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Characterization of Sheep Management and Breeding Practice under Resource Poor Extensive Production System in Borana low-land, Southern Ethiopia

Feyissa AA*, Kefeni KK and Amaha N
Addis Ababa University, Addis Ababa, Ethiopia

Abstract

The study was conducted in Yabello and Dirre districts of Borana low-land southern Ethiopia. The objective of the study was to characterize and describe sheep management, breeding practices and major constraints to promote sheep productivity in the study area. A total of 148 households from four peasant association were selected purposively. Data were collected through semi-structured questionnaire, focus group discussions, and field observations. Major farming activities in the study district were livestock rearing followed by crop livestock production. Livestock and livestock products are major sources of income and home consumption in the pastoral area; whereas, crop farming was the leading in agro-pastoral communities. It pointed out that, both female and male sheep are maintained mainly for breeding followed by source of income. Body size has given high priority in selecting breeding males and female. Disease, feed shortage, drought and water shortages are the major constraints of sheep production mentioned in the study area. It was concluded that genetic improvement programs targeting smallholder pastoralists in agro pastoral and in the pastoral production system need to incorporate trait preference of pastoralist, multipurpose role of sheep and the existing traditional herding and breeding practices.

Keywords: Black head Somali sheep; Characterization; Production constraints; Production system

Introduction

Ethiopia is believed to have the largest livestock population in Africa. The livestock sector has been contributing considerable portion to the economy of the country, and still promising to rally round the economic development of the country [1]. Sheep and goat have a great role in the livelihoods of the subsistence farming and pastoral communities inhabiting diverse production systems. According to Tibbo [2], the productivity of indigenous sheep breeds is low due to several technical (genotype, feeding and animal health), institutional, environmental and infrastructural constraints. However, indigenous sheep breeds have great potential to contribute more to the livelihood of people in low-input, smallholder crop-livestock and pastoral production systems [3].

The sheep populations are found widely distributed across the diverse agro-ecological zones of Ethiopia. Ethiopia has diverse indigenous sheep breeds, at least 9 breeds and 14 traditional sheep populations, distributed across diverse ecology, production systems and communities or ethnic groups [4]. Among indigenous sheep breeds, Black Head Somali sheep breed are the most promising for their better adaptability under low input extensive production systems in their production environment, where scarcity of feed and water are the two major constraints [5,6].

Conservation and sustainable utilization of biological diversity makes a key contribution to food security and poverty alleviation, through its application to improve agricultural productivity. Breed identification, estimation of their population size, documentation of their common uses and description of the management systems in which they are maintained are the first information to be assessed before improvement and conservation of animal genetic resources [7,8]. Detailed and up-to-date information on production system, indigenous knowledge of managing the breed, identification of important traits for selection with full participation of pastoralists are prerequisites [3,9]. 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 work was designed to provides information on sheep breeding practice, traits preference and selection criteria and production constraints.

Materials and Methods

Study area

The study was conducted in Yabelo and Dirre districts of Borana lowland, southern Ethiopia, which is mainly inhabited by the Borana Oromo. The area has an elevation range of between 1,000 and 1,500 m above sea level. The climate is arid and semi-arid with an annual average rainfall and temperature ranging from 300 mm to 600 mm and 19°C to 26°C, respectively [10,11]. Rainfall distribution is bimodal, the long rainy season ("Ganna") extending from March to May and the short rainy season ("Hagaya") from September to November. A cool dry period ("Adoolessa") occurs from June to August, while a warm dry season ("Bona Hagaya") runs from December to February [10,12,13]. The Borana production system is a pastoral/agro-pastoral system which has adapted to the variation of climate variability and spatiotemporal heterogeneity of forage production [10,12,14,15]. Livestock production is the main livelihood of the people, with increasing engagement in crop production and other livelihood strategies although, they rarely harvest due climate variability.

