International Journal of Livestock Production Research
Vol. 3, No. 2, May 2015, pp. 1 - 17, ISSN: 2329 - 8634 (Online)
Available online at http://acascipub.com/Journals.php

Research article

Traditional management practices, breeding objectives and trait preference for indigenous sheep in Northern Ethiopia

Berhane Hagos[1] and Kefyalew Alemayehu[2], Zeleke mekuriaw[3]

[1]Samara University department of Animal Science, Samara, Afar, Ethiopia
[2,3]Bahir Dar University, College of Agriculture and Environmental Sciences, Bahir Dar, Ethiopia

Phone: +251914782233

P.O.Box:132

E-mail: **berhagos2@yahoo.com**

Abstract

This study was undertaken to assess the existing sheep breeding practices and identifying breeding objectives of sheep breeders as base line information for sustainable sheep genetic improvement strategies. purposive sampling technique, s were used to select respondent farmers. Semi-structured questionnaire, ranking experiment, focus discussion and participatory observation were used to collect data. A total of 150 households were selected from three districts representing the zone. Feed shortage, disease and water shortage were the most frequently mentioned production constraint in the area. The study showed that the mean sheep flock size was 14.4 with little controlled mating system. Sheep owners kept their sheep for source of cash income (I=0.34), manure (I=0.15) and meat (I=0.14) and intangible functions such as, insurance (I=0.19) ceremony and traditional affairs. High probability of mixing sheep flocks was reported in most of the seasons. According to farmers' preferences, traits like body size, tail length, early maturity and body conformation, mothering ability, body size, short lambing interval, and adaptation followed by coat color in their order of importance, respectively were reasons for selecting their best male and female sheep preferences. The farmers' breeding objectives were to increase net cash income per flock, through increased number of marketable animals and increased fertility per flock, and to insure food supply when there is crop failure and improve meat production by improving conformation and growth traits. It is concluded that sheep had multifaceted function to the keepers Therefore, considering the existing management practice, farmers' trait preference and breeding objectives is recommended as feasible strategy way for future genetic improvement.

Keywords: Breeding practice, Degua sheep, Trait preference highland

Introduction

Sheep are of great importance as major sources of livelihood and contribute to sustenance of landless, smallholder and marginal farmers especially to the poor in the rural areas throughout the developing countries (2). Ethiopia is home for at least nine breeds and 14 traditional sheep populations distributed from cool alpine climate of the mountains to the arid pastoral areas of the lowlands (15). Sheep is the second most important species in the country with an estimated population of 25.5 million heads (3).The Ethiopian indigenous sheep breeds have a great potential to contribute substantial amount to cash income, food (meat and milk) and non-food products such as manure, skins and wool. They also serve as a means of risk mitigation during crop failures, property security, monetary saving and investment, in addition to many other socio-economic and cultural functions (1).

Despite the large population and great role of sheep both to the livelihood of the poor farmers and the national economy at large, the current level of on-farm productivity in the smallholder production systems is low. These are due to several technical (un improved genotype, feeding and animal health), institutional, environmental and infrastructural constraints (11). Urbanization and growing human population in the country resulted in increased domestic demand for sheep meat, which also offers significant incentive for market-oriented production. It is very urgent to improve sheep productivity in order to satisfy the large population of the country estimated at 81 million with 2.7%) an annual growth rate (2).

Unfortunately, attempts to improve sheep in the country so far faced several constraints mainly due to weak planning, poor involvement of owners and implementing without taking into consideration the needs of farmers (12; 11). There is, emerging a new thinking and developing breeding programs with the discussion and involvement of all stakeholders from the planning to implementation. So participatory assessment of the indigenous knowledge of managing the breed, identifying important traits for selection of sheep owners are prerequisite to set up genetic improvement at smallholder and pastoral level (9; 11). North-western zone is one of the administrative zones of Tigray which is located in northern part of the country. Even though the zone has huge number of livestock resources including sheep, information on the existing traditional breeding practices and husbandry systems is scanty. Therefore, the aim of this research work is to present the existed sheep breeding practices; breed management system and identifying breeding objectives of sheep owners in north western zone of Tigray region.

Materials and Methods

Description and Selection of Study Sites

The study was conducted in Northwestern zone of the Tigray region, which is located at the Axum-Gondar high-way, between 1057km and 1109 km from Addis Ababa. It is situated between 12^0 15’ and 14^0 57’ N latitude and 36^0 27’ and 39^0 59’ E longitude. The area is characterized by different climatic

zones having an altitude range of 800-3200 meter above sea level. The area has an annual temperature range of 15 ^{0}C to 34 ^{0}C and annual rainfall range of 600-1900mm.

Sampling techniques

North western zone has 6 districts of which three districts were selected purposely based on their agro-ecology and flock size. From each selected districts; two peasant associations were selected based on the flock size, and accessibility for transportation. Twenty five households were selected from each peasant association based on flock size of sheep through discussion with key informants in the village and secondary information. Accordingly, 150 households were included in the study that were selected from three districts and a total of six peasant associations.

