

**Review Article**

Review on Production Systems, Farmers Trait Preferences and Breeding Practice of Indigenous Sheep Breeds in Ethiopia

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To cite this article:Tarekegn Demeke. Review on Production Systems, Farmers Trait Preferences and Breeding Practice of Indigenous Sheep Breeds in Ethiopia. *American Journal of Plant Biology*. Vol. 5, No. 4, 2020, pp. 99-104. doi: 10.11648/j.ajpb.20200504.14**Received:** October 23, 2020; **Accepted:** November 3, 2020; **Published:** November 23, 2020

Abstract: In Ethiopia sheep serve as a source of income, meat, milk, skin, manure and employment for smallholder rural farmers. Sheep are the most preferred animals by rural poor communities as they require small investment, have shorter production cycles faster growth rates and greater environmental adaptability as compare to large ruminant. The objective of this senior seminar is reviewing on Production Systems, Selection criteria and Breeding practice of indigenous Sheep Breeds in Ethiopia. Rural households are practicing animal husbandry in diverse production systems and climatic zone which are classified as three major different production systems; highland sheep-barely, mixed crop-livestock and pastoral and agro-pastoral production systems. However, sheep production and productivity in the country is challenged by scarcity of feed, diseases outbreak, poor infrastructure, lack of market information, lack of knowledge, absence of planned breeding programs and policies. The existed sheep type in the country is really the output of human intervention and natural selection. Traits like coat color, tail type, horn and ear size of sheep can also have dynamic effect on the price of sheep marketing. For selecting breeding ram's farmers consider different traits like body conformation, coat color, tail type/size, growth rate, sexual drives, dentation and the quality of being adapted and record of ancestors. Breeding ewes are selected by farmers as a replacement stock based on their Coat color, twining ability, lamb growth, lamb survival, age at first lambing and lambing intervals. In Ethiopia the main objective of sheep production is to provide income, meat, milk, skin, manure and employment for smallholder rural farmers. In Ethiopia both pure-breeding and crossbreeding are the most common sheep breeding practice. Farmers practice both selection and crossbreeding to improve their breeding stocks. Therefore, the economic value each trait should be assessed because it influenced the market value of sheep and the decision of farmers in selecting breeding stocks. The establishment of standard marketing systems and market information calls further investigation.

Keywords: Sheep, Production Systems, Selection Criteria, Breeding Practice, Ethiopia

1. Introduction

Small ruminant have a unique specialization in smallholder agriculture from the fact that they require small state of being invested, have shorter generation interval, faster growth rates and greater environmental adaptability as compare to large ruminants [1]. They provide food and income for poor farmers and support survival of many farmers in the tropic and sub [2]. The formation and growth of cities in the country resulted in increased demand for sheep meat, which also offers significant reward for market

oriented production. Ethiopia's vast sheep population, estimated at about 30.70 million, it is distributed across the heterogeneous agro-ecological zones of the country [3]. In order to make best use from sheep keeping operation, it is important and prerequisite to have a comprehensive understanding of the whole situation through assessing the production environment (climate, feed availability and diseases prevalence); the production systems (production practice, preferences, socio economic circumstance and level of inputs use) and productive and adaptive characteristics of sheep breeds [4].

Sheep production and productivity in the country is challenged by scarcity of feed, diseases outbreak, poor infrastructure, lack of market information, lack of knowledge, absence of planned breeding programs and policies [5]. The productivity of indigenous sheep breed is clearly low due to such constraints the indigenous sheep types having the necessary power to add the degree of importance in subsistence way of living of the low input smallholder and pastoral production systems [6]. Genetic betterment of the indigenous livestock through suitable techniques or selection and breeding programme is the need of the day especially under such constraints [7]. However, the farmers decision of selection criteria could be affected by breed, production system and herd size [8]. Moreover, for successful improvement programs, compatibility of the genotypes with the farmers' breeding objectives and the production systems is crucial [9]. However, sheep production system in diverse climatic zones has not been plenteously studied as well as the farmers' production objective and breeding practice [10]. Therefore, the objective of this review is reviewing the production system, farmer's trait preference and breeding practices of indigenous sheep type in the Ethiopia.

2. Literature Review

2.1. Sheep Production Systems in Ethiopia

Ethiopian sheep production systems are broadly classified into "contemporary" and "traditional" [11]. The "contemporary" system is practiced only in few places such as research center and in small scale intensive production systems while most of sheep production depends on the free range system of production [12]. Common features of extensive production systems are small number of animals per unit area, low output per animal, relatively less use of improved technology and use agricultural by-products rather than procured inputs [12]. Rural households are practicing animal husbandry in diverse production systems and climatic zone which are classified as three major different production systems; highland sheep-barely, mixed crop-livestock and pastoral and agro-pastoral production systems. Characterized by different production goals and priorities, management strategies and practices, and constraints [13, 14]. The majority of the respondents (94.2% and 96.7%) in Meket and Gidan districts, respectively, practiced mixed crop livestock production system. The possible reasons for this might be the area receives good amount of rainfall and moderate temperature for crop production. According to the report of the respondents, 5.8% of respondents in Meket district and 3.3% of the respondents in Gidan district were practice agro pastoral production system [15].

