (0.9); d =is degree of accuracy desired (0.05) or 5% erro r term. The sample size was 138; which included 43 HHs from highland, 57 midland and low lan d 38 HHs were selected.

2.3. Data sources and data collection tools

A focus group discussion consisting of 12 famers were conducted in each agro-ecology. The focus group included model and well experienced sheep farmers, women, development agents and kebele governor at each agro-ecology. Discussion was made to complement the interview information and consists the objective of sheep keeping, breeding practices, selection criteria and trait preferences, and reproductive performances like age at first lambing and lambing interval, life span lambing, litter size, parturition length and puberty age, general management and breeding practices, productivity and adaptation ability.

In addition, the researcher's own observation to production system and breeding practices was made besides group discussion, questionnaire interview and communication with concerning livestock experts at different levels, farmers trait/breed preferences of sheep in the studied areas were collected using a pretested structured questionnaire.

2.4. Statistical analysis

Data (both qualitative and quantitative) was cleaned and entered into Microsoft office Excel every day after administering questionnaire to prevent loss of data. All the surveyed data was analyzed using statistical procedures for social science (SPSS) version 20. The indices were calculated for purpose of keeping sheep and trait preferences as follows:

Index = Sum of (3 × number of households ranked first + 2 × number of households ranked second + 1 × number of households ranked third) given for an individual reason, criteria or preference divided by the sum of (3 × number of households ranked first + 2 × number of households ranked second + 1 × number of household ranked third) for overall reasons, criteria or preferences.

3. Results and Discussion

3.1. Purposes of keeping sheep

The overall purposes of sheep production in the study areas were ranked as 0.32, 0.23, 0.17, 0.14, 0.13, and 0.01 for sale (income generation), saving, meat, share risks with other animals, manure and social functions (sacrifices or ritual), respectively. In the study area, sheep were kept for sale (income generation), meat, manure, saving, share risks with other animals and social functions (sacrifices or ritual) in highland with the index value of 0.31, 0.16 ,0.20, 0.20, 0.12 and 0.01, respectively and in the mid altitude 0.30, 0.19, 0.16, 0.12, 0.15 and 0.01, respectively. In the low land the index value of 0.40, 0.13, 0.32 and 0.16 for sale (income generation), meat, saving, and share risks with other animals, respectively (Tables 2).

The primary reason of sheep keeping by the farmers was for source of income generations through the sale of live animals with an index value of 0.31, 0.30, and 0.4 in highland, midland and lowland AEZs, respectively. During the focus group discussion, it was described that from the sales of live animals they generate cash that might be used to buy clothing and food items, pay taxes, to purchase additional fertilizers and household supplies (children's schools). These findings were in agreement with reports of earlier research works of (Arse et al., 2013; Yadeta, 2016; Hundie & Geleta, 2015). The second main reason of sheep keeping was for saving sheep as a pocket money being a live bank for the farmers that they use it at any time where the need for cash arises according to the focused group discussion. The rank of the index value was 0.20, 0.21 and 3.2 in the highland, midland and lowland respectively. Thirdly, meat production for the sheep keepers during festivals, family birth and wedding and personal consumptions was another purpose with index value of 0.17 overall AEZs which indicated in Table 2.

The fourth purpose was to distribute risk and benefit which was insurance for the sheep keepers during unexpected problems. When they face crop loss, they go for sales of the sheep for the large animals were not easily sold and their long replacement period does not help the farmer

to solve his immediate problems so that they prefer to save those large animals. Its index value of this purpose was 0.12, 0.15 and 0.14 in the highland, midland and lowland respectively. Lastly, the manure production was the final purpose of keeping sheep mostly in the high land and midland farmers; manure is used as an organic fertilizer for increasing their soil fertility.