Data collection methods and procedures

Data were collected by administrating a semi-structured questionnaire to the 150 selected household head or representative by an enumerators employed for this purpose with close supervision of the researcher. The questionnaire was designed to obtain information on general household information, sheep flock size and structure, herding and breeding practices and purpose of keeping sheep. Own flock ranking system was used to study trait preferences and breeding objectives. Participants of the own flock ranking were asked to rank their first, second, third and least preferred male and female sheep within their own flock giving reasons for each preference rank. The respondents were mentioned as much reasons as possible for each rank. But, only the first mentioned reason were taken as preferred or exposed trait to define their breeding objectives in their current production mode and for future improvements. Informal enquiries to randomly accessed local informants and talks with local agricultural officers were made as a method of triangulation in order to crosscheck reports on similar issues and observations to the important trait expression in their production systems.

Data analysis

Data collected through questionnaire were entered into Statistical Package for Social Sciences (17). The same statistical package was used to summarize the data and results were presented mainly in the form of descriptive tabular summaries for each district. Indices were calculated to provide ranking of the reasons of keeping sheep and calculated as Index = Sum of (3 for rank 1 + 2 for rank 2 + 1 for rank 3) given for an individual reason divided by the sum of (3 for rank 1 + 2 for rank 2 + 1 for rank 3) for overall reasons.

Results and Discussion

General household information

The result of this study revealed that the majority of the households in this study area were male headed which was about 72.7%.While the remaining proportion of the households was headed by

females. Female headed household in this particular study would indicate either their husband has died or they are divorce. About 33.3%of household heads in this study area were literate (grade 3-10), 33.3% were able to read and write either from religious school or from adult education and the remaining (33.3%) of the smallholders in the area were illiterates. This proportion of literate farmers is higher than reported by (4) of 15% literate for farmers in the same area Thus, better educational background obtained in farmers might be a good potential for adoption of improved technologies and facilitate performance and pedigree recording (10). It is also mandatory to consider upgrading of the educational status of other farmers for the successfulness of sheep breeding strategies and other development interventions.

About 98.67% of the interviewed farmers keeping indicated that they practice both crop and livestock farming activities. Average land holding for crop and grazing in the area was 0.93±0.36 hectare. Out of the total crop land, about 68% was used for main season cropping and the remaining 32% was used for irrigation cropping. In the area farmers cultivate sorghum, maize, millet, teff, wheat, bean, barley, pea, lentil, grass pea, chick pea, vegetables (Tomato, onion, potato and cabbage), pepper and rice. Among these crops, vegetable, pepper, maize and chick pea were the major grown crops using irrigation in their order of dominancy. The remaining crops were grown in rainy season. Farmers hold cattle, sheep, goat, donkey, camel and poultry along with crop production. Sheep production in the area was integrated with crop farming activity. Use of manure was figuratively practiced as organic fertilizer in the area. On the other hand, sheep was provided with some level of crop residues supplementation and crop aftermaths. Meanwhile, the accessible crop residues were usually preferentially fed to cattle, owning to their inability to withstand feed shortage during the dry seasons. Sheep spent their time grazing on fallow lands and grazing lands during the dry season.

Sheep flock structure

Flock size and structure of Degua sheep breeds are indicated in Table 1. Sheep flock structure in the area according to age and sex categories is the females outnumbered their male counterparts in that, females constitute 68.9 % whereas males are accounted only 31.1% in the whole sheep population. Females more than one year of age constituted 40.1% of the whole population while males of the same age made up only 10.8% of the population. The ratio of male to female of more than one year of age was accordingly 1:4.69. This ratio of ram to ewe found in this study was similar with 1:4.87 for Abergelle sheep in Tigray region. Whereas, this was far greater than the ratio of male to female animals having age greater than 12 months of age with 1:7 for Gumuz sheep in Amhara region (14) and 1:7.5 for Menz sheep in Menz area and 1:6.4 for Bonga sheep (19) in southern Ethiopia. Thus, in Degua sheep flock, the ratio of male to female is enough for proper breeding.

larger flock size of 16.0 for Gumuz sheep and (19.2) for Blackhead Somali sheep were reported (13; 6) was reported. Similarly larger flock size of 24 was reported for Menz sheep in the cool highlands of Ethiopian (1). The result obtained in this study and previous reports on sheep flock size showed that

sheep flock size gets higher when we go to the cool highlands from the mid altitude areas. This might be due to the highly degraded areas which could not support crop production as well as large ruminants like cattle.

Table.1. Sheep flock structures in the study area

SD = Standard deviation.

