

Study on Management Practices and Constraints of Black Head Somali Sheep Reared in Awbarre District of Fafen Zone, Somali Region, Ethiopia

Abdi Abdilahi¹ , Mohammed Beyan², Sandip Banerjee³, Kawnin Abdimahad¹ 

¹Department of Animal and Range Sciences, College of Dry Land Agriculture, Jigjiga University, Jigjiga, Ethiopia

²School of Animal and Range Sciences, College of Agriculture, Hawassa University, Hawassa, Ethiopia

³School of Smart Agriculture, Adamas University, Kolkata, India

Email: abdiabdilahi17@gmail.com

How to cite this paper: Abdilahi, A., Beyan, M., Banerjee, S. and Abdimahad, K. (2022) Study on Management Practices and Constraints of Black Head Somali Sheep Reared in Awbarre District of Fafen Zone, Somali Region, Ethiopia. *Open Journal of Animal Sciences*, 12, 493-505.

<https://doi.org/10.4236/ojas.2022.123037>

Received: July 1, 2022

Accepted: July 26, 2022

Published: July 29, 2022

Copyright © 2022 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

The study was conducted to assess management practices and constraints of Black head Somali sheep in Awbarre district of Fafen zone, Somali regional state, Ethiopia. A total of 120 households were purposively selected for this study using purposive sampling technique. The data were collected through the questionnaire, key informants interview, focus group discussions & field observations. The primary purpose of keeping sheep was for income generation followed by saving, meat production, milk, social and cultural functions. The main feeds for sheep during wet season were communal & private natural pastures. In dry season, communal natural pasture, crop residues & private natural pasture were used. The major source of water during wet season was dam/pond, whereas in the dry season spring & pipe water were used. The majority of the respondents (85.8%) used houses enclosed with thorn woody trees and houses enclosed with stone/brick fence were also reported. Majority of the respondents used controlled mating system and sheep are bred to lamb when forage is plentiful because they are less drought tolerant than goats and to avoid unwanted lambing in dry season. Majority (90%) of respondents own their breeding ram and those who have no breeding males used their neighbors' rams and borrow from others. The breeding rams were born in the flock implying that animals within the flock are very closely related which leads to inbreeding. The most important health problems affecting sheep were circling disease, sheep pox, tick lameness (tick paralysis), Peste des Petits Ruminants (PPR), bloating, and Foot & mouth disease (FMD). The major constraints hindering sheep production in the study area were shortage of

veterinary service, feed shortage, scarcity of water, predators, diseases, and marketing. Therefore, to improve and increase the productivity of sheep production in the study area, better management practices and establishing of veterinary service centers are necessary.

Keywords

Black Head Somali Sheep, Management Practice, Constraints, Pastoral & Agro-Pastoral

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 for animal genetic diversity [1] [2]. According to CSA [3], the country is home to about 70 million cattle, 42.9 million sheep, 52.5 million goats, and 8.1 million camels.

Contribution of livestock 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 contributing to the asset, social, cultural and environmental values and sustain livelihoods of the people and also sources of foreign currency [4] [5]. 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 [6].

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 Fafen zone.

The Blackhead Somali sheep is a widely distributed sheep breed raised throughout the arid and semiarid areas in the south eastern 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 Blackhead sheep [7]. 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 heart shape in Appearance [7].

Improvement of sheep productivity is still marginal in Ethiopia and it's more so in the Somali region [8]. The corner stone of the development of ovine husbandry begins with the identification of the production constraints, and then in-

roduction of new technologies or refining of existing husbandry practices [8].

Detailed and up-to-date information on production system, indigenous knowledge of management practices of black head Somali sheep, identification of important constraints are prerequisites to set up improvement programs at the smallholder and pastoral levels [9] [10]. Information on management practices, production system and major production constraints are lacking for black head Somali sheep breed, in spite of its contribution and role in improving food security as a sole dominant sheep breed in the study area. This research study was designed to provide information on sheep management practice and production constraints.

