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BREEDING OBJECTIVE, BREEDING PRACTICES AND SELECTION CRITERIA OF INDIGENOUS SHEEP IN WESTERN AMHARA, ETHIOPIA

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ABSTRACT

The purpose of this research was to generate organized information on breeding objectives, breeding practices and choice criteria of farmers in Farta, Lay Gayint and Sekela districts. A sum of 180 households was selected to survey questionnaires in selected districts, Semi structured questioner and group discussions were used as information sources. The average separation of the Statistical Analysis System was used to analyze the flock size and structure in the three districts. An index was calculated to supply an overall ranking of categorical variables. The average flock per house holding the study districts was 8.8±0.05 heads. For source of income (0.45), home use (0.28), saving (0.20), and manure (0.04) were the reasons of sheep keeping. The uncontrolled mating system was practiced by most (72.6 %) of households. In the study districts 37.7 % of farmers received their own breeding rams while the rest farmers shared with their neighbors. Appearance (0.38), growth rate (0.34), color (0.13), pedigree (0.10) and tail type and size (0.10) were the sheep owner's standards for breeding ram, while the appearance (0.29), coat color (0.18), lamb growth (0.17), lambing interval (0.12), age at first lambing (0.09) and lamb survival (0.08) where the farmers' selection criteria for breeding ewes. Going through a breed improvement program considering the farmers' production objectives and existing breeding practices is important. Nevertheless, designing alternative breeding strategies to key out the optimal number of traits to be considered and size of flocks to be mixed is crucial before setting up a breeding plan.

Contribution/Originality: This study is one of very few works which have investigated to evaluate the existing breeding practice and choice criteria of sheep farmers' in Ethiopia. This inquiry is important to design breeding strategies for improvement breeding practices and choice of traits chosen by farmers in the study districts.

1. INTRODUCTION

In developing countries, livestock production is mostly subsistence oriented and fulfills numerous capacities that contribute more to food security (Roessler *et al.*, 2008; Duguma *et al.*, 2010).The small ruminants account for 40% of cash income earned by farmers, 19% of the total value of subsistence food derived from all livestock production and 25% of total domestic meat consumption (Hirpa and Abebe, 2008). Sheep have multipurpose function and contribute to the livelihood of a large number of small and marginal farmers (Tefera and Jabarin, 2006; Thiruvenkadan *et al.*, 2009). Smallholder sheep productions are the major source of food security serving a diverse role, including cash income, savings, fertilizer, socio-cultural functions and fiber yield. Sheep are

especially significant for farmers in the subalpine highlands and pastoralist and agro-pastoralist where crop production is unreliable. The highland area of smallholder sheep production systems characterized by erratic and unevenly distributed rainfall, recurrent drought and scarcity in livestock feeds and feed that is poor in quality (Solomon *et al.*, 2008). In those production environments the role of sheep in supporting the livelihood of smallholder farmers is increasing due to recurrent crop failure (Yeheyis *et al.*, 2004; Tibbo, 2006).

Ethiopian sheep are classified based on their morphological characteristics and geographic distribution into 14 sheep types/population (Gizaw, 2008). Locally available breeds of livestock are important economic resources since they adapt to the existing production constraints such as feed shortages, prevalent diseases, etc. According to CSA (2017) there are about 30 million numbers of sheep populations in Ethiopia of which about 27.16 % Males and 72.84 % Females. Within the country almost all (99.85 %) of the sheep breeds are local breeds. Compared to temperate breeds indigenous breeds productivity is low, but their ability to survive and produce in the harsh and mostly unpredicted tropical environment is remarkable (Awgichew, 2000). In malice of the large population of sheep and the great part 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 down. The country sheep production and productivity 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).