Flock class	Medebay zana			Tahtay koraro			Asgede tsimbla		
	Sum	Mean ±SD	%	Sum	Mean± SD	%	Sum	Mean ± SD	%
Male < 6 months	91	1.57±0.94	12.8	83	1.7±1.1	9.9	58	1.45±0.9	9.5
Female <6 months	99	1.87±1.35	13.9	103	2.1±1.3	12.3	82	2.1±1.15	13.4
Male 6 month to 1year	74	1.24±0.94	10.4	75	1.5±1.2	8.9	58	1.45±1.2	9.5
Female 6 month to 1 year	96	2±1.7	13.5	142	2.84±2.6	16.9	102	2.55±1.8	16.7
Male >1 year	75	1.32±0.89	10.5	86	1.72±1.0	10.3	72	1.8±0.99	11.8
Female >1year	278	4.63±2.49	38.9	350	7±4.4	41.7	238	5.95±3.3	39
Total	713	11.88±6.62	100	839	16.72±8.1	100	610	15.2±8.1	100

Purpose of Sheep keeping and Production Objectives

The objective of sheep rearing was for multiple functions; Such as source of cash income, meat, manure, ceremony, saving/insurance, skin and as traditional values. Details of rankings on the benefits of sheep rearing are presented in Table.2. Quantifiable products like cash income (I=0.34), manure (I=0.15, meat (I=0.14) and skin (I=0.09) were reported as the most tangible benefits in their order of index value. Similar finding from Menz sheep owners indicated that, the reason for keeping sheep was to generate cash income followed by manure, meat consumption, hair and as means of saving respectively, in their order of importance (18). Having sheep for manure was also mentioned as important sheep function in Horro sheep owners (19). The use of manure from sheep was highly practiced and sheep production is integrated with crop production in the study area.

Functions of sheep for saving/ insurance against crop failure were also well ranked in this study. Keeping sheep is seen in the community as a traditional identity as well as job opportunity with (0.1) index value. Based on the stated functions of sheep, the main breeding objectives that have been defined are increasing marketable lambs, meat, secure the house hold cash income and insurance/saving and to improve growth rate and conformation for meat production as household consumption.

In the meantime, tradition, social status and ceremony were among the intangible benefits of sheep flock and reasons for their wish to expand it. Similar functions of sheep rearing were also reported for sheep keepers in the central highlands of Ethiopia (1). Milk as a function of sheep for home consumption was

not reported in the area. Similarly milk was not mentioned as function of sheep in Horro, Bonga and Menz sheep owners (18). The importance and multiple values of indigenous sheep breeds in developing countries in low input system were also well addressed (8; 19).

Sheep provides social functions that allow an owner to join together within the community. Sheep is also used as mediums of gift exchange in various social circumstances and means to give social identity and status as well as ceremonial affairs. Another tradition by which people with large flocks support their poorer relatives is known as (Nfrki/Rbi). In this tradition the poorer relative is given a flock of sheep, composed of mainly breeding ewes. The poor relative will be given a traditionally formal access to profit from the flock including lamb crop and manure. The foundation animals remain the property of the (Nfrki/*Rbi* /provider) and only he/she is able to sell or slaughter the foundation flocks.

Table.2. Rankings for keeping purpose and functions of sheep

**R= Rank and I=Index*

Ownership of sheep in terms of both flock size and quality of breeding animals is also used as criteria of wealth status and strength. Members with high flock sizes are considered as dignified once and possess high social influence and respect.

Major sheep production constraints

Districts	Percentage of respondents (%)							
	Rank	Products and functions						
		Cash	Meat	Manure	Ceremony	Insurance	skin	Tradition
	R1	91	6.8	-	5.1	45.6	0	61
	R2	9	33.9	20.3	10.2	33.4	34	6.8
Medebay	R3	-	20.3	33.9	23.3	21	2.9	13.6
zana	I	0.38	0.14	0.13	0.08	0.21	0.07	0.20
	R1	85.25	7.25	16.5	3.35	42.5	-	-
Asgede	R2	13.5	37.5	30.25	10.4	12.5	11.5	20
tsimbla	R3	1	30.5	34	24	12.5	60.3	-
	I	0.32	0.24	0.17	0.65	0.19	0.10	0.06
Overall Index		0.34	0.14	0.15	0.07	0.19	0.09	0.10

Rankings of sheep production constraints are presented in Table.3. Among the reported constraints feed shortage, disease and water shortage were the most frequently mentioned production constraint with their overall index value of I=0.4, I=0.3 and 0.09, respectively. Degree of occurrences varies across districts.

Feed shortage and disease were ranked as first and second important constraint with index value of I=0.47 and I=0.30 for Medebay zana, and I=0.46 and I=0.33 in Tahtay koraro, districts, respectively. In the contrary disease and feed shortage were ranked as first and second important constraint at Asgede tsimbla with I=0.46 and I=0.37index value, respectively. Labor and predators were also mentioned as important constraints affecting sheep production in all the three districts. Low genetic potential of the breed was ranked worse in both farmers. This might be due to lack of awareness of sheep owners about genotype. Hyena and Fox are the major predators attacking sheep and other livestock in the study area. Drought is also as exacerbating factor for feed shortage. Disease and water problems were no however mentioned as major constraint. Similar constraints for livestock production were reported by, for cattle production system characterization in western zone of Tigray (1).