2. Materials and Methods

2.1. Description of the Study Area

This study was carried out in Awbarre district of Fafen zone, Somali Region, Ethiopia. The district lies in 9°18'N and 10°12'N Latitude and 42°37'E and 43°26'E Longitude. It is bordered on the southwest by Jigjiga, on the west by the Sitti 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. 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 multistage sampling technique was employed in this study. At 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, while Cagarwayne and Shed Dher represented agro-pastoral production system. At the second stage, thirty sheep rearing households were selected randomly from each *kebele* bringing the total number of sample households to 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. The data were analyzed using SPSS (version 20.0). Chi-square test was employed to examine the differences among categorical variables and the differences were considered to be significant at the level $P < 0.05$. The traits pertaining to constraints of sheep production, purpose of keeping sheep and health problems/diseases of sheep were evaluated using 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 Respondents

Sex, Age, education level and family size of the respondents are summarized in **Table 1**. Majority of the respondents in pastoral and agro-pastoral production systems were male headed households. The average age of the respondents was 44.78 ± 0.95 . This finding is line with the report of Fikru and Omer [11] who found that majority of respondents in Awbarre district were between 40 - 50 years of age. The majority of respondent (72.5%) were illiterate followed by those who read and write (24.17%) (**Table 1**). Higher proportion of illiterate was also reported by Hassen *et al.* [12] and Ma'alin *et al.* [13] for Dehabur and Gode districts of Somali Region, respectively. The role of education is obvious in affecting household income, technology adoption, demography, health and the whole socio-economic status of the family as well [14]. Thus, households need to get basic education and understanding on livestock production and management measures.

The average family size in the study area was 8.86 (**Table 1**). This finding is higher than the report of Hassen *et al.* [12] who reported an average family size of 6.89 in Degahbur district, Ethiopia, which implies that the population density of the study area is higher than Degahbur district. The result also showed a significance difference ($P < 0.05$) in family size between the production systems whereby the higher family size (9.23) was reported from agro-pastoral, while the lower (8.48) was reported from pastoral system. This might be due to the higher population density of the agro-pastoral system.

Table 1. Sex, age, educational background and family size of the respondents.

Variable	Pastoral	Agro-pastoral	Overall	χ^2	P-value
Sex					
Male	61.67	50	55.83	1.66	0.19
Female	38.33	50	44.17		
Educational level					
Illiterate	76.67	68.3	72.5	4.58	0.03
Read & write	21.67	26.7	24.17		
Primary school	0	5	2.5		
Secondary school	1.7	0.0	0.83		
Age (years)	44.68 ± 9	44.87 ± 0.19	44.78 ± 0.95		
Family size	$8.48 \pm .37^b$	$9.23 \pm .31^a$	8.86 ± 0.24		

*Means with different subscripts differ across rows significantly at $P < 0.05$, χ^2 = chi-square.

3.2. Purpose of Sheep Production

The primary reason of keeping sheep in pastoral and agro pastoral in the study area was income generation with index of 0.27 and 0.24, respectively and the second reason being as saving with index of 0.26 and 0.21, respectively (**Table 2**). The third reason of keeping sheep in 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 of keeping of sheep in the agro pastoral area was for milk with an index value of 0.20, while meat and social and cultural functions ranked as fourth and fifth with index values of 0.19 & 0.14, respectively. Similarly, Fikru and Omer [11] reported that the main purpose of sheep and goat production in Awbare district is for subsistence and quick income cash from local and export markets. In addition, Hailemariam *et al.* [15] also reported that the primary reason for keeping sheep in Gamogofa zone in southern Ethiopia was for income generation.

