

Study on Breeding Practices and Reproductive Performance of Black-Head Somali Sheep under Traditional Management System: The Case of Awbarre District, Eastern Ethiopia

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Abstract

The study was conducted in the Awbarre district of the Fafen zone of the Somali regional state of Ethiopia. The objective of the study was to assess the breeding practices and reproductive performance of Black-head Somali sheep under a traditional management system. Purposive and simple random sampling techniques were used to select targeted *kebeles* and households, respectively. A total of 120 households were selected from four *kebeles*, each of 30 households, based on the production system and sheep population. Semi-structured questionnaires, group discussions, key informants interviews and field observations were used to generate the required data. The primary purpose of keeping sheep was for income generation, followed by saving as a future asset. The majority (89.2%) of the respondents separated male and female animals during herding. The selection criteria for breeding rams were appearance, growth, pedigree, and color while for breeding ewes were appearance, adaptability, pedigree, color, and lamb growth. The overall weaning age of Black-head Somali sheep in the study area was 3.7 months for both males & females. The castration of male sheep was common for the purpose of fattening, fattening with breeding control and breeding control as well. The castration is mainly performed during the summer and autumn and the methods of castration were both traditional and modern methods, the traditional castration method being the most important one in pastoral areas. The age of sexual maturity was 7.64 months for rams and 8.97 months for ewe's male and female lambs in the pastoral area and 8.42 & 8.38 for rams & ewes in agro-pastoral and overall lambing interval was 11 months. On average, the ewe of Black-head Somali sheep in pastoral & agro-pastoral could produce 9.49 &

9.57 lambs, respectively in their lifetime. As the pastoralists and agro-pastoralists indicated the source of the breeding ram was their own, so the exchange of breeding ram is recommended to minimize the risk of inbreeding and further studies of on-farm performance investigation would be necessary to be carried out so as to understand the uniqueness of the breed better.

Keywords

Black-Head Somali Sheep, Breeding Practice, Reproductive Performance, Selection Criteria

1. Introduction

Ethiopia is among the few countries in the world with a huge livestock population due to its suitable environmental conditions within the different ecological zones [1]. These potentials make the country a noticeable source of animal genetic diversity [2]. According to CSA [3], the country is home to about 42.9 million sheep, 52.5 million goats, 70 million cattle, and 8.1 million camels.

Livestock has a significant contribution to the livelihood of the people, especially in the rural area and the national economy of the country is momentous by generating income for the smallholder farmers, creating job opportunities, providing drought power, ensuring food security, providing services and contributes to the asset, social, cultural and environmental values and sustain livelihoods of the people and also sources of foreign currency [4]. In terms of contribution to the national economy, livestock contributes about 16.5% of the Gross Domestic Product (GDP), 35.6% of the agricultural GDP, 15% of export earnings and 30% of agricultural employment and currently, the subsector supports and sustains livelihoods for 80% of the rural population [5].

Small ruminants represent the largest proportion of the livestock population of Somali region. As reported by CSA [3], the region possessed 27.5 million sheep and goats which represent about 32.4% of the national resources. The reports also indicate that there are around 807,519 sheep and 712,699 goats in the Fafen zone.

The Blackhead Somali sheep is a widely distributed sheep breed raised throughout the arid and semiarid areas in the southeastern parts of Ethiopia and is the predominant sheep breed of the region. The breed, locally known as *Wankie*, is also internationally recognized by names such as the Ogaden or Berbera Black-head sheep [6]. The breed has a distinguishing black color on the head and white on the rest of the body. The breed has small, short and sharply pointed ears with erect appearance. Generally, both sexes are polled with rudimentary horns occasionally seen in rams. It has a well-pronounced fat rump at the base of the tail with a heart shape in appearance [6].

Improvement in sheep productivity is still marginal in Ethiopia and more so in the Somali region [7]. The corner stone of the development of ovine produc-

tion begins with the identification of the breeding practice and then the introduction of new technologies or refining existing traditional breeding practices [7].

