Synthesis of Classification, Breeding Practices and Selection Criteria of Indigenous Sheep of Ethiopia

Nurlign Mohammed

Department of Animal Science, College of Agriculture, Woldia University, Woldia, Ethiopia

Abstract: The objective of this paper was to know the classification, breeding practices and selection criteria of indigenous sheep of Ethiopia. Ethiopian sheep breeds are generally classified into 14 traditional populations in 9 breeds within 6 major breed groups. 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. The farmers' decision of selection criteria could be affected by breed; production system and herd size. 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. Therefore, indigenous sheep of Ethiopia are generally classified into 14 based on their ecological distribution, geographic proximity, tail types and tail shape; mating was predominantly uncontrolled and appearance/conformation, fast growth, coat color were most selection criteria of ewes and rams.

Key words: Breeding Practices · Classification · Indigenous Sheep · Selection Criteria · Synthesis

INTRODUCTION

In the country, there were approximately 60.39 million cattle, 31.30 million sheep, 32.73 million goats, 2.00 million horses, 0.46 million mules, 7.84 million donkeys, 1.41 million camels, 56.05 million poultry and 6.52 million beehives [1]. Farm animals as a whole are an integral part of the country's agricultural system and are raised both in the highland and lowland areas. In developing countries, livestock production is mostly subsistence oriented and fulfills multiple functions that contribute more to food security [2]. The demand for livestock products is increasing due to the growing urban population, while farm areas are shrinking considerably as a result of an increase in the population [3]. Livestock also plays an important role in providing export commodities, such as live animals, hides and skins to earn foreign exchanges to the country. On the other hand, draught animals provide power for the cultivation of the smallholdings and for crop threshing virtually all over the country and are also essential modes of transport to take holders and their families long-distances [4]. The livestock sector in Ethiopia plays significant role in the national economy. It contributes 15-17% and 35-49% of the total and agricultural Gross Domestic Product (GDP), respectively and provides livelihood for 37-87% of the population [5].

Ethiopia is home for at least nine breeds and 14 traditional sheep populations [6]. The country has a diverse sheep population of about 14 sheep types in four major groups, i.e. sub-alpine short fat-tailed, highland long fat-tailed, lowland fat-rumped/tailed and lowland thin-tailed [7]. The sub-alpine short fat-tailed group consisting of Menz, Tikur and Wollo and Simien sheep types is predominantly found in the central and northern highlands at an altitude of above 2500 m. In this area, sheep are mainly reared for income generation from the sale of lambs at market age although they are also important as a source of food, manure and socio cultural benefits [7, 8].

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. 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 [9].

Corresponding Author: Nurlign Mohammed, Department of Animal Science, College of Agriculture,
Woldia University, Woldia, Ethiopia.

The farmers' decision of selection criteria could be affected by breed; production system and herd size. The traits traditionally considered as criteria for selecting breeding stock are important in describing the adaptive attributes and genetic merits of the indigenous livestock and in identifying farmers' choice of sheep breeds and the underlying factors that determine the choice of genetic stock used [10]. The objective of this review is to know the classification, breeding practices and selection criteria of indigenous sheep of Ethiopia.

Origin of Sheep: Domestication of sheep is thought to have begun in the central Fertile Crescent especially the upper parts of the Tigris and Euphrates rivers [11]. Archaeological and molecular genetic evidence suggests that sheep's (*Ovis Aries*) wild ancestor was the Asiatic mouflon (*O. orientalis*) and that it was domesticated about 11, 000 years ago in the Fertile Crescent region [11].

Sheep belong to the sub-family Caprinae, family Bovidae. The genus Ovis include all sheep, while domesticated sheep belong to the species *Ovis Aries*. There is more confusion and disagreement about the ancestry of sheep than any other animals. This difficulty arises from the bewildering number of breeds and the marked changes produced by domestication. Sheep are extremely versatile and since domestication they have spread throughout the world and currently there are more than 850 distinct breeds of sheep scattered throughout the world [12].

Diversification of Sheep Breeds: Following domestication, further diversification among breeds has stemmed from selection by man for numerous characteristics such as appearance, color, size and wool production [13]. The modification which domestication brought about resulted from alteration in the mating system whereby inbreeding, out breeding and assortment mating became the predominant mating system as opposed to random mating. The process of domestication brought about a number of morphological and physiological modifications in sheep. Consequently, breeds of sheep differ markedly in adaptability to different environments and in performance for traits that influence efficiency of production and product quality. Environmental changes under conditions of domestication would have permitted genetic variation to become more evident and thus more readily influenced by selection and the altered mating system [12].