***Corresponding author:** Feyissa AA, Addis Ababa University, Addis Ababa, Ethiopia, Tel: +251 11 123 2435; E-mail: abraham.abera@aau.edu.et

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Sampling method and data collection

The study followed a multi-stage sampling techniques where a combination of purposive and random sampling procedures was used to select sample District, kebeles and households, respectively. Yabello and Dirre district were purposively selected to represent different source of water for livestock during long dry season where, Dire represent a tula-well (Permanent) ecosystem and Yabelo a non-tula well (Temporal) ecosystem. In the second stage, from each district two Pastoral Association (PAs) pastoral and agro-pastoral were selected by considering production system practiced, seasonal livestock movement pattern and concentration of sheep population. In the third stage 37 households (Sheep owner) were selected by systemic random sampling from each of the selected PAs and a total of 168 respondents from the four PAs were selected.

Semi-structured questionnaires, formal interviews and focus group discussions were used to gather information from the selected households. Data on household's demographic and socio-economic characteristics, purpose of keeping sheep, breeding management and selection criteria, ways of acquisition and disposal of sheep from farm and major production constraints were collected by trained enumerators. The questionnaire was pre-tested before commencements of the actual survey to ensure that all questions were clear brief for the respondents. Focused group discussions were held with elder pastoralist, village leaders, and development agents who are known to have better knowledge on sheep production system, production constraints to substantiate the information collected through individual pastoralists' interview.

Data analysis

Data collected through questionnaire was analyzed following the frequency procedures of statistical analysis system (SAS version 9.1, 2008). Microsoft Excel 2007 was used for ranking of data on reasons of keeping sheep, selection criteria for breeding females and males and constraints for sheep production. An index was calculated to provide overall ranking according to the formula: Index=Σ of [3 for rank 1+2 for rank 2+1 for rank 3] given for particular reason divided by Σ of [3 for rank 1+2 for rank 2+1 for rank 3] for all reasons. Survey data collected from pastoral and agro pastoral production systems of both districts were analysed together, by considering that the tow districts are similar in agro ecology and production system.

Result and Discussion

Household characteristics

Major farming activities in the study area were livestock production (48.6%) followed by mixed livestock and crop production (43.9%). Crop production was entirely practiced in agro-pastoral area. All of the respondents in pastoral area (N=76) purely depend on livestock production for their livelihood and all of the respondents in agro-pastoral area (N=72) were engaged both in livestock production and crop farming. The mean reported cultivated land holding was 1.75 ha for agro-pastoral households. Livestock composition that is most often possessed by pastoral and agro pastoral communities in the study areas was cattle, sheep, goats and camels. Total livestock holding per household in the pastoral system was higher (70.3%) than smallholder in agro pastoral area (27.7%). Whereas sheep flock size was 30.2 (range of 5 to 65) in Pastoral and 25.4 (range of 2 to 21) in Agro pastoral areas. The total number of animals kept per household was higher for goats than for sheep and cattle. Similar result was reported among Afar pastoral communities [6,16]. The higher holding of sheep and goats as compared to large stock in the study area shows the importance of small ruminant in the livelihood of the pastoral community. Moreover, resource poor pastoralists might also prefer goats and sheep to cattle due to the better adaptation to the changing climatic situation and in the ecology. Further, the better adaption of small ruminants to the changing ecology, climate, high prolificacy and short generation interval might prompt pastoralists to keep more number of sheep and goats.

Purpose of keeping sheep

Knowledge of reasons for keeping animals is a prerequisite for deriving operational breeding goals [17]. Small ruminants are kept to meet both tangible and non-tangible benefits. Tables 1 and 2 present purpose of keeping sheep. Sheep are highly valued animals by the Borana people next to cattle and reared to fulfill diverse socio-cultural needs. Sheep is slaughtered at wedding ceremonies, at *Gadamoji* (Cultural festival) and slaughtered in honors of special guests and as dowry. Both female and male sheep are maintained mainly for breeding followed by source of income. This builds financial capital and allows the sale of animals for cash that can be used for other agricultural enterprises, school fees and medical bills, etc. Functions like manure and skin received a lower ranking among sheep breeders. In contrast to these findings, Kosgey et al. [18] reported low ranking of small ruminants for breeding purpose among the smallholders and pastoralists in Kenya. Unlike that of cattle and camels, goats and sheep milk is not supplied to market rather it is used for household consumption either as a form of complementary product for making tea and as fresh milk for children consumption. Diverse functions are particularly important under subsistence production system. The importance of diverse values of indigenous livestock breeds under low input system were well documented [19,20].