Nevertheless, even though access to market was not a problem by itself, lack of fair and equitable share from the transactions was reported as a constraint by sheep owners. This is especially prominent in case of sales of sheep to mitigate loss due to drought. Despite higher end-prices for live animals and meat, the producers receive significantly lower share of the transaction. This owes to lack of organization among the livestock producers and this situation is leaving them with lower bargaining power vis-à-vis the powerful urban middle men and butchers.

Table.3. Ranking on major production constraints in the study area by district

	Medebay zana				Tahtay koraro				Asgede tsimbla				Total
Constraints	R1	R2	R3	I	R1	R2	R3	I	R1	R2	R3	I	Index
Feed shortage	83.3	15.0	1.7	0.47	78	22	0	0.46	22.5	75	2.5	0.37	0.44
Water shortage	0.0	11.7	28	0.09	0	4	18	0.05	0	0	80	0.13	0.09
Disease	15	58.3	20.3	0.30	20	62	8	0.33	75	25	0	0.46	0.36
Predator	0	11.7	11.7	0.06	2	0	20	0.04	0	0	12.5	0.02	0.04
Labor	1.7	1.7	15	0.04	0	4	36	0.08	2.5	0	2.5	0.02	0.05
Genotype	0	1.7	23.3	0.05	0	4	14	0.04	0	0	2.5	0.01	0.033

* R1, R2 and R3 = rank 1, 2 and 3 respectively. I= index : Index =

Traditional Breeding practice and Breed Management

Selection of breeding animals

About 95.7 percent of respondents were reported to select breeding ram from own flock, neighbors/ relative, communal sources Table 4. Meanwhile, 74.9% of respondents were also reported to select their breeding females. From the report of sheep owners (28.7%), (43.3%), (18%) and (10.22) of the respondents were used to select a breeding ram at early age, young age, adult and multi-age respectively. While, (36.67%), (34.33%), (26.67%) and (2.33%) of the sheep owners select their breeding ewes at

multi-age, adult age, young age and at early age, respectively. The sheep owners in the area select their breeding rams and ewes using individual appraisal/own performance (68.56 %), pedigree/maternal history/ (26.33%) and (5.1%) both in combination as selection criteria. In Afar and Menz sheep characterization work (90%) of sheep owners recognize the importance of selection and practiced selection of breeding animals using their own criteria (18).

In cases of selection for breeding ewes, the outstanding females were kept for breeding while unwanted ones were disposed mostly through slaughter and sale. The selection intensity for female was lower as compare to ram, since disposal was limited to extremely inferior females.

Nevertheless, use of mother history in selecting breeding ram can also be taken as an indirect means of selecting ewes as certain criteria is considered on the mother's performance. Selection criteria using appraisal reported in this study is in agreement with the report in Menz and Afar sheep owners (18)

Generally, stage of selection for breeding ram was different from breeding ewes; rams were selected at their youngest age whereas ewes are selected mostly at different ages as in Table 4.

Table.4. Breeding practice and stage of selection of breeding animals by district

Selection activity	Respondents /districts/(%)			Over all (%)
	Medebay zana	Tahtay koraro	Asgede tsimbla	
Breeding ram				
Yes	91.67	98	97.5	95.72
No	8.33	2	2.5	4.28
Stage of selection ram				
Early	25	46	15	28.67
Young	38.33	42	52.5	44.28
Adult	15	8	32.5	18.5
Multi stage	21.67	4	5.0	10.22
Breeding ewe				
Yes	73.33	74	77.5	74.94
No	26.67	26	12.5	21.72
Stage of Selection				
Early	0	2	5	2.33
Young	26	34	20	26.67
Adult	46	16	25	34.33
Multi stage	38	22	50	36.67

Selection criteria				
Maternal history	35	24	20	26.33
Appraisal/ own performance	61.67	74	70	68.56
Both in combination	3.33	2	10	5.11

Pedigree keeping and individual identification systems

The farmers have ability of mentally tracing back to their superior animals. Accordingly, 86.8% of overall respondents reported to mentally memorize pedigree of every sheep through the maternal line of descendent. FGD members also reported that owners can recall up to more than 12 lines of maternal lineages tracing back to superior individuals. Pedigree recalling is used to select breeding animals born to a superior maternal lineage (locally known as Alet). In the mean time, only 20% of the respondents reported to recognize the sire of a lamb. Identifying paternal lineages may be difficult because group of two or more selected breeding rams (known as *Magula*) are usually run within the flock while hand-assisted mating was not practiced. The culture of maternal tracing back and remembrance is even more intense in the case of cattle.

Methods of identifying individual sheep was reported as naming every individual (55.2%), mental memorization by physical appraisal (16.06%) and in combination of these (28.8%). Majority of households owning small flock were able to identify their animals just by naming (50.5%). Some of them (5%) could also identify their few animals based on just their features without the need of naming. To the contrary, majority of households with large flock sizes (44%) had employed naming and ear cutting in combination in order to identify individuals within their large flocks. It was observed that sheep are named based on physical characteristics (body size, coat color pattern and type etc). Naming based on physical feature was, however, the most commonly applied system. Nevertheless, naming an individual in this method usually follow special characteristics of the maternal lineage rather than its own.