Awbarre district is situated in the breeding tract of the Black-head Somali sheep and limited study has been conducted on the prevailing breeding practices of the breed which is not adequate. Detailed and up-to-date information on indigenous knowledge breeding practices of black head Somali sheep, identification of important selection criteria of breeding stocks are prerequisites to set up improvement programs at the smallholder and pastoral levels. Information on breeding practices, selection criteria of breeding stocks are lacking for Black-head Somali sheep breed, in spite of its contribution and role in improving food security as the sole dominant sheep breed in the study area. Therefore, this study aims to assess the traditional breeding practices and reproduction performance of Black-head Somali sheep in the study area. The study further aims to assess the traditional methods of selecting the rams and ewes.

2. Materials and Methods

2.1. Description of the Study Area

This study was carried out in the Awbarre district of the Fafen zone, Somali Region, Ethiopia. The district lies in 9°18' and 10°12'N Latitude and 42°37' and 43°26'E Longitude. It is bordered on the southwest by Jigjiga, on the west by the Siti Zone, on the east by Somaliland, and on the southeast by Kebri-beyah. It is characterized by arid and semi-arid climate, warm climate and low relative humidity. The dominant climate of the agro-climatic zone of the area is characterized to be semi-arid; the mean temperature is 14°C with minimum and maximum temperatures of 20°C and 25°C, respectively. The elevation of the area ranges from 1200 to 2117 meters above sea level and topographically it is characterized by an extensive flat to gently sloping topography.

2.2. Sampling Technique and Sample Size

A multi-stage sampling technique was employed in this study. In the first stage, four kebeles namely: Guncadde, Wagarcadle, Cagar Wayne and Shed Dher were selected purposely based on sheep population and production system. Guncadde and Wagarcadle represented pastoral production system, while Cagarwayne and Shed Dher represented agro-pastoral production system. In the second stage, thirty households who rear sheep were selected randomly from each kebele making the total number of households to be 120.

2.3. Data Collection and Analysis

A semi-structured questionnaire, key informant interviews, personal observations, and focus group discussions were used to gather the necessary relevant information for this study. The data were analyzed using SPSS (version 26.0). Chi-square test was employed to examine the differences among categorical va-

riables and the differences were considered to be significant at the level $P < 0.05$. The traits pertaining to the purpose of keeping sheep and the selection criteria of rams & ewes were evaluated using an index formula. The following model was used for data analysis:

$$Y_{ijk} = \mu + a_i + e_{ij}$$

where, μ = the overall mean, a_i = production system ($i = 1, 2$, pastoral & agro-pastoral), e_{ij} = error.

3. Results and Discussion

3.1. Demographic Characteristics of the Households

The majority of the respondents in pastoral and agro-pastoral production systems were male-headed households (**Table 1**). The average age of the respondents was 44.78 ± 0.95 . This finding is in line with the report of Fikru and Omer [8], who found that 33.3% and 40% of respondents in Awbarre district were between 40 - 50 years of age. The majority of the respondent (72.5%) were illiterate followed by those who read and write (24.17%) (**Table 1**). The Higher proportion of illiterate was also reported by Hassen *et al.* [9] and Ma'alim *et al.* [10] for Degahbour and Gode districts of Somali Region, respectively. Education clearly plays a role in determining household income, technology use, demographics, health, and the overall socioeconomic level of the family [11]. Thus, households need to get basic education and an understanding of livestock production and management measures.

3.2. Purpose of Sheep Production

The primary reason for keeping sheep in pastoral and agro-pastoral production systems in the study area was income generation with index of 0.27 & 0.24, respectively and the second reason being as saving with index of 0.26 & 0.21,

Table 1. Sex, age, and educational level (%) of the respondents in the study area.