3.3. Management Practices of Sheep

3.3.1. Feed Resources and Feeding of Sheep

The main feed resource of sheep during wet season in the study areas were communal natural pasture (65.8%) followed by privately owned natural pasture (37.8%) (**Table 3**). There was a significant difference ($P < 0.05$) in the availability of feed resources during wet season between the two production systems in the study area; this indicated that the higher proportion of communal natural pasture was found in pastoral area, whereas higher proportion of privately owned natural pasture and crop residues were found in agro-pastoral area and this implies that in agro pastoral area, the land was mainly privately owned and crop cultivation was practiced. Hailemariam *et al.* [15] in Gamogofa zone southern Ethiopia and Fikru and Omer [11] reported similar information.

As the respondents of the study area reported, the main feed resources during dry season were communal natural pasture (50%) and natural pasture with crop residues (37.5%) followed by crop residues (9.2%) and privately owned natural pasture, which accounts 3.3%. The result of this study indicated that the availability

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

Purpose (s)	Pastoral					Agro-pastoral				
	1 st	2 nd	3 rd	4 th	Index	1 st	2 nd	3 rd	4 th	Index
Income	47	13	0	0	0.27	40	12	3	3	0.24
Meat	1	19	24	4	0.22	7	18	17	5	0.19
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 and 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.

of feed resources during the dry season were significantly different ($P < 0.05$) among the production systems except the private natural pasture.

3.3.2. Water Sources and Watering Management

Sources of water and distance of watering points during wet and dry seasons are presented in **Table 4**. The availability of water sources during the dry season in pastoral and agro pastoral of the study area were significantly ($P < 0.05$) different between the production systems in the study area, this implies the major source

Table 3. Major available feed resources of sheep in the study area.

Feed resources	Pastoral	Agro-pastoral	Overall	χ^2	<i>P-value</i>
Wet season					
Communal natural pasture	86.7 ^a	45 ^b	65.8	23.83	<0.0001
Private natural pasture	13.3 ^b	48.3 ^a	37.8		
Crop residues	0.0 ^b	6.7 ^a	3.3		
Dry season					
Communal natural pasture	98.3 ^a	1.7 ^b	50	113.06	<0.0001
Private natural pasture	1.7 ^b	5 ^a	3.3		
Crop residues	0.0 ^b	18.3 ^a	9.2		
Natural pasture with crop residue	0.0 ^b	75 ^a	37.5		

*Values with different subscripts across rows differ significantly at $P < 0.05$, χ^2 = chi-square.

Table 4. Major water sources and distance to the watering points.

Variable	Pastoral	Agro-pastoral	Overall	χ^2	<i>P-value</i>
Water source (wet season)					
Well water	1.67	0.0	0.83	1.008	0.3
Dam/pond water	98.33	100	99.17		
Water source (dry season)					
Dam/pond water	3.33	1.67	2.5		
Spring water	70 ^a	48.33 ^b	59.17		
Pipe water	26.67	50	38.33		
Distance to watering point (wet season)					
<1 km	100 ^a	91.67 ^b	95.83	5.217	0.02
1 - 5 km	8.33 ^a	4.17			
Distance to watering point (dry season)					
<1 km	0	3.3	1.7	3.395	0.06
1 - 5 km	55	63.3	59.2		
>5 km	45	33.33	39.2		

*Means with different subscripts differ across rows significantly at $P < 0.05$, χ^2 = chi-square.

of water during dry season in pastoral and agro pastoral of the study area were spring and pipe water, respectively. The finding of this result is in contrast with the report of Demissu and Gobena [16] who indicated the major source of water for Horro sheep in Horro Guduru and East Wollega Zones, West Ethiopia was river this is due to the availability river in that area.

The majority (99.17%) of respondents in the study area reported that the major source of water during wet season was dam/pond; the other reported water source during wet season was well water (0.83%). On the other hand, the major (59.17%) water source of sheep during dry season was spring water followed by pipe water (38.3%) and 2.5% of respondents in the study area reported dam/pond water as least source.