The genetic variation among breeds for production traits does not imply that one breed is better than the other. The value of breed diversity is that producers can identify and use a breed or breeds that perform at a level consistent with marketing goals and with production resources such as feed availability, labor, facilities and managerial skill [12].

Sheep Breed Classification in Ethiopia: The classification based on their importance is not common in Africa; rather sheep breeds are classified based on their tail form and hair type. In Ethiopia, six sheep breeds are available.

The fourteen sheep types were categorized into four groups (sub-alpine short-fat-tailed, highland long-fat-tailed, lowland fat-rumped, lowland thin-tailed) based on their ecological distribution, geographic proximity, tail types and tail form/shape. Earlier studies used the tail type [14] and the eco-regional distribution [15] to describe some of the sheep types. Inclusion of tail form/shape in the current study enabled identification of two groups of fat-tailed sheep which differ in other important characteristics.

Sub-Alpine Short-Fat-Tailed: Sub-alpine short-fat-tailed sheep inhabit a contiguous central-northern highland area (2000 - 3600 m) [7].

Highland Long-Fat-Tailed: The group is distributed over the southern and south-western mid-highlands (1500 to 2500 m). The tail is fat and long reaching the hocks, broad at the base and upper third with a long tapering end. Such inconsistencies could be due to the unique tail shape in this group which could be the result of influence from a thin-tailed ancestor [7].

Lowland Fat-Rumped: Afar and Black-Head-Somali (BHS) sheep constitute the lowland fat-rumped group Adal (Adal and Afar are synonymous) sheep are also traditionally described as fat-tailed, but categorized as fat-rumped [16]. Our observation is that BHS be classified as fat-rumped and Afar as fat-tailed sheep. Here, BHS and Afar are classified under the same group as from a systematic point of view; fat-rumped and fat-tailed sheep are more closely related than other sheep types [16].

Lowland Thin-Tailed: This group is found adjacent to the thin-tailed sheep region of the Sudanese desert [7].

These falls into three breed groups: the fat-tailed hair sheep, the fat-tailed coarse wool sheep and the fat-rump hair sheep. The study of Solomon Abegaz Guangul [17] indicated the presence of long-thin tailed sheep breeds in North West and Western part of the country on the border area with Sudan. According to Sisay Lemma [18], they classified sheep breeds of the Amhara Region into

Table 1: Ethiopian sheep classification

Breed group	Breed	Population	Tail type/shape	Fiber type
Short-fat tailed	Simien	Simien	Fatty and short	Fleece
	Short-fat tailed	Sekota, Farta, Tikur, Wollo, Menz	Fatty and short	Fleece
Washera	Washera	Washera	Fatty and short	Hair
Thin-tailed	Gumz	Gumz	Thin and long	Hair
Long-fat-Tailed	Horro, Arsi	Horro, Arsi-Bale, Adilo	Fatty and long	Hair
Bonga	Bonga	Bonga	Fatty and long	Hair
Fat rump Sheep	Afar, Blackhead Somalia	Afar, Blackhead Somalia	Fat rump/fat tail hair, Fat rump/tiny tail	Hair

Source: [7]

four groups based on agro-ecology and morphological characteristics. 1).The central highland sheep: include Farta, Tikur, Menz, Wollo, Shewa/Legegora, Sekota/Abergele sheep; 2) Rift valley: include Afar sheep; 3) North western highland: include Agew/Dangla sheep, Wegera sheep, Semien sheep; and 4) North western lowland sheep: include Gumuz/Shankila sheep. According to Solomon Gizaw [7] conducted morphological and molecular characterization of Ethiopian sheep breeds by targeting those sheep populations traditionally recognized by ethnic and/or geographic nomenclatures. Based on his finding, the Ethiopian sheep breeds are classified into 14 traditional populations in 9 breeds within 6 major breed groups as indicated in Table 1.

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. 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 [9].

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 [8, 19-22].

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 [9].

Breeding Practices: Sheep breeders without a breeding ram indicated that they use neighboring ram or their ewe mated with breeding ram from other flock in communal grazing land. Most important reasons for keeping more than one ram were for fattening and selling [23]. According to Nurlign Mohammed [23] mating was predominantly uncontrolled and some amounts were controlled.