Table 2. Purpose of keeping sheep

Purpose of sheep production	Agroecological Zones												OI	Rank
	Highland				Midland				Lowland					
	R_1	R_2	R_3	I	R1	R2	R3	I	R1	R2	R3	I		
Sale	22	18	3	0.31	29	21	7	0.3	18	13	7	0.4	0.32	1
Meat	16	4	2	0.16	20	16	-	0.19	4	5	4	0.13	0.17	3
Manure	19	6	2	0.20	23	3	4	0.16	-	-	-	-	0.13	5
Saving	11	16	-	0.2	25	15	-	0.21	20	10	1	0.32	0.23	2
Share risks	6	11	-	0.12	21	6	2	0.15	11	4	-	0.16	0.14	4
Scarification	1	-	-	0.01	-	1	-	0.01	-	-	-	-	0.01	6

R_1= First rank, R_2 = Second rank, R_3 = Third rank, I = index, OI= Overall index

3.2. Sheep breeding practices

There was often no selective mating policy in the study area. Ram run with flock throughout the year, some select the breeding ram from the flock and neighbor's with 29.7% and 70.3% of overall altitudes. Only 29.7% of overall respondents that owned sheep had breeding ram. The majority of breeding rams originated from the same or other villages. In dry season, immediately after crop harvest, ram from different flocks while roam freely mates females within the same village or from other villages and some were using market rams or use neighbors' ram. Two possible breeding seasons of the flocks were identified.

Sheep owners (78.26%) indicated that the major breeding time of the flocks was between Octobers to January. Until crops were harvested, flocks usually tethered and maintained under nutritional stress. Between October and January, immediately after crops harvested the flocks freely graze on crop stubbles and aftermaths. Thus, adequate nutrition for reproductive process and access to breeding males creates favorable situation to the flock breeding during this period. About 65.22% of the sheep keepers indicated that the second minor breeding season was between April to June in the different agro-ecologies. As in main season, this was also attributed to improved feed supply from grasses and browses grown immediately after the belg shower rains.

Lambing of the flocks mated in major breeding season occur in an entry to wet season from April to May whereas births of the minor breeding season occur in dry season from October to December. This finding was in agreement with (Dhaba et al., 2013) who reported high

lambing/kidding rate during April to June and (Yadeta, 2016). It was observed that there was no deliberate practice of making selective breeding to avoid risks of the inbreeding depression in the flocks. This has of more concern that almost all breeding rams originated from their respective flocks that might imply that the relationship of animals within a flock and even within a village was narrow and inbreeding was widespread and increasing.

3.3. Lamb rearing and selection of castration/culling

In cases of loss of their dams, young lambs were offered with cow's milk and household leftover foods until they start grazing and browsing. About 13.95% of the highland respondents practiced early weaning (preventing suckling by herding separately or tethering, until 4 months) of young lambs to maintain body condition of mothers for the subsequent reproduction, that was earlier than (Tsedeke, 2007) reported 4.6 months. These kinds of practices were not recorded in agro-ecologies. Dams were self-weaned their lamb (dams mated and prevent suckling, lamb grow and stop suckling).37.2% in the highland, 24.6% in the midland and 27% in the lowland of respondents were castrating their male animals, which was not significantly different in the AEZs.

In the highland, midland and lowland 34.9%, 33.3% and 26.8% of the households respectively used traditional methods of castration (use wood or stone to crash vas deference of the testicle), and2.3%, 3.5% and 21.1% households in the highland, mid altitude and lowland respectively use modern methods (using Burdizzo) at the kebeles DAs office. According to 95% of the total respondents the major reason of castration, was to fatten the sheep and sale them, the difference in this practice experienced in the agro ecology was closely related i.e., 93.8%, 100% and 90% in the high land, mid altitude and low land, respectively (Table 3). This was in agreement with (Yilikal, 2015; Sisay & Kefyalew, 2015), reported closer castration practices of sheep in Chencha and Mirab and Eastern Ethiopia.

About 2.5% of the total flock owners in all AEs castrate males with undesirable physical characteristics like black coat color and small body size at early age to avoid breeding. Several intact males in a household make noises and become restless and difficult to handle thus 2.5% in all AEZs of the respondent castrate their animals to tame, in high land it was 6.2% but, in the midland, and lowland there was no more rams tamed in the flock. The average age of castration was one year for sheep. This is attributed to the households' interest to castrate and fatten sheep as early as possible to take advantage of the higher demand and prices at the present market. No

one of the sheep owned respondents practice docking the tail of female sheep to facilitate mating and sanitary purpose.

