

Selection Criteria and Breeding Practice of Sheep in Mixed crop livestock Farming System of North Shoa, Ethiopia

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ABSTRACT

The study was carried out in Basonawerena and Angolelatera districts in north shoa zone of Amhara region, Ethiopia. The objectives of the study were to assess breeding practice and selection criteria of sheep. A total of 150 households were selected to collect data through semi-structured questionnaire. The results showed that the major feed resources during dry and wet seasons were natural pasture and crop residue. Based on the survey result primary objective of sheep production in the study area was income generation with index value of 0.335 and followed by breeding (0.30) and meat production (0.195). Mating was uncontrolled but in rare case there is control mating, the reason for uncontrolled mating was sharing of common grazing land and watering point. The primary trait preferences of the farmers in selection of rams were appearance, growth rate and pedigree the most frequently reported traits whereas twinning ability, appearance and lamb growth were mentioned as traits given due emphasis in choosing future breeding ewes. The farmers preferred white coat colour, unwanted colour was black. It can be conclude that for designing and implementing of breed improvement program. It is important to consider farmers breeding practice trait preference and management system.

Key words: selection, breeding practice, production constraints

1. INTRODUCTION

Ethiopia is endowed with huge livestock resources of varied and diversified genetic pools with specific adaptations to a wide range of agro-ecologies. 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 (Roessler *et al.*, 2008; Gemeda *et al.* 2010). 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 (Siegmond-Schultze *et al.*, 2009).

The population of sheep in Ethiopia is estimated at 29.33 million, out of which about 72.77 percent are females, and about 27.23 percent are males from total number of sheep 99.78% are indigenous breeds (CSA, 2015). In spite of the large population of sheep and the great role of sheep both to the lively hood of resource-poor farmers and the national economy at large; the current level of on farm productivity in the smallholder production system is low. Sheep production and productivity in the country is constrained by feed shortages, diseases, poor infrastructure, lack of market information and technical capacity, and an absence of planned breeding programs and breeding policies (Gizaw *et al.* 2013).

To develop sustainable genetic improvement schemes under small holder situation, knowing of indigenous animal breeding practice techniques is very important. Lack of such knowledge leads to unrealistic breeding goal in genetic improvement (Zewdu *et al.* 2006). Previous study have identified breeding objective and breeding practices associated with the raring of indigenous sheep in Ethiopia (Getachew *et al.* 2011; Edea *et al.* 2012). Thus, this study was aimed at assessing traditional sheep breeding practices, selection criteria and sheep production constraints.

2. MATERIAL AND METHODS

2.1. Study Area

The study was conducted in two districts i.e., Basonawerena and Angolelatera in North Shoa, Ethiopia. Basonawerena district is located at 09^o41'N longitude and 39^o31'E latitude. It is about 135 km North of Addis Ababa. It covers about 121,300 hectare with mean elevation 2800-2845 m.a.s.l. The mean annual temperature is 13.6°C and annual rainfall range between 1000mm to 1200mm, with two rainy seasons, namely Meher (July to September), which denotes the big rain season while Belg denotes the small rain season from February to May. Angolelatera district is located at 9^o 38'N longitude and 39^o 26' E latitude. It is about 110 km North of Addis

Ababa. The district covers an area of 989,000 hectare and elevation of the district ranges from 1700 to 3044 m.a.s.l. The mean annual temperature is 10°C and the annual rain fall ranges from 930-1100mm. The district has two rainy seasons namely Meher (July to September), which denotes the big rainy season while Belg denotes the small rainy season from March to April and also irrigation is one of the activity held in September and May

2.2. Data collection and analysis

Data were generated by administrating a structured questionnaire, and from secondary sources. Secondary data on climate conditions, topography, agro-ecology and sheep population, sheep production constraints were collected from agricultural rural development office. A questionnaire was prepared by adopting a questionnaire prepared by ILRI (International Livestock Research Institute)-OADB (Oromiya Agricultural Development Bureau) for survey of livestock breeds in Oromiya (Workneh and Rowlands, 2004). This questionnaire was interpreted in local language to make it first understandable. The questionnaire was pre-tested before administration and some re-arrangement, reframing and correction in accordance with the respondents' perception were done. The questionnaire was administered to the purposely selected household heads by enumerators recruited and trained for this purpose. Based on the questionnaire information on breeding practices: mating type, sheep production objectives and selection criteria were gathered. Data were entered into Statistical Package for Social Sciences (SPSS 20). The same statistical package was used to summarize the data and results are presented mainly in the form of descriptive tabular summaries for the two farming systems. Chi-square was employed when required to test the independence of categories or to assess the statistical significance. Indices were calculated to provide ranking of selection criteria and 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.

3. RESULTS AND DISCUSSION

3.1. Farming activities

In both districts, farmers practice crop and livestock production. Both livestock and crop have vital role in each and every living process of the farmers as indicated below in Table (1).