Acquisition and disposal

Major modes of flock entry and exit are summarized in Tables 3 and 4, respectively. On-farm birth was account for about 72.17% total number of animal entered into the flock during the last one year for

Purpose	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Index
Breeding	56.08	10.81	20.95	6.46	0	0.27
Income	20.27	27.7	7.43	23.44	6.77	0.17
Meat	0	17.57	58.78	6.56	4.73	0.18
Milk	6.76	31.08	0	17.57	10.13	0.14
Ceremony	0	0	9.46	19.5	22.97	0.06
Wealth	12.16	12.84	3.38	0	21.62	0.1
Blood	4.73	0	0	26.47	33.78	0.07

Index=the sum of [5 for Rank 1+4 for Rank 2+3 for Rank 3+2 for Rank 2+1 for Rank] for particular purpose of keeping sheep divided by the sum of [5 for Rank 1+4 for Rank 2+3 for Rank 3+2 for Rank 2+1 for Rank 1] for all purpose of keeping sheep in a production system.

Table 1: Ranking of purpose of keeping female sheep.

Purpose	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Index
Income	52.02	38.2	0	0	20.96	0.29
Breeding	41.22	29.7	22.97	8.11	0	0.27
Meat	4.73	18.92	64.86	4.73	0	0.2
Ceremony	0	12.74	12.17	32.43	33.78	0.12
Wealth	0	0	0	4.73	15.54	0.02
Blood	2.03	0	0	44.59	28.37	0.09
Manure	0	0.44	0	5.41	1.35	0.01

Index=sum of [5 for Rank 1+4 for Rank 2+3 for Rank 3+2 for Rank 2+1 for Rank] for particular purpose of keeping sheep divided by sum of [5 for Rank 1+4 for Rank 2+3 for Rank 3+2 for Rank 2+1 for Rank 1] for all purpose of keeping sheep in a production system.

Table 2: Ranking of purpose of keeping male sheep.

Mode of entry	Pastoral	Agro pastoral	Overall	% of total entry
Born	9.50 ± 0.91	10.40 ± 1.081	9.97 ± 0.682	72.17
Purchased	1.62 ± .167	1.46 ± 0.184	1.54 ± 0.124	11.31
Gift	1.64 ± .117	1.63 ± 0.135	1.64 ± 0.089	12.15
Exchange	.54 ± .129	0.54 ± o.150	0.54 ± 0.099	4.36

Table 3: Mode of entry for sheep flocks.

Mode of exit	Pastoral	Agro pastoral	Overall	% of total exit
Lost	1.45 ± 0.228	1.54 ± 0.252	1.50 ± . 170	6.12
sold	4.90 ± 0.490	5.11 ± 0.541	5.01 ± .365	20.29
Slaughtered	2.69 ± 0.352	2.87 ± 0.391	2.78 ± .263	11.06
Exchange	0.97 ± 0.129	0.96 ± 0.142	0.97 ± .096	3.89
Died	9.82 ± 1.041	10.69 ± 1.194	10.26 ± .790	42.04
Predators	2.74 ± 0.178	2.99 ± 0.203	2.85 ± 0.14	11.86
Gift	1.10 ± 0.177	1.27 ± 0.199	1.18 ± 133	4.72

Table 4: Mode of exit for sheep flocks.

sheep, followed by gift and purchase. Exchange as source of animals was very minimal. Tsedeke [21] reported that birth at home constitutes about 54.9% and purchase constitutes 18.5% in Southern Ethiopia. In support to this finding, Kosgey et al. [18] reported inheritance as the main source for indigenous sheep and goat breeds for smallholders and pastoral communities in Kenya. In the study area the number of animals obtained through gift was higher for sheep than for goats. This is due to the fact that sheep have more socio-cultural values as compared to goats. It was indicated that for the Borana community, sheep fulfill diverse socio-cultural values (as dowry, slaughtered during traditional ceremonies of *Gadamoji*, *Gubisa, Godiya, Kara mara* and marriage). Sheep was often ranked next to cattle in terms of its traditional values.

Based up on the respondents information, majority of the animals left the flocks through death (42.04%) followed by commercial destocking. Males were the first to dispose to fulfill households' immediate cash need and females are maintained for breeding purpose. An exit of higher value through death (47.5%) was reported by Edea [19] and Tsedeke [21]. Slaughter for own home consumption and for traditional ceremonies account for about 11.06% of the total exit.