Sources of breeding ram and Mating systems

Details of breeding ram sources are presented in Table 6. Main sources of breeding ram according to respondents were own-flock, relatives/neighbors and communal. However, use of communal breeding ram was owned and cared by the individual owners. Use of purchased breeding ram was only reported by (5.13%) farmers in Asgede tsimbla district sheep owners. Most households preferred to have their own breeding ram, but large proportion (24.51%) of them were reported to use breeding ram primarily from other alternative sources (Table 5).

Table.5. sources of breeding ram and methods of mating control

Source of ram	Respondents /districts/(%)			Over all (%)
	Medebay zana	Tahtay koraro	Asgede tsimbla	
Farm born	80	72	69.23	73.74
Neighbors/relative	3.33	26	5.13	11.44
Communal	16.67	2	20.41	13.03
Purchased	0	0	5.13	1.71
Mating control system				
Controlled	15.5	30	5	16.83
Uncontrolled	84.5	70	95	83.17
Methods of control				
Cull	66.67	68	42.5	59.06
Herding	33.33	32	37.5	34.28
Both	0	0	20	6.66

Only 16.83% of respondents were reported to control mating. Means to control were culling (59 .1%), either through sale or slaughter of unselected animal, herding /hand mating (34.3%) and in combination of these (6.66%) (Table.5).Totally sheep castration was not practiced in the study area. This strong culture of not castrating is in agreement with the result of Workneh (1992) who reported a cultural taboo against castration at southern Ethiopia. Mean age at culling of unselected males was reported to be at 6 month. Their communal grazing land and watering points were mentioned as main factors for the high proportion of uncontrolled mating practices in this area.

Regarding to sheep herding /grazing pattern, majority of overall respondents (82.2%) of them mix their flock with other flocks in the neighborhood while only 17.8% of them run their sheep as a flock alone during grazing. A densely populated mixed crop-livestock production system is characterized by number of households with relatively small communal grazing area. And this typical feature forces households to mix their flock with neighborhood flocks. Sheep were reared or grazed to gather with cattle, goat and equines.

A selected breeding ram can serve up to 3.1 years of mean age after which it will be usually disposed through sale or slaughter. However, the average age at which the breeding ram is changed, reported in the current study, may still be considered enough to prevent inbreeding. Inbreeding is generally higher in small flocks kept by smallholders and in flocks having only limited breeding rams.

Heat detection practices

All respondents were reported to be able to detect heat. The methods of heat detection mentioned by farmers were observation of behavioral and physiological changes on the ewes at heat (44.88%), indirect detection using ram (15%) and (38.02) combination of the two. Signs of heat reported included screaming over night (33.9%), mounting on other sheep (48.7%), willingness to be mounted (12.3%), increased activeness (3.4%) and loss of appetite (0.9%). According to some respondents most of these signs of heat are displayed only at times of feed availability.

Although majority of the respondents were able to detect heat, determining mating was limited to access and ram quality. When the owner depends on other ram sources than his own flock for breeding ram and once detecting heat in ewes, he will either bring a ram borrowing from his alternative sources or would mix his ewe with the flocks having good ram.

The current breeding structure for the study area is characterized by absence of formal performance recording but traditional subjective assessments do exist. There is no formal pedigree keeping, nonetheless, traditional systems of pedigree memorization and individual identification are present were exist. Mating is to some levels of selected breeding males were practiced although communal grazing and watering points are limiting the intensity of control. Exchange of breeding ram is also practiced but the direction is significantly affected by flock size rather than similarity of goals. The existing social exchange network may be exploited for disseminating the superior genotypes. Accordingly, selected ram(s) may remain under the ownership of the original individuals and the existing sharing culture be used to arrange access for those members whose ram(s) are not selected.

Trait preferences and breeding objectives

Livestock owners may have particular preferences to the type of animals he/she raised. After identifying and selecting their first, second, third and least preferred male and female sheep from their sheep flocks, owners were asked to give reasons/traits/ for each preference rank. The respondents mentioned a number of traits for each rank but only the first mentioned trait, under each rank, was taken as the “best” preferred trait for that rank. A numbers of traits and their rankings according to the owners for both sexes by district are presented in Tables 6 and 7.

Ranking of traits preferred for male sheep

Farmer’s rankings for trait preferences to select male are presented in Table 7. Body size, fast growth, tail size/length/ and conformation were mentioned in their order of importance by owners as reasons to select their best male sheep at district level. With regard to overall index value, body size, tail length, fast growth and conformation (Tsenagle/qumena) were the leading reasons, with index value of I=0.22,I=0.17, I=0.16 and I=0.11, respectively, due to higher frequency of being mentioned as first and second reasons.