Table 1. Importance of major farming activities in the study area

Importance	Districts				Over all
	Basonawerena		Angolelatera		
	N	%	N	%	
For food consumption					
Crop production	87	96.67	56	93.33	95
Livestock production	3	3.33	4	6.67	5
χ^2 -value	78.4*		45.07*		
For Income					
Crop production	24	26.67	8	13.33	20
Livestock production	16	17.77	17	28.33	23.05
Both	50	55.56	35	58.34	56.95
χ^2 -value	23.3*		18.9*		

N = number of observation, %=Percentage of respondent; *=P<0.05

Feed consumption in both district highly depend on crop production. Whereas for sources of income both crop production and livestock production is used. Similar result reported by Amelmal (2011) in Dawro zone.

3.2. Purpose of keeping sheep

The reasons for keeping sheep are related to the farmers' needs in the long or short term. The results of this survey revealed that sheep play multi-functional roles in both districts. Table 2 presents ranked purposes of keeping sheep. The results indicated that farmers in both districts keep sheep primarily as source of income

secondary for breeding and third for meat. Similar multi- purpose functions of sheep rearing were reported for sheep keepers in the central highlands of Ethiopia (Abebe, 1999). In contrast to these findings, Kosgey (2004) reported low ranking of small ruminants for breeding purpose among the smallholders and pastoralists in Kenya.

Multiple functions are particularly important in low and medium input production environments. Different studies addressed the importance of multiple values of indigenous livestock breeds in developing countries in low input system (Kosgey, 2004; Mwacharo and Drucker, 2005; Wurzinger *et al.* 2006; Zewdu *et al.* 2006).

Table 2. Ranked purpose of keeping sheep as indicated by respondents

Purpose of keeping	District								
	Basonawerena				Angolelatera				Over all
	R1	R2	R3	Index	R1	R2	R3	Index	Index
Income	52	10	5	0.34	22	21	13	0.33	0.335
Breeding	25	40	10	0.30	25	12	9	0.30	0.30
Meat	11	30	30	0.23	5	10	22	0.16	0.195
Manure	2	10	39	0.12	5	12	10	0.14	0.13

3.3. Constraints to Sheep Production

Identifying the constraints of sheep production is a base to solve the problems and to improve sheep genetic resource and sheep productivity (Bosenu *et al.*, 2014). Ranking of sheep production constraints are presented in Table 3. Among the constraints feed shortage and disease were considered as more important problem in both Basonawerena and Angolelatera areas with varying intensity. In Basonawerena feed shortage, disease and lack of initial investment ranked first second and third with index of 0.32, 0.30 and 0.19, respectively. Moses (2006) stated that feed shortage is the number one issue stated by small ruminant researchers, extension agents and farmers. This is associated with deforestation, lack of pastureland, human population pressure claiming more land for cropping and the cultivation of marginal and eroding land for crops instead of grazing. However, disease, feed shortage and lack of initial investment ranked first, second and third with index of 0.34, 0.27 and 0.21, respectively in Angolelatera district.

Table 3. Ranking of sheep production constraints

Constraints	Districts								Over all Index
	Basonawerena				Angolelatera				
	R1	R2	Index	Index	R1	R2	R3	Index	
Disease	35	23	10	0.30	23	21	13	0.34	0.32
Predator	3	4	7	0.04	3	2	6	0.05	0.045
Feed shortage	28	31	27	0.32	18	15	12	0.27	0.295
Labour shortage	5	10	13	0.09	3	5	7	0.07	0.08
genotype	4	5	8	0.06	2	4	6	0.06	0.06
lack of initial investment	15	17	25	0.19	11	13	16	0.21	0.02

3.4. Breeding Practices

Natural mating was identified as the method used to breed sheep. All farmers reported that female animals are served randomly by any intact male in the flock. Similarly, studies in the country reported that natural mating was a method to breed different livestock species and almost all farmers practiced this system (Samuel, 2005). Controlled breeding was practiced by few in Basonawerena (13.33%) and Angolelatera (10%) farmers. Reason for uncontrolled mating in both areas was because of communal grazing and watering point and lack of sufficient number of rams. Tesfaye (2008) 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 (Samuel, 2005).

About 78% of the interviewed smallholder farmers in Basonawerena area and 80% in Angoletera area indicated that they were able to identify the sire of a new born lamb by relating the lamb with the colour and appearance/conformation of the ram. The same method was reported by Tesfaye (2008).

3.5. Selection criteria for breeding ram

Selection criteria for selecting breeding rams as ranked by farmers in the study area is presented in Table 4. Among selection criteria considered, appearance or body size was ranked first by sheep owners in Basonawerena and Angolelatera with an index of 0.32, and 0.26, respectively. In Basonawerena pedigree, tail type, colour and fast growth were ranked second, third, fourth and fifth with index of 0.23, 0.18, 0.14 and 0.14, respectively. In Angolelatera fast growth, pedigree, colour and tail type/length were ranked second, third, fourth and fifth with index of 0.24, 0.15, 0.14 and 0.05, respectively. Traits like appearance/body size, colour, fast growth and pedigree were all considered as important at both districts and given due emphasis in selecting breeding rams. Related to this result, Bosenu *et al.* (2014) in Selale area and Wossenie *et al.* (2014) in East Hararghe indicted that traits like Appearance was the most considered characters in selection of rams.