Existing breeds are adapted to the existing environmental condition which is characterized by feed shortage and disease challenge (Gizaw, 2008). Environmental pressure also maintains a wide range of genotypes, each adapted to a specific set of circumstances (Getachew *et al.*, 2010). Despite the role sheep play in the economic system, sustainable improvement programs targeting the species have been lacking. The development of relevant breeding objectives and breeding strategies for livestock in general and sheep in particular for smallholder and pastoral production systems has been noted as an issue that has received little attention in the tropics (Kosgey, 2004). The sheep have multipurpose role like a source of income, meat, skin, manure and coarse wool or long hairy fleece, means of risk avoidance during crop failure and their role in different cultural functions during thefestival is well documented (Kosgey *et al.*, 2008). Indigenous knowledge of animal breeding practices and techniques is important to develop sustainable genetic improvement schemes under smallholder situations. Lack of such knowledge leads to the setting up of unrealistic breeding goals in the design of livestock genetic improvement programs and the consequence of which can put in danger the conservation of indigenous animal genetic resources (Wuletaw *et al.*, 2006). The farmers' decision on selection criteria could be affected by breeds, production system and herd size (Thiruvenkadan *et al.*, 2009).

Table-1. Description of the study districts.

Features	Farta	Lay Gayint	Sekela
Attitude (m)	1920-4135	1300-3500	2000 – 3535
Temperature (°C)	9-25°	9 - 19°	11.8 - 28.4°
Rainfall (mm)	900-1099	600-1100	1000-2000
Human population	232,181	206,499	138,691
Animal population			
Sheep	113,978	88,836	90,532
Goat	51556	48758	11,089
Agro-ecology			
Frost (%)	1.5	2.7	-
Mountain (%)	42.5	45.4	65.0
Midland (%)	56.0	39.4	35.0
Low land (%)	-	12.5	-
Longitude	37°31'-38°19'	38°12'-38°19'	37°00'0.00"
Latitude	11°32'-12°03'	11°32'-12°16'	11° 09'60.00"

Previous study has identified breeding objective and breeding practices associated with the raring of indigenous sheep in Ethiopia (Getachew *et al*., 2011; Zewudu *et al*., 2012). Nevertheless, the information is limited about breeding objective and practices, trait preferences, and selection criteria of sheep improvement in the study area. Therefore, this study was important to identifying existed breeding objectives, practice and selection criteria of smallholder farmers in Farta, Lay Gayint, and Sekela districts.

2. MATERIALS AND METHODS

2.1. Study Area Description

Description of the study districts is represented in Table 1 and Figure 1. The study was conducted in Farta and Lay Gayint districts in South Gondar Zone and Sekela district in West Gojjam Zone of Amhara Region, Ethiopia.