Variables	Pastoral	Agro-pastoral	Overall	χ^2	<i>P</i> -value
Sex					
Male	61.67	50	55.83	1.66	0.1
Female	38.33	50	44.17		
Age (years), Mean \pm SE	44.68 \pm 9	44.87 \pm 0.19	44.78 \pm 0.95		
Educational status					
Illiterate	76.67	68.3	72.5	4.88	0.03
Read & write	21.67	26.7	24.17		
Primary school	0	5	2.5		
Secondary school	1.7	0.0	0.83		

SE = standard error, χ^2 = chi-square.

respectively (**Table 2**). The third reason for keeping sheep in the pastoral area was meat with index of 0.22 whereas the milk and social and cultural functions ranked as fourth. On the other side, the third reason for keeping sheep in the agro-pastoral area was for milk with an index value of 0.20, while meat and social and cultural functions ranked fourth and fifth with index values of 0.19 & 0.14, respectively. Similar to this, Fikru and Omer [8] reported that the main purpose of sheep and goat production in Awbare district is for subsistence and quick income cash from domestic and international markets. Furthermore, Haillemariam *et al.* [12] noted that income generation was the primary reason for keeping sheep in the Gamogofa zone of southern Ethiopia.

3.3. Herding of Sheep

Herding practice of sheep during day time in the study area is presented in **Table 3**. The majority of the respondents of the study area reported that they separated

Table 2. Purposes of keeping sheep in the study area.

Purpose(s)	Pastoral					Agro-pastoral				
	R1	R2	R3	R4	Index	R1	R2	R3	R4	Index
Meat	1	19	24	4	0.22	7	18	17	5	0.19
Income	47	13	0	0	0.27	40	12	3	3	0.24
Saving	11	26	16	5	0.26	8	20	19	3	0.21
Milk	1	2	17	23	0.19	5	5	9	30	0.20
Social & cultural	0	0	3	6	0.19	0	5	12	17	0.14

Index = ((4 for rank 1) + (3 for rank 2) + (2 for rank 3) + (1 for rank 4)) divided by the sum of all weighted purposes mentioned by respondents.

Table 3. Herding practices of sheep in the study area.

Variables	Pastoral	Agro-pastoral	Overall	χ^2	P-value
Herding of sheep during day time					
Male & female separate	91.7	86.7	89.2		
Lambs are separated	1.7	1.7	1.6	2.902	0.08
All classes are together	6.7	11.7	9.2		
Sheep flock is herded with					
Sheep herded separately	25	11.7	18.3	3.562	0.05
Together with goat	75	88.3	81.7		
Way of herding sheep					
Sheep of HH run as flock	95	96.7	95.8		
Sheep of more than one HH run as flock	5	3.3	4.2	0.209	0.6

χ^2 = chi-square.

males and females during the day, herding practice during the day in the study area were the same between the production systems. The majority of the respondents herded their sheep with goats, whereas 18.3% of the respondents herded their sheep separately and there was no difference in herding of sheep between the production systems and this result was in line with the report of Wendimu [13] who indicated that the majority of pastoralists & agro-pastoralists herded their sheep with the goat in Gode zone. 95.8% of the respondents reported that the sheep households run as flock, whereas 4.2% of the respondents in the study area reported that sheep of more than one household run as herd and this finding is in line with the report of Wendimu [13] in Gode and Adadle district of Gode zone.

3.4. Breeding Practices of Sheep

The purpose of keeping rams, selection practice of breeding males and females, and the mating system of black-head Somali sheep in the study area is presented in **Table 4**. The primary purpose of keeping ram in the study area was both for mating and fattening followed by fattening purpose and mating. This finding is in contrast with another result reported by Ferew [14] in Shinile zone of Somali region for the same breed. The purpose of keeping was similar in both production systems. The entire respondents reported that the source of breeding ram

Table 4. Type of breeding, source and purpose of keeping rams (%).