About 31.2% of respondents of overall altitudes sheep owners indicated that coat color was some of the good traits. White, light brown and mixture coat colors have a preference in that order in sheep, 78.9% of the respondents prefer these most important traits in the low land. The presence of medium size and up-ward orientation of horns add high aesthetic value as it was elaborated during the focused group discussion. The width, length and fatness of the tail were vitally important in sheep in the overall altitudes so that 2.9% of the respondents look intently for these traits.

This study identified that body conformation (height and length) and physical characteristics (coat color, horn, tail) were the major criteria that household consider selecting sheep for castration and fattening. Coat color (like red, red mixed with black) and horn (medium and twisted) and fat and long tail in sheep were also very important traits farmers preferences. This clearly depicts body conformation and certain physical traits (tail, coat color, horn) were foremost criteria that producers, traders and consumers critically consider and accordingly breeding efforts needs to assimilate the stakeholder preferences.

Table 3. Household management practices (%) of young, breeding and fattening flocks

Particulars	Agroecology			overall
	Highland	Midland	Lowland	
Castration of sheep	37.2	24.6	27	29.2
Castrating by local methods	34.9	33.3	7.9	26.8
Castrating by modern (burdizo)	2.3	3.5	21.1	8
Castration to fatten and sale	93.8	100	90	95
Castration to control unwanted breed	-	-	10	2.55
Castration to tame	6.2	-	-	2.5
Selection of physical characteristics color	14	12.3	78.9	31.2
Selection of physical characteristics horn	-	7	-	2.9
Selection of physical characteristics tail	34.9	43.9	78.9	50.7
Selection of physical characteristics body length	23.3	36.8	78.9	44.2

3.4. Breed types and preference to sheep

Types of sheep observed in the study AEZs were of short and thin-tailed, fat and long tailed and fat-tailed coarse hair type. Local sheep types, Dawro/Bonga breed and lowland sheep type Wolyta/Doyogena breed are found in the study area. According to (Solomon, 2008) phenotypically, Bonga sheep breed are fatty and long tail. As observed in the current study Doyogena sheep types are also fatty and long tail with course hair. In the highland and mid

altitude, local (in area usually found) sheep type was dominant and characterized by thin and long tailed. In the study area, for the last few years GO and NGOs introduced sheep from Dawro into the highland and midland. In the low land, Doyogena sheep breed was dominantly distributed. Farmers from three AEZs mentioned, about 60.9, 54.7, 51.8, 51.4, 29.7 and 21.9% prefer sheep for immediate return, easy to manage keeping/raring, high market demand, distribute loss and benefits, market incentive price and appropriate for slaughter and home consumption, respectively. Immediate return due to high reproduction efficiency was comparably appreciated by respondents as compared to large animals like cattle Table 4.

Table 4. Household preferences to sheep

Characteristics	Agro-Ecology %			overall
	Highland	Midland	Lowland	
High market demand	64.3	36.8	60.5	51.8
Incentive market price	27.9	28.1	34.2	29.7
Easy to manage	66.7	42.1	60.5	54.7
Immediate return	65.1	57.9	60.5	60.9
Distribute loss and benefits	69.8	35.1	55.3	51.4
Appropriate for slaughter and home consumption	18.6	17.9	31.6	21.9

3.5. Reproductive performances of sheep

The results on reproductive performance of all agro-ecological zones Age at First Lambing, slaughter age, age of sexual maturity, Lambing Interval, Litter Size, and reproductive life span of the sheep had significant difference between AEZs as it is presented in Table 5.

3.5.1. Age at puberty

Age at puberty for highland local sheep male and female were 7.34±0.123 months and 7.95±0.136 months respectively, Dawuro/Bonga sheep breed/type was 7.00±0.555 months and 7.50±0.614 months for male and female respectively which was not significant differ. The sexual maturity of the breed types closely related but there was significantly different with in the agro-ecological zone ($p<0.05$). In the highland puberty age of male and female local sheep were 7.34±0.123 months 7.95±0.136 months and for midland local it was 7.74±0.120 months and 8.02±.132 months respectively. The case of Dawuro/Bonga sheep breed/type in the highland male and female was 7.00±0.555 months and 7.50±0.614 months and in the mid altitude male and female was 7.79±0.120 months and 8.14±0.232 months, respectively. In the highland Dawuro/Bonga Breeds/types and local sheep types had earlier puberty age than the midland sheep types/breeds in the study area.