Table 1. Sheep production system in Ethiopia.

Production system	Environment	Geographical region	Characteristics of feature production system	
			Main products	Scale of production management
Subalpine sheep cereal system	Subalpine (>3000 m.a.s.l)	Menz area, wag himra, parts of north Gondar (Debark, Dabat, Janamora, Wegera, South Gondar, North and South Wollo, Tigray State.	Meat, fiber, manure, skin, unreliable long season barely	Medium scale, sheep production, semi intensive/extensive, low input
Highland cereal livestock system	Highland (2000-3000m.a.s.l)	Moist of Oromia, west and East Gojjam and Agew Awi Zone of Amhara State, Central Tigray	Mainly cereal cropping, meat, manure and skin	Small scale sheep production, semi intensive, low input
Highland perennial crop system	Highlands (1500-2000 m.a.s.l)	Coffee, inset and fruit area of southern and Oromia	Mainly perennial cash crops (coffee, chat, inset; meat skin)	Minor sheep production, semi intensive, low input, some practice tethering
Lowland crop livestock system (agro-pastoral)	Submoist/moist lowland (1000 m.a.s.l)	Benishangul Gumz, lowland of Amhara, Tigray, Oromia	Cereals, sesame, cotton, meat, skin	High level of livestock keeping, extensive/ semi intensive, low input
Pastoral system	Semi-arid/arid (1000 m.a.s.l)	Pastoral region in Somali, Afar, Oromia, Southern States	Meat, milk, skin, minimal or no cropping	Rangeland based large scale sheep production, extensive, low input

Source: [16].

2.2. Trait Preference and Selection Criteria

The available breed type is definitely the result of long term manmade and natural selection [17]. Selection by considering morphological and production characteristics is the prerequisite to replace breeding stock [18]. In developing countries, acceptance of new breeds by farmers is influenced not only by their productive performances but also by non-production traits like beauty and appearance of the animal [19] and cultural values [20]. Traits like coat color, tail type, horn and ear size of sheep can also have significant influence on price in the predominant live animal marketing [21]. According to the report of [22] plain black and black associated colors are not

preferred by farmers in South Wollo zone and implies that traits associated with this color being at risk.

According to the report of [15] in Meket and Gidan District of North Wollo Zone, the price of sheep were significantly affected by body hair coat color. Sheep having white, red and brown coat color were sold immediately by high-priest than black sheep. Before the past ten years the dominant color of sheep in thus districts was black but examining the results of the present study against the earlier ones indicated that the proportion of white is increasing and that of black is decreasing through time. This is strongly supported by the preference of farmers to white and red colors against the black color for which the farmers are exercising some kind of

selection and crossbreeding for the preferred ones. Other traits like ear size, tail type/shape and horn had significant influences on the price of sheep in Meket and Gidan Districts. Generally, sheep having white, red and brown coat color, large size, polled/short horn and long and broad tail were marketable than sheep having black coat color, rudimentary ear, short and thin tail and long horn.

2.3. Selection Criteria of Breeding Rams

On physical characteristics, farmers base their selection on color, body size/length, tail size and appearance, horn presence and appearance and ear size and shape ranked in decreasing order of importance to select rams in southern Ethiopia [23]. In the northern part of Ethiopia of Northern Wollo Habru 77% and in Gubalafto 63% of the population practiced selection for breeding ram and ewe. Lambing interval, mothering ability, coat color and twinning with index of 0.22, 0.19, 0.17 and 0.15 are the selection criteria for ewe [24]. For selecting a breeding ram criteria to be considered by farmers in Afar and Menz area are appearance or body size, coat color, tail type/length, fast growth, libido, age, adaptation and pedigree [25]. In Selale area and East Hararge indicated that traits like appearance was the most considered characters in selection of rams [26, 27].

Large body size red/brown coat color, tail with long, broad and twisted at the end are the most preferred traits by most of the farmers to select breeding rams in Adili Kaka, Horro, West and south western Ethiopia [28]. As reported by the authors in Gozamen, hulet iju and Sinan districts of east Gojjam zone all farmers give attention for appearance to select breeding rams [9]. Usually large body size, polled, coat color of red, brown and white/creamy color, long and broad tail were mostly preferred traits to select breeding rams to the next generation in Tocha, Mareka and Konta districts, Southern Ethiopia [29].

2.4. Selection Criteria of Breeding Ewes

Appearance, mothering ability, Performance of progeny and twinning ability were the most preferred traits to select breeding ewes for the next generation in East Gojjam Zone, Ethiopia [9]. Appearance, twinning rate, age at first birth and lambing interval in Tocha district, coat color, longitivity, twinning rate and lambing interval in Mareka district and color, appearance, twinning rate and age at first lambing in Konta district were the most preferred trait to select breeding ewes [29]. Breeding ewe can also be selected based on parameters like, twinning ability, lamb growth, lamb survival, age at first lambing and lambing intervals [30]. Like that of ram, appearance is the most considered factor for selecting ewe [25]. Across all the production systems, overall appearance is the most preferred attribute for selecting both breeding rams and breeding ewes. The next most important were fast growth and coat color for rams and mothering ability for ewes [31].