Variables	Pastoral	Agro-pastoral	Overall	χ^2	<i>P-value</i>
Purpose of keeping rams					
Mating	5	1.7	3.3		
Fattening	25	11.7	18.3	4.973	0.02
Mating & fattening	70	87.7	78.3		
Practice of selecting breeding rams					
Yes	93.3	93.3	93.3	0.00	1
No	6.7	6.7	6.7		
Practice of selecting breeding ewe					
Yes	30	23.3	26.7	0.00	1
No	70	76.7	73.3		
Type of mating/breeding					
Controlled mating	93.3	91.7	92.5	0.00	1
Uncontrolled mating	6.7	8.3	7.5		
Reasons for uncontrolled mating					
Sheep graze together	5	6.7	5.8	0.152	0.6
Lack of awareness	0.83	0.83	1.6		

χ^2 = chi-square.

was raised in the flock. The majority of the respondent in the study area reported that they practiced the selection of the breeding ram. However, the selection of breeding ewes is not important as that of breeding ram. Only 26.7% of the respondents practiced the selection of breeding females. This result is in line with that of Ferew [14] in Shinile zone of Somali region.

The majority of the sample households used a controlled mating system for sheep. The reasons for controlled mating in sheep were that sheep are bred to lamb in wet season (when forage is plentiful) because sheep are less drought tolerant than goats and to avoid unwanted breeding during the dry season. The community agreed to breed sheep five months prior to rainy season. Rams are separated from female sheep most of the time except during breeding. Rams are kept with the lambs and great care has been given throughout wet season. At this time, if rams escape to the female and breed, it is a grave and disaster to the animal owner; because sheep bred during wet season will give birth during dry season which can lose their lives. In dry season, no sheep were allowed to lactate and sheep lactate at this time death of both sire and lamb is common. This current finding is in contrast with the report of Feyissa *et al.* [15] who indicated that mating system of sheep in Borana low-land was generally uncontrolled. The difference might be due to feed resources availability and management system of the pastoralists. Moreover, the study indicated that only 7.5% of the respondents used uncontrolled mating system and this occurs lack of awareness and only in communal grazing whereby ewes and rams graze together.

3.5. Selection Criteria of Breeding Rams

The selection criteria for breeding rams in the study area are presented in **Table 5**. As the respondents in the study area reported the primary criteria for the selection of breeding ram in pastoral area was appearance with index value of 0.25 followed by growth, pedigree, and color with index values of 0.22, 0.18 & 0.14, respectively. Similar to the pastoral area, the respondents of agro-pastoral area indicated that the primary criteria for selection of breeding ram were appearance with index value of 0.24, followed by growth, color and pedigree with index values of 0.21, 0.20 & 0.18, respectively. The selection criteria pertaining for selection of breeding ram in pastoral and agro-pastoral production systems are all most all similar. The only difference was that in the pastoral area the respondents reported that they consider the ear size as selection criteria, whereas in the agro-pastoral area they reported the rump/tail type as selection criteria for breeding ram. The finding of the present study is in line with the result of different studies conducted in different areas. Study conducted by Wendimu [13] in Gode zone of Somali region indicated that the primary criteria for selecting the breeding ram was appearance and also another study conducted by Getachew *et al.* [16] in cool highland (Menz sheep) and arid and semi-arid lowland of Afar region in Ethiopia indicated that the primary pertaining criteria for selection of breeding ram were appearance.

Table 5. Selection criteria for breeding rams.

Criteria(s)	Pastoral					Agro-pastoral				
	R1	R2	R3	R4	Index	R1	R2	R3	R4	Index
Appearance	29	18	8	0	0.25	39	9	4	1	0.24
Color	0	15	10	6	0.14	2	21	15	7	0.20
Growth	12	11	16	8	0.22	4	13	18	12	0.21
Age	0	4	1	1	0.03	1	2	2	7	0.05
Walk ability	2	0	2	7	0.05	1	3	2	6	0.05
Pedigree	12	6	14	9	0.18	8	7	13	12	0.18
Ear size	1	2	2	9	0.12	-	-	-	-	-
Rump/tail type	-	-	-	-	-	1	1	2	11	0.06

Index = ((4 for rank 1) + (3 for rank 2) + (2 for rank 3) + (1 for rank 4)) divided by the sum of all weighted purposes mentioned by respondents.