Natural mating was identified as the method used to breed sheep. Female animals are served randomly by any intact male in the flock. Reason for uncontrolled mating was because of communal grazing and watering point and lack of sufficient number of rams. According to Tesfaye Getachew [8], who stated that reason for uncontrolled mating in Menz and Afar areas was because of communal grazing land and watering point. On the other hand, no controlled breeding was identified in some studies of the country.

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 [24].

Selection Criteria of Breeding Rams: Among selection criteria considered, appearance or body size was ranked first by sheep owners in Basonawerena and Angolelatera districts. Traits like appearance/body size, colour, fast growth and pedigree were all considered are important at both districts and given due emphasis in selecting breeding rams [24]. 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 [9].

Selection Criteria of Breeding Ewes: The higher proportion of ranks for mothering ability, reproductive performances and conformation traits was 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 [24].

CONCLUSION

Indigenous sheep types were categorized into four groups (sub-alpine short-fat-tailed, highland long-fat-tailed, lowland fat-rumped, lowland thin-tailed) based on their ecological distribution, geographic proximity, tail types and tail form/shape. Majority of farmers recognize the importance of selection and practiced with their own selection criteria's. Appearance/conformation, fast growth, coat colour, tail size, lambing interval and age at first sexual maturity were the most important selection criteria for rams and ewes. Sheep breeders without a breeding ram indicated that they use neighboring ram or their ewe mated with breeding ram from other flock in communal grazing land. Selection of breeding ewes and rams the outstanding females and males were kept for breeding while unwanted ones were disposed mostly through sale. Generally, stage of selection for breeding ram was different from breeding ewes; rams were selected at their youngest age, whereas, ewes were selected mostly at older age. Therefore, indigenous sheep of Ethiopia are generally classified in to 14 based on their ecological distribution, geographic proximity, tail types and tail shape; mating was predominantly uncontrolled and appearance/conformation, fast growth, coat color were most selection criteria of ewes and rams.

Conflict of Interest: Author declares that there are not conflicts of interest.

REFERENCES

1. CSA (Central Statistical Agency), 2018. Central Statistical Agency of the Federal Democratic Republic of Ethiopia. Agricultural Sample Survey of 2017/18 (2010 E.C).Volume II. Report on Livestock and characteristics (Private peasant Holdings), Central Statistical Agency, Addis Ababa, Ethiopia.

2. Roessler, R., A.G. Drucker, R. Scarpa, A. Markemann, U. Lemke, L.T. Thuy and A.Z. Valle, 2008. Using choice experiments to assess smallholder farmers' preferences for pig breeding traits in different production systems in North–West Vietnam. Ecological Economics, 66(1): 184-192.

3. Siegmund-Schultze, M., G. Legesse, Girma Abebe and A. Valle Zárate, 2009. Bottleneck analysis of sheep production systems in southern Ethiopia: Comparison of reproductive and growth parameters. Options Mediterranean's, A no. 91, 2009 – Changes in sheep and goat farming systems at the beginning of the 21st Century.

4. CSA (Central Statistics Agency), 2016. Agricultural sample survey report on livestock and livestock characteristics (private peasant holdings). Volume II, Statistical bulletin, 578, Addis Ababa, Ethiopia.

5. CSA (Central Statistical Authority), 2011. Agriculture Sample survey Statistical bulletin. Addis Ababa, Ethiopia.

6. Solomon Gizaw, Sisay Lemma, H. Komen and J.A.M. van Arendonk, 2007. Estimates of genetic parameters and genetic trends for live weight and fleece traits in Menz sheep. Small Rumin. Res., 70: 145-153.

7. Solomon Gizaw, H. Komen, O. Hanote and J.A.M. Van Arendonk, 2008. Indigenous sheep resources of Ethiopia: types, production systems and farmers preferences. Anim. Genet. Res. Inf., 43: 25-39.

8. Tesfaye Getachew, Aynalem Haile, Markos Tibbo, A. K. Sharma, J. Sölkner and M. Wurzinger, 2010. "Herd Management and Breeding Practices of Sheep Owners in a Mixed Crop-livestock and a Pastoral System of Ethiopia" 5(8): 685-91. doi:10.5897/AJAR10.392.