The distance to the watering point in the study areas of sheep vary during the wet and dry season. The majority of respondents (95.8%) in the study area travel < 1 km to search water for their sheep during wet season, whereas 4.2% travel a distance of 1 - 5 km for searching water to their sheep during wet season. There was also significant ($P < 0.05$) difference between production systems in the study area. On the other hand, the majority of the respondents (59.2%) in the study area travel 1 - 5 km to the water point and 39.2% of the respondents also indicated to travel a distance of >5 km to the water point. The result of this study during wet season is in contrast with that of Ferew [17] who reported in Shinile zone of Somali region, the majority of pastoralist and agro pastoralist travel their sheep to search a water for 5km which higher is higher than the present study this may due to the availability of water point during the wet season in the study area better than that of Shinile zone of Somali region; however the distance of traveling to water point during dry season is consistent on the report of Ferew [17].

3.3.3. Housing System and Management

Housing provides opportunities to protect animals from predators and theft and sheep housing may vary based on the production system. Good housing can determine productivity by reducing stress, disease hazards and making management easier. The majority of the respondents (85.8%) in the study area reported that they use houses enclosed with thorn woody fence were the most important house, while 14.2% of the respondents reported houses enclosed with stone/brick fence (Table 5). There was a significant difference ($P < 0.05$) in the type of adult sheep between the production systems. All of the respondents in pastoral area used the houses enclosed with thorn wood fence for adult sheep, while 71.7% of agro pastoralist uses the same house. However, 28.3% of the respondents in agro-pastoral area reported that they use houses enclosed with stone/brick fences.

However, the limitation of housing system in the area is that animals are exposed to the rainfall and extreme weather conditions, especially during the severe cold winter-nights and high daily temperatures during the spring and autumn seasons. Thus, the housing system for sheep should be improved in order

to maintain the animals healthy and productive.

The result of this study indicated that the majority of the respondents (98.3%) did not house the lambs with adult sheep (Table 5). This implies that as the respondents and the participants of group discussion indicated the lambs are separately housed and this result is in contrast with that of Wendimu [18] in Gode zone who reported that the lambs are mostly housed with adult sheep.

3.3.4. Breeding Practices and Management

Type of mating and source of breeding rams of black head Somali sheep in the study area are presented in Table 6. Majority of the sample households used controlled mating system for sheep. The reasons for controlled mating in sheep was due to that sheep are breed to lamb in wet season (when forage is plentiful) because are less drought tolerant than goats and to avoid unwanted breeding during dry season. Focus group discussion and key informants interviewed added that sheep are susceptible to drought and a great traditional management practice is applied in that area. 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 cares have been given throughout wet season. At this time, if rums escape to the female and breed, it is a grave and disaster to the animal owner, because sheep bred during

Table 5. Housing of sheep in the study area.

Variable	Pastoral	Agro-pastoral	Overall	χ^2	<i>P</i> -value
Housing type					
Enclosed house with thorn woody	100 ^a	71.7 ^b	85.8	19.806	<0.0001
Enclosed house with stone/brick	-	28.3	14.2		
Housing lambs with adult sheep					
Yes	-	3.3	1.7	2.034	0.15
No	100	96.7	98.3		

*Means with different subscripts differ across rows significantly at $P < 0.05$, χ^2 = chi-square, SE=standard error.

Table 6. Type of mating and source of breeding rams in the study area

Variable	Pastoral	Agro-pastoral	Overall	χ^2	<i>P</i> -value
Type of mating					
Controlled natural mating	93.3	91.7	92.5	-	-
Uncontrolled natural mating	6.7	8.3	7.5		
Source of ram					
Born in the flock	88.3	91.7	90	2.034	0.15
Neighbor	11.7	8.3	10		

χ^2 = chi-square.

wet season will give birth during dry season which can cost their lives. In dry season, no sheep were allowed to lactate and sheep lactate at this time death of both sire and lamp is common. This current finding is in contrast with the report of Feyissa *et al.* [19] 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.

Majority of the respondents own their breeding ram (90%). Those who have no breeding males mated their female animal by using neighbor male and borrow males from others. The study showed that the breeding rams were born in the flock. This implies that the animals within the flock are very closely related and have narrow relationship which leads to inbreeding [19] [20].