During the focused group discussion, it was explained that due to feed shortage and the grazing land shortage, sheep keepers in the mid land mostly keep their sheep tethered. And in the low land it was found that the sheep breed was Woliata/Doyogena, average age at first mate male and female was 6.32±0.127 months and 7.42±0.141 months respectively. In both sexes, it was earlier than that of the highland and midland sheep breeds/types. The overall age at puberty 7.23±0.14 for males and 7.24±0.11 months for female of all sheep types, respectively; was longer than that of (Yilikal, 2015), 6.9 months in Chencha and 6.4 months in Mirab Abaya, but closer with (Helen et al., 2015) that was reported, 7.63±.14 for male and 7.24±.14 for female in indigenous sheep production system in eastern Ethiopia in her study on the implications for genetic improvement and sustainable use.

On other hand; the current finding is lower than result of (Amelmal, 2011) age at sexual maturity (puberty) was 11.05±1.6, 10.88±1.7 and 9.5±1.4 months for males and 11.13±2.7, 10.8±1.9 and 9.5±1.4 months for females in Tocha, Mareka and Konta, respectively. This indicates that the sexual maturity of sheep in Ethiopia Showed great variation among breeds / types, locations and differences or variation allowing for the selection of suitable breeds for a given environment.

3.5.2. Age at first parturition

Mean age at first parturition was 12.95±0.138 months for local sheep type and 12.50±0.626 months for Dawuro sheep type/breed in the highland and 13.02±0.135 months for local sheep type/breed and 13.14±0.237 months Dawuro sheep type/breed in the mid altitude. In the highland and midland for local sheep 12.95±0.138 and 13.02±0.135 months and 12.50±0.626 13.14±0.237 months in the highland and midland months Dawuro sheep types/breed, respectively represents the age at first parturition. Woliata/Doyogena sheep found only in the lowland and their age at first parturition was earlier than that of high and midland and the same is true for local and Dawuro sheep types.

Average age at first parturition observed in this study was 12.808±.142 months for parturition over the three agro-ecologies. In the mid altitude average age at first parturition was 13.02±0.135 month which was higher than the high land and low land. This finding is in agreement with (Deribe, 2009; Fsahatsion et al., 2013) in their study on farm performance evaluation of indigenous sheep (12.40) in Alaba, traditional sheep production and breeding practice (12.4±0.28) in Gamo Zone.

3.5.3. Parturition interval

Local highland sheep breed/type parturition interval was 7.76±0.75 and for midland it was 7.60±0.75 months but Dawuro breed/type has 7.50±0.339 and 7.29±0.128 months in the highland and mid land respectively. Doyogena/Wolyta sheep type parturition interval was closer to the Dawuro sheep type as indicated in Table 5. Parturition interval was significantly different between AEZs ($p<0.05$) with 7.519±0.077 months overall agro-ecologies of the system. Lambing interval was closer with (Fsahatsion et al., 2013) traditional sheep production and breeding practice (7.34±0.28) in Gamo zone and (Yilikal, 2015) small ruminant production and marketing: constraints and opportunities in Chencha and Mirab Abaya woredas, Southern Ethiopia.