3.6. Selection Criteria of Ewes

The selection criteria for breeding ewes in the study area are presented in **Table 6**. In this study, the most important traits considered as selection criteria for breeding ewes in pastoral area are appearance, adaptability, pedigree, ability to walk a long distance and lamb growth with index of 0.26, 0.21, 0.17, 0.14, and 0.14, respectively. Similar with little difference, the important pertaining criteria for breeding ewe selection in agro-pastoral area were appearance, adaptability, pedigree, lamb growth and color with index of 0.25, 0.19, 0.18, 0.16 and 0.14, respectively. The selection criteria of the two production systems in the study area are similar except the color which the agro-pastoralists consider as selection criteria for breeding ewes. The group discussion indicated that the farmers in the study area prefer some sheep colors for the selection of breeding ewes. Mostly, they prefer Black-head with white body, followed by Black-head with white and black body. Black-head with white body is preferred due to the resistance and adaptability and it was also good for meat production. As perceived by respondents, Black-head with white body and a small black point is preferred due to their claim that it was good for milk production. Comparing with other findings and another study conducted by Feyissa *et al.* [15] it was indicated that the body size, lamb growth and mothering character are pertaining criteria for selection of breeding ewes in Borana lowlands in southern Ethiopia.

3.7. Weaning Age of Lambs

The overall weaning age of Black-head Somali sheep in the study area was 3.7 months for both male and female lambs (**Table 7**). However, the average weaning age of lambs in pastoral area was 3.81 months, whereas in the agro-pastoral area it was 3.5 months. This implies that there was a difference ($P < 0.05$) in weaning age between the production systems. The higher weaning age was found

Table 6. Selection criteria for ewes.

Criteria(s)	Pastoral					Agro-pastoral				
	R1	R2	R3	R4	Index	R1	R2	R3	R4	Index
Appearance	7	3	4	4	0.26	13	0	1	0	0.25
Lamb growth	2	3	3	2	0.14	0	5	2	1	0.14
Sexual maturity	1	3	1	0	0.07	0	3	0	0	0.05
Ability to walk	1	3	4	2	0.14	0	0	1	0	0.02
Adaptability	4	6	1	4	0.21	0	5	5	1	0.19
Pedigree	3	0	5	4	0.17	1	1	4	4	0.18
Colour	-	-	-	-	-	0	0	1	8	0.16

Index = ((4 for rank 1) + (3 for rank 2) + (2 for rank 3) + (1 for rank 4)) divided by the sum of all weighted purposes mentioned by respondents.

Table 7. Weaning age (mean \pm SE) of lambs in the study area.

Weaning age	Pastoral	Agro-pastoral	Overall
Male	3.81 \pm 0.05 ^a	3.5 \pm 0.07 ^b	3.7 \pm 0.05
Female	3.81 \pm 0.05 ^a	3.52 \pm 0.07 ^b	3.7 \pm 0.05

in pastoral area. The finding of weaning age in the agro-pastoral was consistent with the report of Wendimu [13] in Gode zone of Somali region for the same breed.

3.8. Castration Practices of Sheep

Castration practice, castration method, age of castration reason and season of castration of male sheep are presented in **Table 8**. As the majority of the respondents in the study area indicated, castration of male sheep was common in the area. The reasons for castration which the respondents reported were fattening, fattening with breeding control and breeding control with proportion of 59.2%, 35.8% and 0.8%, respectively. This implies that the primary reason for castration for male sheep was to improve the fattening potential of sheep. The study also indicated that there was a difference ($P < 0.05$) for reasons of castration between the production systems; which means the primary reason for castration of male in pastoral area was fattening purpose followed by fattening and breeding control, whereas in agro-pastoral areas the primary reason for castration of sheep was both fattening and breeding control followed by fattening purpose. Another study conducted by Mesfin *et al.* [17] indicated that the majority of framers in some selected districts of Wolaita zone practiced the castration of sheep with the purpose of mainly fattening and this is in line with the result of present study. This implies the castration of sheep for fattening purpose is common in different areas of Ethiopia. As the respondents reported 41.7%, 35.8% & 18.3% of the respondents in the study area castrate their male sheep in summer, autumn, and summer and autumn, respectively.