3.3.5. Disease and Health Management

Table 7 shows the most common health problems of sheep ranked in order of prevalence. As the respondents in pastoral area ranked, the four most important diseases affecting the production of black head were circling disease, sheep pox, tick lameness and thick borne disease (tick paralysis) and PPR with index values of 0.26, 0.21, 0.19 and 0.13, respectively. The other reported diseases in pastoral area were bloating, FMD and throat swelling with index values of 0.09, 0.08 and 0.02 respectively. On the other hand, the three most important diseases affecting the production of black head Somali sheep in agro-pastoral area were circling disease, tick lameness and FMD with index values of 0.24, 0.21 and 0.16, respectively. The other reported diseases in agro pastoral area include bloating, PPR,

Table 7. Most common health problems of sheep in the study area.

Health problem/disease	Pastoral					Agro-pastoral				
	1 st	2 nd	3 rd	4 th	Index	1 st	2 nd	3 rd	4 th	Index
Tick lameness	10	9	22	3	0.19	22	15	9	4	0.21
Circling disease	31	19	8	0	0.26	25	20	11	1	0.24
Sheep pox	15	17	9	5	0.21	4	6	8	2	0.08
PPR	3	13	7	6	0.13	3	7	6	7	0.09
Bloating	0	0	6	15	0.09	0	1	9	16	0.11
FMD	0	1	8	9	0.08	4	10	14	12	0.16
Throat swelling	1	1	0	3	0.02	2	1	0	4	0.03
Abortion	-	-	-	-	-	0	0	1	8	0.04
Foot root	-	-	-	-	-	0	0	2	6	0.03

*Index = ((4 for rank 1) + (3 for rank 2) + (2 for rank 3) + (1 for rank 4)) divided by the sum of all weighted health problems mentioned by respondents, PPR = peste des petitis ruminants, FMD = foot and mouth disease.

abortion, throat swelling and foot and root with index values of 0.11, 0.09, 0.08, 0.04, 0.03, and 0.03, respectively. The result of this study indicated that the circling disease was the most important disease challenging the production of black head Somali sheep of the study area. The report of Wendimu [18] for the same of breed in Gode district indicated that the most prevalent disease of sheep were sheep pox, foot root, foot and mouth disease and tick lameness and tick borne disease. However, the report of Wendimu [18] did not indicate the circling disease and PPR as the most common disease affecting black head Somali sheep in Gode zone as the present study indicated.

The information generated through the focus group discussion and key informants revealed that pastoralists/agro-pastoralists used traditional (ethno-veterinary) practices using herbs and non-herbal methods and use of modern veterinary was limited. According to respondents, focus group discussion, and key informants report, *Urowawayn* (coriander) and *xanshar* (by product of coffee) were the herbs used to treat tick disease by means of smoking and dirking, respectively. The sheep pox diseases, the reciting of holy Qur'an was the only means of traditional medicine and in case of bloating sheep were only supplemented with minerals mainly soil containing mineral (*caro*). Burning was also common in the study area to treat sick animals. The diseases treated with burning were circling disease, throat swelling etc. Burning of the parts of body of sheep may result in some defects on skin and it indicates low awareness and understanding of the pastoralists/agro-pastoralists in the study area.

3.4. Constraints of Sheep Production

The major constraints of Black head Somali sheep in the study area are presented in **Table 8**. As the respondents of the study area are indicated the major constraints challenging the production of Black head Somali sheep in the pastoral area were shortage of veterinary service, feed shortage, scarcity of water, predators

Table 8. Major constraints of sheep production in the study area.