Table 5. Reproductive parameters of sheep flock

Performance measurements	Agroecology (mean ± SE months)			Overall	p-value
	Highland	Midland	Lowland		
Local sheep type					
Age at first mate male	7.34±0.12[a]	7.74±0.12[a]	-	7.24±0.13	0.000
Age at first mate female	7.95±0.14[a]	8.02±0.13[a]	-	7.81±0.14	0.002
Age at first parturition	12.95±0.14[a]	13.02±0.13[b]	-	12.81±0.14	0.003
Parturition interval	7.76±0.08[a]	7.60±0.08[a]	-	7.52±0.o8	0.017
Litter size	1.29±0.08[a]	1.21±0.08[b]	-	1.50±0.08	0.000
Slaughtering age of male	7.73±0.22[b]	9.09±0.22[a]	-	7.80±0.20	0.000
Slaughtering age of female	8.00±0.22[b]	9.16±0.21[a]	-	7.95±0.22	0.000
Dawro/Bonga sheep type					
Age at first mate male	7.00±0.56[b]	7.79±0.210[a]	-	7.24±0.13	0.000
Age at first mate female	7.50±0.61[b]	8.14±0.232[a]	-	7.81±0.14	0.002
Age at first parturition	12.50±0.6[b]	13.14±0.24[a]	-	12.81±0.14	0.003
Parturition interval	7.50±0.34[a]	7.29±0.128[b]	-	7.52±0.o8	0.017
Litter size	1.50±0.36[a]	1.50±0.136[a]	-	1.5±0.08	0.000
Slaughtering age of male	7.00±1.00[b]	8.64±0.38[a]	-	7.78±0.23	0.000
Slaughtering age of female	7.50±0.38[b]	8.64±0.37[a]	-	7.95±0.22	0.000
Wolyta/Doyogena sheep					
Age at first mate male	-	-	6.32±0.13[a]	7.24±0.13	0.000
Age at first mate female	-	-	7.42±0.14[a]	7.81±0.14	0.002
Age at first parturition	-	-	12.4±0.14[a]	12.81±0.14	0.003
Parturition interval	-	-	7.45±0.08[a]	7.52±0.08	0.017
Litter size	-	-	1.97±0.08[a]	1.5±0.08	0.000
Slaughtering age of male	-	-	6.42±0.23[a]	7.78±0.23	0.000
Slaughtering age of female	-	-	6.42±0.23[a]	6.42±0.64	0.000
Average life span in year	10.5±0 .44[a]	9.5±0.19[b]	9.3 ±0.09[b]	9.8 ±0.16	0.016
Average lamb crop of life time of sheep in number	10.25±0.4[b]	9.7±.36[c]	15±0.37[a]	11.7±0.30	0.000

Means in the same row with different superscript ([a, b, c]) are significant at $P<0.05$

3.5.4. Litter size

Litter size of the local sheep type in the highland and mid land was lower than that of the Dawuro sheep in the highland and midland as well as Doyogena sheep closer to the Dawuro sheep type as presented in the Table 5. The average litter size or prolificacy as obtained in the present study was 1.495±0.082 lambs per head in the overall agro-ecologies significant (P<0.001) of the study area. The average litter size was in agreement with (Deribe, 2009) on farm performance evaluation of indigenous sheep (1.51) in Alaba.

The current results were within the range (1.08 - 1.75) as reported by (Girma, 2008), for tropical breeds. But the current liter size was higher than those reported by (Yadeta, 2016), 1.21, 1.18 and 1.16 in high, mid and lowland, respectively, for Ada Barga and Ejere districts sheep of West Shoa Zone, (Tadele, 2010) for Menz and Afar sheep breeds (close to one lamb per lambing), Bonga sheep (1.13) and Washera sheep (1.11) reported by (Solomon et al., 2010).

3.5.5. Slaughter age

Average slaughter age of sheep was 7.78±0.226 and 7.945±0.224 months for male and female in the overall AEs. Female slaughter age was higher than that of the male in the study area and highly significantly different in the AEZs (P<0.001). In Arba Minch zuria district there was consumption tradition of young lambs that might lead to culling of future breeding stock. That there was a belief on this practice to contribute to building the body and health of sick family better specially for mothers and this could attribute to the observed early slaughter ages of the sheep.

The current finding is lower than the results reported by Assen & Aklilu, (2012) who reported Age at Sexual Maturity of 8.42 and 8.8 months in HL and ML of Tigray region respectively. This finding was higher than that of Yadeta, (2016), finding but it was in agreement for the low land sheep.