Table 8. Reasons of castration, season of castration and castration method.

Variables	Pastoral	Agro-pastoral	Overall	X^2	<i>P</i> -value
Practice of castrating male sheep					
Yes	95	96.7	95.8	0.209	0.6
No	5	3.3	4.2		
Reasons of castration					
Breeding control	0.0	1.7	0.8	14.68	0.0001
Fattening	75	43.3	59.2		
Both	20	51.7	35.8		
Season of castration					
Autumn	35	36.7	35.8	9.65	0.001
Summer	51.7	31.7	41.7		
Autumn & summer	8.3	28.3	18.3		
Castration method					
Traditional	95	50	72.5	36.58	< 0.0001
Modern	0.0	46.7	23.3		
Age of castration (Mean \pm SE)	2.11 \pm 0.05 ^a	1.88 \pm 0.06 ^b	2 \pm 0.04		
Provision of supplementary feeding for castrated animal					
Yes	65	78.3	71.7	2.68	0.1
No	30	18.4	24.1		

X^2 = chi-square, SE = Standard Error.

The majority of respondents in the pastoral area practiced traditional castration; whereas in the agro-pastoral area 50% and 46.7% practiced the traditional and modern castration methods, respectively. The majority of the respondents in the study area were providing supplementary feed for the castrated sheep; these supplementary feeds included concentrates, enclosure pasture and drugs as well.

3.9. Fattening Practices of Sheep

The fattening practices of sheep in the study area are presented in **Table 9**. Most of the respondents in the study area practiced the fattening of sheep. Castrates were reported to be the first category of sheep used for fattening followed by castrates and older rams together and the respondents reported that few older rams were used for fattening. The findings of this study are in contrast with that of Wendimu [13] in Gode zone who reported the first category of sheep used for fattening was young male in Gode and Adadle districts of Gode zone in Somali

Table 9. Fattening practices of sheep in the study area.

Variables	Pastoral	Agro-pastoral	Overall	χ^2	<i>P</i> -value
Fattening of sheep					
Yes	95	100	97.5	3.07	0.07
No	5	0.0	2.5		
If yes, category of sheep					
Castrates	63.3	51.7	57.5	1.71	0.1
Older rams	1.7	1.7	1.7		
Castrate and older rams	30	46.7	38.3		

χ^2 = chi-square.

region. However, Mesfin *et al.* [17] reported that in Wolaita zone most of the farmers used the castrates for fattening purpose and this report is in line with the finding of the present study.

3.10. Reproductive Performance

The reproductive performance of Black-head Somali sheep in the stud area is summarized in **Table 10**. Age at puberty is a time when animals attain sexual maturity [18]. This is usually associated with proper feeding and health care management besides the selection of the animals themselves. According to the respondent's reports the age of sexual maturity was 7.64 months for male and 8.97 months for female sheep in pastoral area, while the age of sexual maturity for male and female in agro-pastoral of Awbarre district were 8.42 and 8.38 months, respectively. The result of sexual maturity in agro-pastoral area is in line with that of Wendimu [13] in Gode zone.

The reported average age at first lambing was 24.07 months in the study area and this finding is the same as with that of Ferew [14] in Shinile zone of Somali region but higher with that of Wendimu (2013) in Gode district of Somali region. On the other hand, the result indicated that there was a significant difference ($P < 0.05$) for age of first lambing between the production systems and this implies the age of first lambing in pastoral area is higher than that of agro-pastoral area.

The lambing interval of Black-head Somali sheep in pastoral & agro-pastoral area was 11.36 & 10.65 months with overall average of 11 months, which is higher than that of Wendimu [13] who reported average lambing interval of 9.62 months for Gode sheep and 9.68 months for Adadle sheep and this implies that the sheep of the present study area were regular breeders.

The average reproductive lifetime of ewes were 12.98 years in pastoral area and 13.23 in agro-pastoral area with overall average of 13.11 years. The result of the study also indicated that there was a significant ($P < 0.05$) difference for reproductive lifetime of ewes between the production systems. The reproductive lifetime of ewes in the present study was higher than Gode and Adadle districts

Table 10. Reproductive performance (mean \pm SE) of Black-head Somali sheep in the study area.