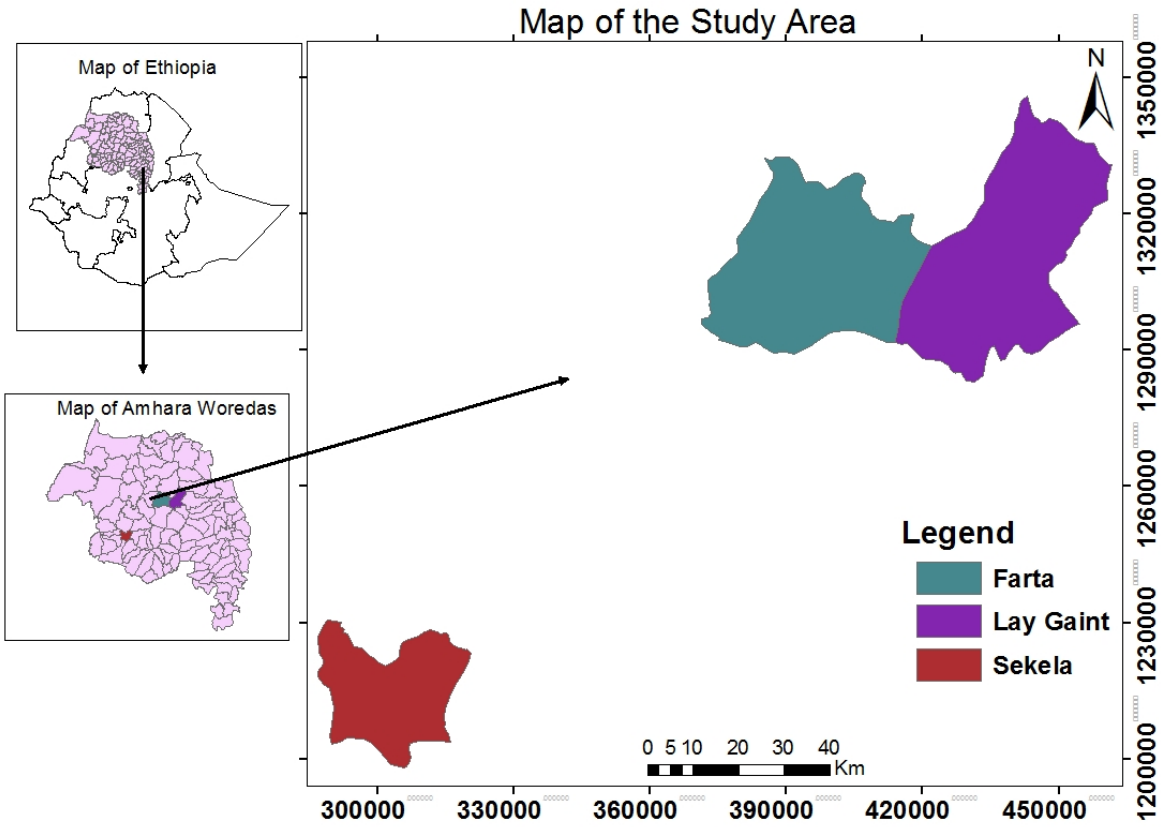

Figure-1. Map of the study districts.

2.2. Site Selection and Sampling Techniques

Discussions were carried with the Zone agriculture bureau livestock experts before deciding on the survey areas to know in which district sheep population was concentrated. Based on their sheep potential and accessibility the three districts were selected purposely. Purposive sampling was too applied to 'kebeles' considering sheep population and accessibility. So, three rural kebeles for each district (a sum of nine Kebeles) were chosen for the survey. A total 180 (60 from each district 20 from each kebeles) respondents were selected by simple random sampling.

2.3. Data Collection Methods

Both primary and secondary information sources were collected and used in this study. From the respective district of Agriculture offices secondary data like climatic data (temperature and rain), geographical location, and human and livestock demography were collected. Semi-structured questionnaire and group discussions were used to

generate primary data. To get to the questionnaire language easily understandable by the respondents converted into the local (Amharic) language. The questionnaire was pre-examined before the start of actual study and some re-arrangement, and correction were made to make sure respondent perception. Enumerators were recruited and trained the questionnaires for the purpose administered the household, with a help of the researchers. Sheep flock size and structure, keeping sheep purpose, practices of breeding and criteria of selection were collected by trained enumerators used for breeding ewe and ram. Also, data was collected from the group discussion. The group was formed by sheep farmers, elders, local leaders, socially respected individuals, women and livestock experts. History of sheep, sheep utility pattern, the main problems of sheep production, unique characteristics of sheep production system, social laws like communal land utilization were the major point's discussions were centered.

2.4. Data Management and Statistical Techniques

Necessary information collected from the study was coded and recorded in Microsoft Excel 97-2003. Data from focus group discussion were held back for their completed before the conclusion of each academic term. Data collected from focus group discussions were summarized and synthesized and used to better understand the household survey results. Sheep flock size and structure data were analyzed by mean separation of SAS version 9.2 (SAS, 2008). The adjusted Tukey-Kramer comparison test was applied to compare the sub factor brought a significance difference. Descriptive statistics were utilized to distinguish the results as percentages for all districts.The ranking of reasons for keeping sheep was done by Microsoft excel , the ranking being expressed as an Index = Sum of (3 x ranked first + 2 x ranked second + 1 x ranked third) given for an individual reason divided by the sum of (3 x ranked first + 2 x ranked second + 1 x ranked third) for all reasons (Kosgey, 2004). Similar indices were calculated for ranking selection criteria associated with both breeding ewes and rams.