3.5.6. Average life span and average lamb crop of the sheep

The variation in the reproductive life span of female sheep was significant due to AEZs (P<0.05) (Table 5). The reproductive life spans of sheep were 10.5, 9.5 and 9.3 years in the highland, midland and lowland respectively. This finding was closer to Yadeta (2016) reported. The mean lamb crops of sheep on its life span were 10.25, 9.7 and 15 lambs in the highland, midland and lowland respectively of agro-ecological zones (p<0.001).

4. Conclusion

The major purpose of this study was to generate baseline information on breeding practices and reproductive performances of available sheep types of Arba Minch Zuria district, Gamo zone, Ethiopia. Information was obtained from 138 sample sheep holders. The existing breeding practices and trait preferences, purpose of sheep keeping and reproductive performances of different sheep types were well summarized. As result, Sheep in Arba Minch Zuria woreda have appreciable reproductive performances such as: early maturity ($P<0.001$), short lambing interval ($P<0.01$) as compared to published reports of many other sheep breeds in Ethiopia. The local sheep breeds come from Bonga and Doyagena areas showed higher reproductive performances than the local sheep breeds inhibited in the study areas. Therefore, the current finding clued that introducing well productive local breeds to other areas is promising option for low resourceful smallholder farmers under tropical condition than introducing exotic breeds to traditionally managing systems. Therefore, GOs and NGO should introduce well-known local breeds like Bonga and Horro in Ethiopia for their better reproduction and production performances to other areas where agro- ecological conditions are matching with their natural habitat.

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Conflict of Interest

There is no any conflict of interest.

References

Abegaz, S., Negussie, G., Duguma, & Rege, J. E. O. (2002). Genetic parameter estimates for growth traits in Horro sheep. Journal of Animal Breeding and Genetics, 119, 35–45.

Amelmal, A. (2011). Phenotypic characterization of indigenous sheep types of Dawuro Zone and Konta special Woreda of SNNPR, Ethiopia (Unpublished Master's Thesis). Haramaya University, Haramaya, Ethiopia.

Arse, G., Hundessa, F., Umeta, G., Muleta, M., & Debele, G. (2013). Assessment on challenges and opportunities of goat farming system in Adami Tulu, Arsi Negelle and Fantale woreda of Oromia Regional State, Ethiopia. African Journal of Agricultural Research, 8(1), 26–31.

Assen, E., & Aklilu, H. (2012). Sheep and goat production and utilization in different agro-ecological zones in Tigray, Ethiopia. Livestock Research for Rural Development, 24(1), Article 10. Retrieved from http://www.lrrd.org/lrrd24/1/asse24010.htm

Central Statistical Agency. (2017). Agricultural sample survey: Volume II. Report on livestock and livestock characteristics (private peasant holdings). Federal Democratic Republic of Ethiopia.

Cochran, W. G. (1977). Sampling techniques (3rd ed). John Wiley & Sons.

Deribe, G. T. (2009). On-farm performance evaluation of indigenous sheep and goats in Alaba, Southern Ethiopia (Unpublished master's thesis). Hawassa University, Hawassa, Ethiopia.

Dhaba, U., Belay, D., Solomon, D., & Taye, T. (2013). Breeding practices and reproductive performance of traditionally managed indigenous sheep and goat in Ilu Abba Bora Zone of Oromia Regional State, Ethiopia. Livestock Research for Rural Development, 25(7), Article 120. Retrieved from http://www.lrrd.org/lrrd25/7/dhab25120.htm

Edea, Z., Haile, A., Tibbo, M., Sharma, A. K., Sölkner, J., & Wurzinger, M. (2012). Sheep production systems and breeding practices of smallholders in western and south-western Ethiopia: Implications for designing community-based breeding strategies. Livestock Research for Rural Development, 24(7), Article 129. Retrieved from http://www.lrrd.org/lrrd24/7/edea24129.htm

Fsahatsion, H., Aberra, M., & Sandip, B. (2013). Traditional sheep production and breeding practice in Gamogofa Zone, Southern Ethiopia. International Journal of Livestock Production Research, 1(3), 26–43.

Getahun, L. (2008). Productive and economic performance of small ruminant production in production system of the highlands of Ethiopia (Unpublished Doctoral Dissertation). University of Hohenheim, Stuttgart-Hohenheim, Germany.