Constraint(s)	Pastoral					Agro-pastoral				
	1 st	2 nd	3 rd	4 th	Index	1 st	2 nd	3 rd	4 th	Index
Feed shortage	4	8	19	17	0.20	21	17	6	2	0.19
Shortage of veterinary service	23	16	13	2	0.23	18	4	2	8	0.14
Drought	1	3	5	7	0.07	5	7	3	6	0.08
Water shortage	17	8	9	11	0.18	1	22	17	4	0.18
Predator	3	20	8	8	0.16	11	6	22	14	0.22
Market problem	0	1	3	5	0.04	0	3	4	10	0.07
Disease	12	4	3	8	0.11	4	1	6	16	0.11

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

and prevalence of disease with index values of 0.23, 0.20, 0.18, 0.16 and 0.11, respectively. On the other hand, the major constraints of sheep in the agro pastoral area are predators, shortage of feed, scarcity of water, shortage of veterinary service, and prevalence of disease with index of 0.22, 0.19, 0.18, 0.14 and 0.11, respectively. The result of this finding is consistence with the report of Wendimu [18] in Gode zone of Somali region who reported shortage of veterinary service and predator as major constrains of sheep production. Feyissa *et al.* [19] also reported that the major constraints of sheep production in Borana lowland of Oromia region were disease, feed shortage and drought. The information generated through the focus group discussion and key informants revealed that feed shortage, poor veterinary service and predators. The poor veterinary service was caused by inaccessibility and high cost.

4. Conclusion and Recommendations

The study concluded that sheep had a multifunction such as regular cash income, saving as an asset for future use, meat consumption, milk production and other social and cultural functions. The main feed resources in pastoral and agro pastoral were communal natural pasture, private natural pasture and crop residues. The major sources of water were dumb/pond, spring and pipe water and the distance to the watering points may extend from 1 km to more than 5 km with respect to the season and the frequency of watering vary depending on the season and the distance to the watering point. The study indicated that the common house of sheep in the study area was enclosed houses with thorn woody fence. The source of breeding rams was from flock of household and controlled breeding practices were common in the study area. Important diseases which affected the production of sheep in the study area were circling disease, sheep pox, tick lameness and thick borne disease (tick paralysis), PPR and FMD. The study concluded the major constraints challenging the productivity of sheep in the study area were shortage of veterinary service, feed shortage, scarcity of water and prevalence of disease. Therefore, better management, establishing veterinary service centers and strengthening community based animal health worker to overcome health problems are necessary.

Acknowledgements

The authors would like to sincerely thank Jigjiga University and Hawassa University.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Tilahun, S., Vijchulata, P., Chairatanayuth, P. and Swasdiphanich, S. (2006) As-