Culling strategies

Breeding males were principally culled for health problem, old age and size with index value shown in Table 5. This implies that males were kept for long year in the flock which potentially increases the level of inbreeding within the flock. Similarly, breeding females were culled for health problem, old age and sterility with index values of 0.23, 0.20 and 0.17; respectively.

The average culling age of black head Somali sheep were 3.7 and 8.5 for Ram and Ewes, respectively. This figure is similar with Horro for both sexes Edea [19], and larger than what has been reported for Menz sheep in the central highlands of Ethiopia [22].

Breeding management and mating

Mating was generally uncontrolled in the study area. The primary reason for uncontrolled mating was lack of awareness and the use of communal grazing area whereby animals from various households graze together. Year round mating was practiced by 60.1% of sheep producers. Majority of the respondents own their breeding ram (72.3%). Those who have no breeding males mated their female animal by using neighbor male and borrow males from others. Most of the respondent had one ram running with the flock throughout the year. Majorities (87.2%) of the respondents do not practice special management of rams and the remaining provided supplementary feeds (agro pastoral). The purpose of keeping rams was (92.6%) for mating purpose, and (7.43%) for socio cultural purpose. The majority of the males used for breeding purpose were born or originated within the flock (94.6%). Only 5.4% of the respondents kept breeding males purchased from market (Tables 6 and 7). This implies that the animals within the flock are very closely related and have narrow relationship which leads to inbreeding [17]. Similar scenario was observed among Menz and Afar sheep breeders [16].

According to Kosgey et al. [18] gains from breeding programs are achieved only when inbreeding depression is well controlled or minimized. None of the sheep keeper aware the consequence of inbreeding and largely follow mating of closely related individual. The

Trait	Rank 1	Rank 2	Rank 3	Index
Body size	36	4.2	5.3	0.23
Health	44	12.5	26.3	0.35
Slow growth	4	12.5	15.8	0.1
Old age	16	33.3	21.1	0.26
Low libido	0	8.3	10.5	0.05
Temperament	0	0	5.3	0.01

Index=sum of [3 for Rank 1+2 for Rank 2+1 for Rank 3] for particular Selection criteria divided by sum of [3for Rank 1+2 for Rank 2+1 for Rank 3] for all Selection criteria.

Table 5: Culling criteria for breeding males.

Trait	Rank 1	Rank 2	Rank 3	Index
Health	29.6	19.75	10.56	0.23
Old age	1.34	34.81	52.33	0.21
Sterile	26.4	7.3	10.54	0.17
Repeat abortion	11.54	13	5.37	0.11
Low milk	12	10.7	10.51	0.11
poor mothering	4	14.44	5.38	0.08
Delayed puberty	7.12	0	5.31	0.04
Size	8	1.01	0	0.04

Index=sum of [3 for Rank 1+2 for Rank 2+1 for Rank 3] for particular Selection criteria divided by sum of [3 for Rank 1+2 for Rank 2+1 for Rank 3] for all Selection criteria.

Table 6: Culling criteria for breeding females.

Trait	Rank 1	Rank 2	Rank 3	Index
Size	45.323	19.5	22.44	0.33
Adaptable	9.903	1.58	2.56	0.06
Milk yield	4.839	8.28	16.64	0.08
Pedigree	11.12	3.23	1.6	0.07
Color	4.71	7.81	6.3	0.06
Mothering character	12.29	13.15	4.7	0.11
Lambing survival	3.6	11.75	9.4	0.07
Lamb growth	4.539	23.01	18.2	0.13
Age at 1st maturity	2.226	3.56	6.3	0.03
Waking	0	2.68	0	0.01
Lambing interval	1.45	3.51	6.16	0.03
Tail size	0	1.94	5.7	0.02

Index=sum of [3 for Rank 1+2 for Rank 2+1 for Rank 3] for particular Selection criteria divided by sum of [3 for Rank 1+2 for Rank 2+1 for Rank 3] for all selection criteria.

Table 7: Selection criteria for breeding female.

low level of inflow of animals of unrelated population either through purchase or other means may further increase the level of inbreeding within flock size.