Color and mother's history with an index value of I=0.09 each, and body condition, polledness and adaptation traits with an index value of I=0.07 each were also mentioned as important preference reasons.

This trait preference trials result agreed with the farmers breeding objectives. Adult males are usually kept for sale, if not selected for breeding. Price is determined by body size and conformation of the animal, color, sex, tail size and other attributes as polledness both at the central market as well as villages markets.

Use of body weight for price determination was not common in the market and effect of body size on the price of the animal was best criteria followed by body condition, polledness and color. Polled male sheep were more preferred for breeding and in the market than their horned counterparts with assumed association of farmers between the trait (polledness) and meat quality in terms of tenderness and also dressing percentage. As the farmers view, polled sheep are better in dressing percentage and tenderness than the horned sheep.

Table .6. Ranking of trait preference for male sheep (%) and index

	Medebay Zana				Tahtay Koraro				Asgede Tsimbla				Total
Preferred traits	R1	R2	R3	Index	R1	R2	R3	Index	R1	R2	R3	Index	Index
Body Size	23	41.7	21.7	0.29	14	12	16	0.14	27	17.5	15	0.22	0.22
Tail Size	18	21.7	8.4	0.18	20	20	10	0.19	15	10	5	0.12	0.17
Color	15	3.4	21.7	0.13	4	2	6	0.04	2.5	18	17.5	0.10	0.09
Body Condition	6.7	0.00	6.7	0.05	4	16	14	0.10	5	10	5	0.07	0.07
Fast growth	18	13.4	15	0.16	18	13.4	10	0.15	2.5	20	27.5	0.13	0.16
Mother History	3.3	8.4	16	0.07	10	8	6	0.09	12	10	5.5	0.10	0.09
Conformation	8.4	8.4	6.7	0.08	18	12	14	0.15	10	5	12	0.09	0.11
Polldness	5	3.4	3.4	0.05	6	6.6	10	0.07	12	7	10	0.09	0.07
Adaptation*	3.4	1.7	5.4	0.03	6	10	14	0.09	14	2.5	2.5	0.08	0.07

**Adaptation= Feed shortage tolerate, disease resistance, grazing ability and body condition maintenance post draught*R1, R2, R3 = rank 1, 2 and 3 respectively. I= Index*

Ranking of traits preferred by farmers for female sheep

Farmer's rankings for trait preferences to select female sheep are presented in Table 7. From the own flock ranking experiment for trait preference, color (22.9%), body size (18.6%), adaptation (12.7%) and mothering ability (10.8%) were mentioned and ranked as first for their choice of best female sheep at each district. However, owing to their higher frequency of choices as second rank, the overall index value was slightly higher for mothering ability I=0.21, followed by body size I=0.17 and short lambing interval I=0.11. District wise, mothering ability at Medebay zana I=0.24 and Tahtay koraro I= 0.11 and

short lambing interval and at Asgede tsimbla I= 0.13 received the highest indexes of preferences. The next reason receiving higher rank value was adaptation with overall index value of I=0.10 flowed by color with overall index value of I=0.08.

The higher proportion of ranks for mothering ability, reproductive performances and conformation traits was in agreement with the inference from the participatory observations on the leading importance of these traits in the farming system. Body size was also more preferred next to mothering ability. As the owners view body size has direct effect in the production of marketable animals with good conformation traits which are later affect to their market price.

Then ewe posses' large body size is capable of caring heavy breeding ram during breeding and its fetus in gestation and easily produces large sized lambs with less with birth difficulty.

Table.7. Ranking of traits for preferred female sheep within own flock (%) and index

Preferred traits	Medebay Zana (60)				Tahtay Koraro (50)				Asgede Tsimbla (40)				over all
	R1	R2	R3	Index	R1	R2	R3	Index	R1	R2	R3	Index	Index
Body size	28.3	17	8.4	0.18	10	12	12	0.11	17.5	25	17	0.09	0.17
Tail length	6.7	8.4	3.4	0.04	6	8	10	0.09	7.5	5	7.5	0.09	0.07
Color	15	23	18.4	0.20	20	6	18	0.15	33.3	15	13	0.05	0.08
Mothering ability	5	17.5	5	0.24	14	4	10	0.11	8.4	15	18.4	0.13	0.21
Lamb quality	5	5.1	4.6	0.09	8	14	4	0.07	5	-	-	0.03	0.07
Short lambing	5	6.7	8.4	0.06	12	18	8	0.12	7.5	2	7.5	0.2	0.11
Mother history	5	10	0	0.06	4	6	4	0.05	10	5	15	0.07	0.06
Twinning rate	3.4	0	18.2	0.09	4	6	4	0.05	4	2.5	5	0.03	0.04
Conformation	8.4	8	11.7	0.05	2	12	8	0.06	5	5	7.5	0.06	0.07
Body condition	3	1.7	3.4	0.03	0	4	8	0.03	5	5	-	0.04	0.03
Adaptation*	8.4	3.4	3.4	0.07	20	6	10	0.14	7.5	12.5	10	0.10	0.10
Free of abortion	3.4	1.7	3.4	0.03	0	4	2	0.02	-	2.5	5	0.02	0.02
Total				1.00				1.00				1.00	1.00