9. Berhane Hagos, Kefyalew Alemayehu and Zeleke Mekuriaw, 2015. "Traditional Management Practices, Breeding Objectives and Trait Preference for Indigenous Sheep in Northern Ethiopia" 3(2): 1-17.

10. Thiruvenkadan, A.K., K. Karunanithi, M. Murugan, K. Arunachalam and R. Narendra Babu, 2009. A comparative study on growth performance of crossbred and purebred Mecheri sheep raised under dry land farming conditions. South African Journal of Animal Science 39(Supplement 1) South African Society for Animal Science Peer-reviewed paper: 10ᵗʰ World Conference on Animal Production, pp: 121.

11. Zeder, A., 2011. The origins of agriculture in the Near East.Current Anthropology, 52(4): S221-S235.

12. Traore, A., H.H. Tamboura, A. Kabore, L.J. Royo, I. Fernandez, I. Alvarez, M. Sangare, D. Bouchel, I.P. Poiveye, D. Francois, A. Toguyeni, L. Sawadogo and F. Goyache, 2008. Multivariate analysis on morphological traits of goats in Burkina Faso. Arch. Tierz., Dummerstorf, 51(6): 588-600.

13. Kosgey, I.S. and A.M. Okeyo, 2007. Genetic improvement of small ruminants in low-input, smallholder production systems: Technical and infrastructural issues.Small Rumin. Res., 70: 76-88.

14. MOA, Ministry of Agriculture-Ethiopia, 1975. National policy on sheep research and development. Report of The Technical Committee. Mimeograph. MOA, Addis Ababa, Ethiopia.

15. Sisay, L., 2002. Phenotypic classification and description of indigenous sheep types in the amhara national regional state of ethiopia. MSc thesis, Department of Genetics, University of Natal, Pietermaritzburg, South Africa.

16. Epstein, H., 1971. The Origin of Domestic Animals of Africa, Vol. 2. Africana Publication Corporation, New York, pp: 719.

17. Solomon Abegaz Guangul, 2007. In situ characterization of Gumuz sheep under farmer's management in north western lowland of Amhara region.An M.Sc. Thesis Presented to the School of Graduate Studies of Alemaya University of Agriculture, Dire Dawa, Ethiopia, pp: 89.

18. Sisay Lemma, 2009. Phenotypic characterization of indigenous sheep breeds in the Amhara National Regional State of Ethiopia. A M.Sc. Thesis presented to the School of Graduate Studies of Haramaya University.

19. Duguma, G., T. Mirkena, A. Haile, L. Iñiguez, A.M. Okeyo, M. Tibbo, B. Rischkowsky, J. Sölkner and M.X. Wurzinger, 2010. Participatory approaches to investigate breeding objectives of livestock keepers. Livestock Research for Rural Development. Volume 22, Article #64. Retrieved April 19, 2015, from http://www.lrrd.org/lrrd22/4/ dugu22064.htm.

20. Solomon Gizaw, Hans Komen and Johan A.M. Van Arendonk, 2010. Participatory definition of breeding objectives and selection indexes for sheep breeding in traditional systems. J. Anim. Sci., 128: 67-74.

21. Liljestrand, J., 2012. Breeding practices of Red Massai sheep in Massai Pastoralist Communities. Master Thesis, Uppsala, Sweeden.

22. Zonabend, E., T. Mirkena, J.O. Audho, J. Ojango, E. Strandberg, A. Näsholm, B. Malmfors, A.M. Okeyo and J. Philipsson, 2014. Breeding objectives for Red Maasai and Dorper sheep in Kenya– a participatory approach. Proceedings, 10ᵗʰ World Congr. Genet. Appl. to Livest., 1: 1-3.

23. Nurlign Mohammed, Kefyalew Alemayehu and Tesfaye Getachew, 2017. Herd Management and Breeding Practices of Indigenous Sheep Population in South Wollo, Eastern Amhara; Ethiopia. Journal of Natural Sciences Research www.iiste.org ISSN 2224-3186 (Paper) ISSN 2225-0921 (Online) 7(11): 2017.

24. Demeke Haile, Solomon Gizaw and Kefelegn Kebede, 2015. "Selection Criteria and Breeding Practice of Sheep in Mixed Crop Livestock Farming System of North Shoa , Ethiopia" 5(21): 168-74.