Selection of breeding animals

The study result showed that majority of pastoralists practice selection of replacement stock. About 75% the respondent practice selection of breeding ewes. Over 87% of the respondents practice selection of breeding rams. Breeding rams were selected at 9.93 months of age. The selection age for breeding females were 9.35 months. The ranking of important traits as perceived by pastoralists are summarized in Tables 8 and 9 for females and males, respectively. Body size, pedigree information and growth rates were given high priority in selecting breeding males among its mates. Body size, lamb growth and mothering character were mainly focused in deciding to retain the best breeding female sheep for breeding purpose.

Pastoralists give great attention to colors for selecting both male and female breeding animal, accordingly black head with white body, brown head with white body and lastly pure white preferred. In the study district pastoralists indicated that black head with white body sheep have ability to resist drought than dark brown color. Unwanted color was pure black followed by pure white. The reason for this was lower market value and intolerant to harsh condition of black. Similar findings were observed in Erer and Shinille District [5,6].

Major constraints of sheep production

Participatory identification of the major constraints of livestock production is the first step to design demand driven improvement and development options. The major constraints limiting sheep productivity in the study area were presented in Table 9. Disease, feed shortage and drought were the significant constraints for sheep productivity. Causes of feed shortage were scarcity and low productivity of rangeland due to bush and thorny plants encroachment most range land covered by stone, human population growth, and frequent occurrence of drought. Although the significant is low, market, herding labor and lack of improved genotype were mentioned as a problem. Low genetic potential of the breed was ranked lowly in both production systems. This might be due to lack of awareness of sheep owners about genotype. According to Getechew [20], similar understanding was observed in Afar pastoralist. Lack of strong animal health services and recurrent drought was mentioned the main cause of sheep mortality. Similar constraints were reported [6,22,23].

Trait	Rank 1	Rank 2	Rank 3	Index
Body size	68.13	22.22	29.58	0.46
Color	17.24	11.44	11.27	0.14
Growth rate	4.39	42.1	21.13	0.2
Libido	2.11	5.39	8.45	0.04
Pedigree	8.13	8.72	15.29	0.1
Temperament	0	2.17	4.23	0.01
Testicle size and symmetry	0	2.57	2.82	0.01

Index=sum of [3 for Rank 1+2 for Rank 2+1 for Rank 3] for particular Selection criteria divided by sum of [3 for Rank 1+2 for Rank 2+1 for Rank 3] for all selection criteria.

Table 8: Selection criteria for breeding male.

Problems	Rank 1	Rank 2	Rank 3	Index
Feed shortage	39.53	29.07	16.28	0.21
Water shortage	9.3	9.3	13.95	0.12
Disease	27.91	43.02	22.09	0.29
Drought	22.09	5.81	29.07	0.21
Predator	1.16	9.3	8.1	0.09
Market	0	1.2	8.1	0.06
Labor	0	2.3	1.2	0.02
Lack of improved genotype	0	0	1.2	0.01

Table 9: Production constrains of BHS sheep.

Summery and Conclusion

Livestock production is the main means of livelihood of the Borana pastoral community in the study area. Sheep and goat have a great role in the livelihoods of the subsistence farming and pastoral communities inhabiting diverse production systems. Black head Somali sheep breeds are the most promising for their better adaptability under low input extensive production environment where, scarcity of feed and water are the two major constraints. Sheep are highly valued animals by the Borana people next to cattle and reared to fulfill diverse socio-cultural needs. In the study area sheep mating is uncontrolled and majority of sheep keepers practice indiscriminate breeding. Body size, pedigree information and growth rates are given high priority in selecting breeding males among his mates. For breeding female body size, lamb growth and mothering character are among the most considered criteria for selection. Disease, feed shortage, drought and water shortages are the major constraints of sheep production in the study area.