**Adaptation= Feed shortage tolerate, disease resistance, grazing ability and body condition maintenance post draught and *R1, R2, R3 = rank 1, 2 and 3 respectively. I= Index*

Traits mentioned for best female sheep with relatively measurable index as compared to the rest were tail size I=0.07 offspring quality I=0.0), conformation I=0.07, mother history I=0.06 and twinning rate I=0.04. It was a bit surprising that, body condition and free of abortion was among the least mentioned preference reasons with overall indexes of 0.03 and 0.02, respectively in the female sheep. The lower preference for twinning appears inconsistent with the reports of (18) for Bonga sheep and (7) for Issa goats around Dire Dawa of high preference for twinning rate.

Practically, traits to be selected for improvement must reflect the breeding objective and has to be easy to measure, heritable and small number (12). Reproductive performances, including good mothering ability, twinning rate and short lambing interval, were repeatedly mentioned during the flock-rankings for females. But, selecting for these traits has a problem associated with low heritability values (7). Inclusion of reproductive traits in a breeding goal is, however, reasonable as the goal should reflect owners' preferences.

Conformation traits such as tail size, body size and body condition, polledness and color were also frequently mentioned to select breeding animal. These traits also highly affected "marketability" of male sheep in the local as well as central markets. Adaptation traits, including drought resistance and grazing ability, were also mentioned by respondents. Actually, the entire production system primarily depends on utilizing and optimizing these attributes. However, the difficulty in this situation is the broadness of the collectively called adaptation traits (5) and associated complexity in assessment of these parameters on individuals for selection. An experience from the approaches; rather than directly selecting for adaptation, concentrating on selection for the productive and reproductive traits in the presence of environmental stress, thus allowing animals to be selected while responding also to the stressors will be the most feasible practical way.

With regard to color preference, plain white and red colored sheep were highly preferred on the market among the other coat color groups. Farmers reported that plain red, white and mixed of these are the most preferred colors. Meanwhile plain black colored sheep were not preferred by owners for slaughter in holydays and ceremonies, and at market .The reasons for negative preference to black colored sheep were traditional views associated with bad luck. These cultural views discourage the owners from keeping black sheep, slaughter for social and religious events. Similar perceptions in negative preference to black colored animals were also reported by Horro and Bonga sheep owners (19).

Accordingly, the traits considered for improvement were, reproductive traits (mothering ability, short lambing interval, twining rate) in females and conformation traits (color, polledness, body condition), tail and body size. Similar trait preferences in Menz sheep keepers were reported in Menz area (18).

Definition of farmers' breeding objectives

Definition of the breeding objective traits has conducted through owner's identification of important problems, prioritization of contribution of sheep to mitigate these problems and most constraint in their production system through formal survey. According to the survey results, persistent food insecurity and high financial problem were identified as most problems faced by the farmers. Shortage of feed and grazing land resources and disease were also mentioned as the most constraints in the sheep production

systems. After identifying the major function of sheep and purpose of keeping in the area, sheep owners were asked to rank their breeding objectives according their importance.

According to the farmers rank, sheep are significantly contributing to the household food security and cash income through sale of live-sheep. Cash income, insurance/bank/, manure as organic fertilizer to harvest high crop productivity and meat for consumption were ranked as first ,second ,third and fourth important keeping objectives, respectively. This result consistent with the findings revealed that; source of cash income, insurance against crop failure is the principal sheep raring objectives in sheep barley production system areas (8 ;16). Besides prestige /traditional value, meat for home consumption, skin as traditional use as carpet for sitting and ceremonial affairs in their order of index value was prioritized as objective of sheep keeping.

The farmers' breeding objective was therefore; to increase net income per flock, through increased number of marketable animals, to insure their food supply during crop failure, source of manure as organic fertilizer to increase crop production and meat for household consumption under the existing environment considering survival and adaptation traits.

Conclusion

The results from the present study revealed constraints and opportunities such as small flock size, un-controlled mating, indiscriminate mating, low level of literacy, absence of breeding ram in many of the flocks were mentioned. Nevertheless, mixing of flocks as a result of communal grazing and watering points has a good potential in solving absence of breeding ram and reduce the risk of inbreeding.

Thus, strengthening the existing breeding practice by organizing owners utilizing common grazing land based on their interest is prerequisite for sustainable sheep breeding programme. An attempt should be put on the selection and identification of breeding animal before market age to increase the proportion of breeding male and as method of controlling unwanted mating in the existing production system.

According to framers' trait preference, body size, tail size, red brown color and reproductive traits (mothering ability, short lambing interval) were the most preferred traits of their best rams and ewes considered for future improvement. The farmers breeding objective is to increase cash income per flock through increased number of marketable animals, to insure food security during crop failure and meat production by improving growth performance without undermining adaptation and survival traits.