- assessment of Small Ruminant Management Practices in Jijiga and Shinile Zones of Somali Regional State, Ethiopia. *Agriculture and Natural Resources*, **40**, 987-999.
- [2] Hussen M., Kechero Y. and Molla M. (2015) Productive and Reproductive Performances of Ruminant Livestock in Jimma Zone, Southwest Ethiopia. *Journal of Reproduction and Infertility*, **6**, 27-34.
- [3] CSA (Central Statistical Agency) (2021) Agricultural Sample Survey 2013 E.C. Volume II, Report on Livestock and Livestock Characteristics (Private Peasant Holdings). 39-40.
https://www.statsethiopia.gov.et/wp-content/uploads/2021/05/REVISED_2013.LIVESTOCK-REPORT.FINAL-1.pdf
- [4] Tadesse, E., Negesse, T. and Abebe, G. (2014) Supplemental Feeding Options for Fattening Sheep On-Farm in Southern Ethiopia. *Agricultural Science Research Journal*, **4**, 193-200. <http://www.resjournals.com/ARJ>
- [5] Endalew, B. and Ayalew, Z. (2016) Assessment of the Role of Livestock in Ethiopia: A Review. *American-Eurasian Journal of Scientific Research*, **11**, 405-410.
- [6] Duressa, D., Kenea, D., Keba, W., Desta, Z., Berki, G., Leta, G. and Tolera, A. (2014) Assessment of Livestock Production System and Feed Resources Availability in Three Villages of Diga District Ethiopia. International Livestock Research Institute (ILRI), Addis Ababa.
- [7] ESGPIP (2009) Ethiopia Sheep and Goat Productivity Improvement Program. Sheep Breeds of Ethiopia: A Guide for Identification and Utilization. Technical Bulletin No. 28. https://issuu.com/esgpip/docs/technical_bulletin_no.28
- [8] EARO (Ethiopian Agricultural Research Organization) (2001) Small Ruminant Research Strategy. EARO (Ethiopian Agricultural Research Organization), Addis Ababa, 59 p.
- [9] Kosgey, I.S., Rowlands, G.J., van Arendonk, J.A.M. and Baker, R.L. (2006) Small Ruminant Production in Smallholder and Pastoral/Extensive Farming Systems in Kenya. *Small Ruminant Research*, **77**, 11-24.
<https://www.sciencedirect.com/science/article/pii/S0921448808000345>
- [10] Sölkner, J., Nakimbigwe, H. and Valle-Zarate, A. (1998) Analysis of Determinants for Success and Failure of Village Breeding Programs. *Proceedings of the 6th World Congress on Genetics Applied Livestock Production*, **25**, 273-280.
- [11] Fikru, S. and Omer A.A. (2015) Traditional Small Ruminant Production and Management Practices in Awbare District of Ethiopian Somali Regional State. *Journal of Animal Production Advances*, **5**, 697-704.
<https://doi.org/10.5455/japa.20150626043822>
- [12] Hassen, M., Amentie, T., Abdimahad, K., Ma'alın, A. and Mahamed, A. (2022) Hygienic Production and Post-Harvest Handling Practices of Raw Camel Milk in Degahbour District of Jarar Zone, Somali Regional State, Ethiopia. *Open Journal of Animal Sciences*, **12**, 303-316. <https://doi.org/10.4236/ojas.2022.122023>
- [13] Ma'alın, A., Abdimahad, K., Hassen, G., Mahamed, A. and Hassen, M. (2022) Management Practices and Production Constraints of Indigenous Somali Cattle Breed in Shabelle Zone, Somali Regional State, Ethiopia. *Open Journal of Animal Sciences*, **12**, 103-117. <https://doi.org/10.4236/ojas.2022.121008>
- [14] Kerealem, E. (2005) Honeybee Production System, Opportunities and Challenges in Enebe Sar Midir Woreda (Amhara Region) and Amaro Special Wereda (Southern Nations, Nationalities and Peoples Regional State), Ethiopia. M.Sc. Thesis, Alemaya University, Alemaya, 133 p.

-
- [15] Hailemariam, F., Melesse, A. and Banerjee, S. (2013) Traditional Sheep Production and Breeding Practice in Gamogofa Zone, Southern Ethiopia. *International Journal of Livestock Production Research*, **1**, 26-43.
- [16] Demissu, H. and Gobena, 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**, 146-152.
- [17] Ferew, F. (2008) On-Farm Characterization of Blackhead Somali Sheep Breed and Its Production System in Shinile and Erer Districts of Shinile Zone. M.Sc. Thesis, Haramaya University of Agriculture, Dire Dawa.
- [18] Wendimu, B. (2013) On-Farm Phenotypic Characterization of Black Head Somali Sheep and Their Role for Pastoral and Agro Pastoral Community in Gode Zone, Somali Region. M.Sc. Thesis, Haramaya University, Dire Dawa.
- [19] Feyissa, A., Kefeni, K. and Amaha, N. (2018) Characterization of Sheep Management and Breeding Practice under Resource Poor Extensive Production System in Borana Low-Land, Southern Ethiopia. *Journal of Fishery and Livestock Production*, **6**, 1-5.
- [20] Getachew, T., Haile, A., Tibbo, M., Sharma, A.K., Sölkner, J. and Wurzinger, M. (2010) Herd Management and Breeding Practices of Sheep Owners in a Mixed Crop-Livestock and a Pastoral System of Ethiopia. *African Journal of Agricultural Research*, **5**, 685-691.