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References

1. CSA (Central Statistics Authority) (2015) Agricultural Sample Survey, 20014/1015 report on livestock and livestock characteristics. Statistical bulletin, Addis Ababa, Ethiopia.
2. Tibbo M (2006) Productivity and health of indigenous sheep breeds and crossbreds in the central Ethiopian highlands. Doctoral thesis, Swedish University of Agricultural Sciences Uppsal, Sweden.
3. Kosgey IS, Okeyo AM (2007) Genetic improvement of small ruminants in low-input, small holder production systems: Technical and infrastructural issues. Small Ruminant Research 70: 76-88.
4. Solomon A, Kebede, Gemeda D, Ulfina G, Birhanu S (2005) Small Ruminant production system in east wellega and west Shewa zones. Research Report. Oromiya Agricultural Research Institute, Bako Research Center 31.
5. Fikerte F (2008) On-farm characterization of blackhead Somali sheep breed and its Production system in Shinile and Erer districts of Shinile zone. MSc. thesis Presented to the School of Graduate Studies of Hramaya University, Hramaya.
6. Wendimu B, Kefelegn K, Yoseph M, Shibabawu B (2016) Phenotypic Characterization of Black Head Somali Sheep in Gode and Adadile Districts, Ethiopia. Journal Global Veterinary 17: 265-270.
7. Rege JEO, Lipner ME (1992) African animal genetic resources: Their characterization, conservation and utilization. Proceedings of the Research Planning Workshop, 19-21 February 1992. ILCA, Addis Ababa, Ethiopia.
8. Food and Agriculture Organization (2006) The State of the World's Animal Genetic Resources for Food and Agriculture. Commission on Genetic Resources for Food and Agriculture Organization of the United Nations, Rome, Italy.
9. Sölkner J, Nakimbigwe H, Valle-Zarate A (1998) Analysis of determinants for success and failure of village breeding programs. Proceeding 6th World Congr Genetics Applied Livestock Production 25: 273-280
10. Coppock DL (1994) The Borana plateau of southern Ethiopia: Synthesis of pastoral research, development and change1980-90. Addis Ababa, Ethiopia: International Livestock Centre for Africa.

11. Kamara A, Kirk M, Swallow B (2005) Property rights and land use change: Implications for sustainable resource management in Borana, southern Ethiopia. Journal of Sustainable Agriculture 25: 45-61.

12. Angassa A, Oba G (2007) Relating long-term rainfall variability to cattle population dynamics in communal rangelands and a government ranch in southern Ethiopia. Agricultural System 94: 715-725.

13. Tolera A, Aster A (2007) Livestock production in pastoral and agro-pastoral production systems of southern Ethiopia. Livestock Research for Rural Development.

14. Cossins NJ, Upton M (1987) The Borana pastoral system of southern Ethiopia. Agricultural Systems 25: 199-218.

15. Desta S, Coppock DL (2002) Cattle population dynamics in the southern Ethiopian rangelands, 1980-97. Journal of Range Management Archives 55: 439-451.

16. Getachew T, Alemargot H, Markos T, Sharma AK, Solkner J, et al. (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.

17. Jaitner J, Sowe J, Secka-Njie E, Dempfle L (2001) Ownership pattern and management practices of small ruminants in The Gambia-implications for a breeding programme. Small ruminant research 40: 101-108.

18. Kosgey IS, Van Arendonk JA, Baker RL (2004) Economic values for traits in breeding objectives for sheep in the tropics: Impact of tangible and intangible benefits. Livestock Production Science 88: 143-160.

19. Edea Z (2008) Characterization of Bonga and Horro Indigenous sheep breeds of smallholders to design community based breeding strategies in Ethiopia. MSc. Thesis, Haramaya University, Ethiopia.

20. Getachew TM(2008) Characterization of Menze and Afar Indigenous Sheep Breeds of Smallholders and Pastoralist for Designing Community Based Breeding Strategies in Ethiopia. MSc. thesis presented to the School of Graduate Studies of Haramaya Univ. DireDawa, Ethiopia.

21. Tsedeke K (2007) Production and marketing of sheep and goats in Alaba, SNNPR. An Msc Thesis Presented to School of Graduate Studies of Hawassa University. Hawassa, Ethiopia: 104.

22. Abebe M (1999) Husbandry practices and productivity of sheep in Lallo-mama mider woreda of central highlands of Ethiopia (Doctoral dissertation, Alemaya University of Agriculture).

23. Aden T (2003) Evaluation of local sheep under traditional management around rural area of Dire Dawa. An MSc Thesis presented to the School of Graduate Studies of Alemaya University, Dire Dawa, Ethiopia, 128.