In order to minimize the failure of sheep breed improvement programme it is important to consider the existing breeding practices, breed management system and trait preferences of the community and the multifaceted role of the excising genotype.

Acknowledgements

The authors would like to thank for all the local development agents, the community members of PAs within each district as well as to the Axum agricultural research center staff of animal sciences for their technical and material support.

Reference

[1]. Abebe Mekoya. Husbandry practice and productivity of sheep in Lalo-mama Midir woreda of central Ethiopia. An MSc Thesis presented to the School of Graduate Studies of Alemaya University of Agriculture, Dire Dawa, Ethiopia, 1999, pp 91.

[2]. AMFI.The potential for high value livestock indemnity insurance in Ethiopia,Oremia region. Annual report of the Association of Micro Finance Institution, 2010, 80pp.

[3]. CSA (Ethiopian Central Statistics Agency).. Agricultural sample survey : Report on livestock and livestock characteristics (private peasant holdings) , 2013.Addiss Ababa, Ethiopia, 183pp.

[4]. Desalegn Genzebu.. On-farm phenotypic characterization of Arado cattle breed in North West zone of Tigray, Ethiopia. An MSc Thesis presented to the School of Graduate of Addis Ababa University Faculty of Veterinary Medicine, Addis Ababa Ethiopia, 2009, 85pp.

[5]. FAO. Contributions of smallholder farmers and pastoralists to the development, use and conservation of animal genetic resources; proceedings of the intergovernmental technical working group on animal genetic resources for food and agriculture, 5th session.28-30January2009,Rome.

[6]. Fikrte Firew.. On-farm characterization of Blackhead Somali sheep breed and its production system in Shinile and Erer districts of Shinile zone. An M.Sc Thesis presented to the school of Graduate Studies of Haramaya University of Agriculture, Dire Dawa, and Ethiopia, 2008, 134pp.

[7]. Grum Gebreyesus.. Community based participatory characterization of the short eared Somali goat population around Dire-Dawa. An MSc Thesis Haramaya University, 2010, 144pp.

[8]. Kosgey I.S.. Breeding objectives and breeding strategies for small ruminants in the Tropics. Ph.D. Thesis, Wageningen University, the Netherlands. (ISBW: 90-5808-990-8) Germany, 2004, 271pp.

[9]. Kosgey, I.S., R.L. Baker and J.A.M. Arendonk. Successes and failures of small ruminant breeding programmes in the tropics: a review. Small Rumin. Res. 61, 2006, 13–28pp.

[10]. Kosgey, I.S. and Okeyo, A.M.. Genetic improvement of small ruminants in low-inpt smallholder production systems: Technical and infrastructural issues. Sm.Rum.Res., 70: 2007, 76 – 88pp.

[11]. Markos Tibbo. Productivity and health of indigenous sheep breeds and crossbreds in the central Ethiopia highlands. PhD Dissertation. Department of Animal and Genetics, Faculty of Veterinary Medicine and Animal Sciences, Swedish University of Agricultural Science , Sweden. 2006, 74pp.

[12]. Sölkner J., H. Nakimbigwe and A. Valle-Zarate.. Analysis of determinants for success failure of village breeding programmes. Proc. 6th World Congr.Genet. , Livestock Prod. 25: 1998273 – 280pp.

[13]. Solomon Abegaz. In-situ Characterization of Gumuz sheep, under farmers' management in north western lowland of Amhara region. A Msc. Thesis presented to the School of Graduate Studies of Alemaya University of Agriculture, DireDawa, and Ethiopia. 2007, 128pp

[14]. Solomon Abegaz, B P Hegde and Mengiste Taye. Growth and Physical Body Characteristics of Gumuz Sheep under Traditional Management Systems in Amhara Regional State, Ethiopia Livestock Research for Rural Development 23 (5) 2011.

[15] . Solomon Gizaw, Van Arendonk J.A.M., Komen H., Windig J.J., and Hanotte O.. Population structure, genetic variation, and morphological diversity in indigenous sheep of Ethiopia. J.Anim. Genet. 38: 2007, 621-628pp.

[16]. Solomon Gizaw, Hans Komen and Johan A.M. van Arendonk..Participatory definition of breeding objectives and selection indexes for sheep breeding in traditional systems. J.anim.Scin. 128: 2010, 67 – 74pp.

[17]. SPSS.(Statistical Package for Social Sciences). Version 16.0, SPSS Inc., USA. 2007.

[18]. Tesfaye Getachew. Characterization of Menz and afar indigenous sheep breeds of smallholder and pastoralists for designing community-based breeding strategies in Ethiopia. An MSc Thesis presented to the school of Graduate Studies of Haramaya University of Agriculture, Dire Dawa, and Ethiopia, 2008,71-82pp.

[19]. Zewdu Edea. Characterization of Bonga and Horro indigenous sheep breeds of smallholders for designing community based breeding strategies in Ethiopia. An M.Sc Thesis presented to the school of Graduate Studies of Hara