Girma, A. (2008). Reproduction in sheep and goats. In A. Yami & R. C. Merkel (Eds), Sheep and goat production handbook for Ethiopia (pp. 57–72). Ethiopia Sheep and Goats Productivity Improvement Program (ESGPIP).

Helen, N., Mekasha, Y., Abegaz, S., Kebede, K., Kumar, S., & Pale, P. (2015). Indigenous sheep production system in Eastern Ethiopia: Implication for genetic improvement and sustainable use. American Scientific Research Journal for Engineering, Technology, and Sciences, 11(1), 136–152.

Hundie, D., & Geleta, G. (2015). Assessment on production situation and breeding practices of 'Horro sheep' under traditional management in Horro Guduru and East Wollega Zones, West Ethiopia. Global Journal of Animal Breeding and Genetics, 3(3), 146–152.

Kassahun, A. (2000). Comparative performance evaluation of Horro and Menz sheep of Ethiopia under grazing and intensive feeding conditions (Unpublished master's thesis). Humboldt-Universität zu Berlin, Berlin, Germany.

Kosgey, I. S. (2004). Breeding objectives and breeding strategies for small ruminants in the tropics (Unpublished Doctoral Dissertation). Wageningen University, Wageningen, Netherlands.

Mengesha, M., & Tsega, W. (2012). Indigenous sheep production in Ethiopia. Ethiopian Institute of Agricultural Research, DebreZeit Agricultural Research Center.

Ministry of Agriculture. (2000). Agro-ecological zonation of Ethiopia. Ministry of Agriculture.

Sisay, F., & Kefyalew, G. (2015). Sheep and goat production systems in Degehabur Zone, Eastern Ethiopia: Challenge and opportunities. International Journal of Livestock Production, 6(2), 19–28.

Solomon, G. (2008). Sheep resources of Ethiopia: Genetic diversity and breeding strategy (Unpublished Doctoral Dissertation). Wageningen University, Wageningen, Netherlands.

Solomon, G., Azage, T., Berhanu, G., & Dirk, H. (2010). Sheep and goat production and marketing systems in Ethiopia: Characteristics and strategies for improvement (Improving

Productivity and Market Success (IPMS) of Ethiopian Farmers Project). International Livestock Research Institute (ILRI). Retrieved from https://cgspace.cgiar.org/handle/10568/10601

Tadele, M. (2010). Identifying breeding objectives of smallholders/pastoralists and optimizing community-based breeding programs for adapted sheep breeds in Ethiopia (Unpublished Doctoral Dissertation). University of Natural Resources and Life Sciences, Vienna, Austria.

Tsedeke, K. (2007). Production and marketing of sheep and goats in Alaba, SNNPR (Unpublished Master Thesis). Hawassa University, Hawassa, Ethiopia.

Yadeta, N. (2016). Production and reproductive performances, procedures traits preferences and marketing systems of small ruminants in Ada Barga and Ejere Woredats of West Shoa zone (Unpublished Master Thesis). Jimma University, Jimma, Ethiopia.

Yilikal, T. (2015). Small ruminant production and marketing: Constraints and opportunities in Chencha and Mirab Abaya woreda, Southern Ethiopia. Livestock Research for Rural Development, 27(4), Article 67. Retrieved from http://www.lrrd.org/lrrd27/4/yili27067.html

Zelalem, A. (2016). Review of the reproductive performances of indigenous sheep in Ethiopia. Journal of Biology, Agriculture and Healthcare, 6(9), 1–10.

Zewdu, E. (2008). Characterization of Bonga and Horro indigenous sheep breeds of smallholders for designing community-based breeding strategies in Ethiopia (Unpublished Master Thesis). Haramaya University, Dire Dawa, Ethiopia.

Zewdu, E., Aynalem, H., Markos, T., Sharma, A. K., Sölkner, J., & Wurzinger, M. (2012). Sheep production systems and breeding practices of smallholders in western and south-western Ethiopia: Implications for designing community-based breeding strategies. Yabello Pastoral and Dryland Agriculture Research Centre.