Parameters	Pastoral	Agro-pastoral	Overall
Age at sexual maturity for male (month)	7.64 \pm 0.18	8.42 \pm 1.16	8.03 \pm 0.58
Age at sexual maturity for female (month)	8.97 \pm 0.25 ^a	8.380 \pm 0.23 ^b	8.670 \pm 0.18
Age at first lambing (month)	24.54 \pm 0.40 ^a	23.60 \pm 0.29 ^b	24.07 \pm 0.24
Lambing interval (month)	11.36 \pm 0.14 ^a	10.65 \pm 0.15 ^b	11 \pm 0.11
Reproductive life time of ewes	12.98 \pm 0.25 ^b	13.23 \pm 0.20 ^a	13.11 \pm 0.16
Number of lambs ewe gives her life time	9.490 \pm 0.19	9.570 \pm 0.19	9.53 \pm 0.13

a, b; means within a row with different superscripts differ significantly ($P < 0.05$), SE = standard error.

which are 10 & 8.04 years, respectively as Wendimu [13] reported. The reproductive lifetime of Black-head Somali sheep in the study area was higher than the reproductive lifetime of indigenous sheep breeds in Woliata zone as indicated a study conducted by Mesfin *et al.* [17] in Woilata zone and the result of 7.97 and 7.45 years for Horro and Bongo sheep respectively [19].

On average, the ewe of Black-head Somali sheep in pastoral and agro-pastoral could produce 9.49 & 9.57 lambs respectively and there was no significant difference ($P > 0.05$) for number of lambs a ewe could produce in her life time between the production systems in the study area. The result of the present study was in contrast with the result of Wendimu [13] who reported on average one ewe could produce 7.43 in Gode and 7.74 lambs in Adadle in her lifetime for same breed and Ferew [14] also reported that the Black-head Somali sheep could produce 8.4 & 7.97 lambs in her lifetime. The difference might be the breeding control as indicated by respondents and the participants of the group discussion in the study areas. If the breeding is controlled the ewe could produce more lambs than if it is uncontrolled.

4. Conclusion and Recommendations

The study concluded that Black-head Somali sheep play multifarious roles viz. regular cash income, saving as an asset for future use, meat consumption, milk production and other social and cultural functions. Pastoralists and agro-pastoralist separate the male and female during herding and at night as well for the purpose of breeding control. The rams are kept for mating and fattening purposes and the sources of breeding ram from their own herd. The majority of the respondents practiced a controlled mating system of breeding which helps the pastoralist and agro-pastoralist to match the lambing season when there is plentiful availability of feeds and to unwanted ovoid breeding. The study also indicated that the pastoralist and agro-pastoralist practice the selection of breeding stocks (rams & ewes) using their own selection criteria, including appearance, growth, pedigree and color for rams while appearance, adaptability, and pedi-

gree, ability to walk a long distance, lamb growth and color are used for ewes. The castration of sheep was common in the study areas, fattening being the primary reason for castration, followed by breeding control by using both traditional and modern castration methods. In generally, the reproductive performance of Black-head Somali sheep in study areas was low as the age of the first lambing is around 24 months on average, even though the pastoralist and agro-pastoralists have a positive perception in this regard but scientifically, this is the indicator of low reproduction performance. The study also concluded that, on average, the ewe of Black-head Somali sheep in the study area could produce 9.5 lambs if the breeding was controlled as respondents and members of the group discussion indicated. Therefore, based on the result of the present study, the following points are recommended:

- As the pastoralists and agro-pastoralists indicated the source of the breeding ram was their own, so the exchange of the breeding ram is recommended to minimize the risk of inbreeding.
- Further studies of on-farm performance evaluation would be necessary to be carried out so as to understand the uniqueness of the breed better.

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Conflicts of Interest

The authors have not declared any conflict of interest.

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