2.5. Breeding Practices of Sheep Production in Ethiopia

The dominant mating systems in Wogide and Borena district is uncontrolled but in some extent controlled mating was

practiced in Legambo district and the use of ram from own flock predominantly practiced in South wollo Zone [22]. In Ethiopia mating is predominantly uncontrolled in most of the production systems. However, controlled mating is practiced to some extent to match lambing time with wet season and to avoid indiscriminate breeding in the pastoral production system. In Meket and Gidan districts, North Wollo Zone, the entire rural households are practiced both pure and crossbreeding. Majority rural farmers (82.9%) in that Districts are followed naturally uncontrolled mating system. Reason for uncontrolled mating in both districts is because of communal grazing land and watering point [15]. In the south-east lowlands and north-western of the Somali Region in eastern Ethiopia, respectively indicated that controlled breeding to capture both the desired selection criteria and to match lambing with the rainy season enhances the survival rate of the offspring [32].

In Ethiopia breeding males are reared separately with female sheep instead smallholder farmers get the service from neighbors' or use communal rams. Some farmers have breeding rams originated from the same flock and few purchase from market. The ratio of rams older than one year to ewe flocks is 1:6. Majority of small holder farmers practice selection for breeding rams and breeding females [30]. Birth is the major form of sheep breed acquisition across all production systems and sheep acquisition in the form of gift is one method of sheep gaining [33]. The selected rams for breeding start mating few ewes at the age of 12-18 months. After two years, one ram can serve fully 20-30 ewes and can serve up to 3.1 years of mean age after which it will be usually disposed through sale or slaughter [34, 35].

2.6. Production Constraints of Sheep Production in Ethiopia

Feed shortage many authors described the seasonal feed shortages, both in quality and quantity, and the associated reduction in livestock productivity in different parts of the country [36-39]. In line with this, feed shortage is also a major production constraint in many parts of the country [40, 41]. The major challenges in traditional production system is that the system is not market directed, poor marketing and infrastructure system, and weak financial facility, etc. [42]. Poor Management is creating a favourable environment for disease incidences. Early mortalities (as high as 50% in lambs) are among the most important losses associated to managements like cold stress, starvation, mis-mothering, etc. [29].

Weakening of traditional management of communal grazing lands, over grazing, encroachment of cropping in to the grazing land, human population growth were the main factors for declining and shrinkage of the primarily grazing land in Meket and Gidan districts. In other cases, Soil erosion, decline in fallow land productivity and size, deforestation, poor management of the sloppy topography are observed as the agents increasing the feed shortage problem in Meke and Gidan districts, North Wollo Zone, Ethiopia. Poor veterinary services and absence of transportation facilities were also identified as limiting factors. The swampy nature of communal grazing areas in the high land area of Meket district

associated with high incidence of internal parasites such as liver fluke infestation also influence sheep production [15].

Water shortages is a common problem for both human and livestock consumption in most rift valley parts of the country. It has been reported to be a limiting factor for animal productivity in most mid and lowland areas of Alaba, Dale, Boricha and Kindo Koisha Woredas of Southern region. In eastern, north-eastern and south-eastern part of the country there is also critical shortage of water; however, there are breeds adapted to lowland agro ecologies through their physiological adaptation mechanisms [43, 44]. Restrictions of water may result in poor nutrition and digestion, because there is a relationship that exists between water intake and consumption of roughages, particularly during dry season [45].

3. Conclusion

Small ruminant have a unique specialization in smallholder agriculture. In Ethiopia sheep serve as a source of income, meat, milk, skin, manure and employment for smallholder rural farmers. Sheep are the most preferred animals by rural poor communities as they require small investment, have shorter production cycles faster growth rates and greater environmental adaptability as compare to large ruminant. The formation and growth of cities in the country resulted in increased demand for sheep meat, which also offers significant reward for market oriented production. Sheep production and productivity in the country is challenged by scarcity of feed, diseases outbreak, poor infrastructure, lack of market information, lack of knowledge, absence of planned breeding programs and policies.

The productivity of indigenous sheep breed is clearly low due to such constraints the indigenous sheep types having the necessary power to add the degree of importance in subsistence way of living of the low input smallholder and pastoral production systems. Genetic betterment of the indigenous livestock through suitable techniques or selection and breeding programme is the need of the day especially under such constraints. Traits like coat color, tail type, horn and ear size of sheep can also have dynamic effect on the price of sheep marketing. For selecting breeding ram's farmers consider different traits like body conformation, coat color, tail type/size, growth rate, sexual drives, dentation and the quality of being adapted and record of ancestors. Breeding ewes are selected by farmers as a replacement stock based on their Coat color, twining ability, lamb growth, lamb survival, age at first lambing and lambing intervals. Farmers practice both selection and crossbreeding to improve their breeding stocks.

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