Table 4. Selection criteria for selecting breeding ram as ranked by farmers in the study area.

Trait	Districts								Overall Index
	Basonawerena				Angolelatera				
	R1	R2	R3	Index	R1	R2	R3	Index	
Appearance (Body Size)	30	12	24	0.26	24	12	19	0.32	0.29
Colour	6	21	17	0.14	6	7	17	0.14	0.14
Growth	8	17	17	0.14	19	11	7	0.24	0.19
Tail type /length	15	21	11	0.18	0	7	3	0.05	0.115
Pedigree	30	12	8	0.23	11	9	5	0.15	0.19
Adaptability	0	3	3	0.02	0	2	4	0.02	0.02

3.6. Selection criteria for breeding ewe

Selection criteria for selecting breeding ewes as ranked by farmers in the study districts are presented in Table 5. Similar to males, farmers in Angolelatera give due attention primarily towards appearance (index=0.33). Similar selection criteria was reported by Tesfaye (2008) in Menz district. Twining ability, lamb growth, colour and age at first sexual maturity were ranked as second third fourth and fifth with an index of 0.32, 0.18, 0.12, and 0.03 respectively. In contrast to Angolelatera farmers, Basonawerena farmers do not include appearance as primary criterion for selecting breeding ewes. Instead, they ranked twining ability (index=0.26) as first, followed by age at first sexual maturity (index=0.19) and appearance (index=0.14).

Table 5. Selection criteria for selecting breeding ewes as ranked by farmers in the study area.

Trait	Districts								Over all Index
	Basonawerena				Angolelatera				
	R1	R2	R3	Index	R1	R2	R3	Index	
Appearance	17	5	12	0.14	18	25	13	0.33	0.235
Colour	4	8	1	0.05	3	6	23	0.12	0.085
Lamb growth	8	11	14	0.11	16	3	9	0.18	0.145
Tail type	0	0	2	0	0	2	0	0.01	0.005
Pedigree	7	2	3	0.05	0	0	3	0.01	0.03
Twining ability	32	15	17	0.26	23	21	4	0.32	0.29
Age at first sexual maturity	17	18	16	0.19	0	3	4	0.03	0.11
Lambing interval	1	18	4	0.08	0	0	0	0	0.04
Lamb survival	8	12	13	0.11	0	0	2	0	0.055
Wool	0	0	6	0.01	0	0	0	0	0.005
Horn	0	1	2	0	0	0	2	0	0.235

3.7. Coat colour preferences

Beauty traits like coat colour and pattern play significant role in ranking decision of animals (Ndumu *et al.*, 2008). Such decision on the ranking might be associated with socio-cultural practices, market demand, disease tolerance, and environmental factors. Ranking of farmers for the most preferred sheep coat colour in each districts of the study area is summarized in Table 6. White colours were the primarily preferred colours by farmers in Basonawerena and Angolelatera. Solomon *et al.* (2005) indicated that farmers in East Wollega and West Shoa preferred white coloured sheep. Brown and red colour are the second and third preferred in Basonawerena respectively. Among the combination of colours, red and white (*wesera*) and brown, colours were the second and third preferred coat colours in Angolelatera district, respectively.

Table 6. Rank of sheep coat colour preferences of the respondents in each district

Coat colour	Districts								Over all Index
	Basonawerena				Angolelatera				
	R1	R2	R3	Index	R1	R2	R3	Index	
White	72	5	4	0.43	37	16	9	0.42	0.425
Red	5	27	25	0.17	6	6	22	0.14	0.155
Dalecha (brown)	5	43	33	0.25	8	17	13	0.20	0.225
Wesera(red and white)	8	15	28	0.15	9	21	16	0.24	0.195

According to all respondents plain black colour was solely the most undesired colour in both districts. Next to plain black white with black was the second undesirable coat colour in both districts. Sheep having plain black, white, black with red/white, and dark grey were reported as un preferred colours in Menz, Afar, Adiya kaka, and Horro areas (Tesfaye, 2008 and Zewdu, 2008).

4. CONCLUSION

Mixed crop and livestock farming describe the study area in this farming system sheep play multi-functional roles. Most farmers in both of the sites keep sheep primarily for source of income followed by mating, meat consumption and manure.

Majority of farmers gave more attention for traits like appearance, twining ability lamb growth and colour. Majority of the farmers considered selection of breeding rams and ewes. In order to minimize the failure of breed

improvement programs it is important to involve farmers considering the existing breeding practices, selection criteria and trait preferences of the community. To minimize the constraints that hinder sheep production animal health extension service and forage development should be given high emphasis.

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