3. RESULT AND DISCUSSION

3.1. Sheep Flock Size and Structure

Average sheep flock size and structure per household in the study districts is represented in Table 2. The flock owner determined the makeup of the flock on the basis of economic and management considerations. The overall average sheep flock size in the study districts was 8.8 heads. The proportion of the different classes of animals reflects the management decision of the producers which in turn is determined by their production objectives (Gizaw *et al*., 2010). In the flock Lay Gayint district ewe lambs and breeding rams were significantly higher in number ($P< 0.05$) than in Farta and Sekela districts. However, among the three districts there was no significance difference ($P> 0.05$) in flock size/structure, for the number of breeding ewes, lambs less than six months, ram lambs and castrated males.

Table-2. Average sheep flock size and structure per household in the study districts.

Class of sheep	Districts									Overall (N=180)		
	Farta (N=60)			Lay Gayint (N=60)			Sekela (N=60)					
	N	Mean±SE	%	N	Mean±SE	%	N	Mean±SE	%	N	Mean±SE	%
Breeding	234	3.9±0.14	44.7	242	4.0±0.12	40.3	211	3.6±0.07	45.7	687	3.8±0.12	43.4
Lambs (< 0.6 yr)	172	2.9±0.35	34.5	170	2.8±0.51	28.5	156	2.6±0.06	33.5	498	2.8±0.06	31.7
Ewe lambs	37	0.6±0.06^{b}	7.4	78	1.3±0.13^{a}	13.0	34	0.6±0.03^{b}	7.7	149	0.8±0.04	9.4
Ram lambs	41	0.7±0.08	8.4	63	1.0±0.12	10.5	41	0.7±0.08	8.9	145	0.8±0.05	9.1
Rams (> 1 yr)	15	0.2±0.02^{b}	2.9	40	0.7±0.05^{a}	7.0	12	0.2±0.02^{b}	2.5	67	0.4±0.03	4.5
Castrated	9	0.2±0.30	2.3	12	0.1±0.01	0.6	8	0.1±0.30	1.6	29	0.2±0.02	1.8
Total	508	8.6±0.01	100	605	9.9±0.04	100	462	7.8±0.02	100	1575	8.8±0.05	100

$^{a, b}$ values with different subscript are significant at ($P< 0.05$) level. SE = standard error, N = Number of respondents, n= number of animals. % = Percentage values (animals by sex and age group) was calculated across class of sheep.

In this work, as likened to other age groups breeding ewes made a major share (43.4 %), followed by lambs less than 6 months (31.7 %) in all districts while the breeding ram accounted only 4.5 %.Granting to the group discussion made by farmers male sheep was sold for income generation at an early age than females indeed on the off chance that high quality rams are holding up for breeding as it were and commonly castrated at an early age for fattening or simple management. Breeding males to breeding females the proportion was 1: 4.73, 1: 4.62 and 1: 3.11 in Farta, Sekela, and Lay Joint districts, respectively. These results were comparable to the ratio of breeding males to breeding females was 1: 5.01 in Goncha Siso Enesie District reported by Getie *et al.* (2017). The ratio observed in this study indicates that in the flock low numbers of breeding rams are kept.

3.2. Purpose of Keeping Sheep

The aim of keeping sheep in the study areas is shown in Table 3. According to Jaitner *et al.* (2001) information of reasons for keeping animals could be a prerequisite for determining operational breeding objectives. Rank of purposes of keeping sheep in Farta, Lay Gayint, and Sekela districts were the comparative indeed in spite of the fact that the file esteem for each of the destinations are diverse. The role of sheep as a multipurpose animal was common to all the study districts and related to the farmers need in the long or short term. The outcome of the current study indicated that most of the farmers in all the study districts primarily sheep reared for generating income (0.45) which was utilized for purchase seed and plant food, emergency events, educational fees and for other family expenses. Having sheep for meat for home consumption (0.28) was rated second in all the study districts. Saving was the tertiary purpose of rearing sheep in the study districts.

Table-3. Purpose of keeping sheep in the Farta, Lay Gayint, and Sekela district as ranked by farmers.

Purpose of holding	Districts												Overall
	Farta				Lay Gayint				Sekela				
	1st	2nd	3rd	Index	1st	2nd	3rd	Index	1st	2nd	3rd	Index	Index
Income	392	24	0	0.47	392	24	0	0.43	406	0	10	0.46	0.45
Meat	28	252	65	0.28	21	252	75	0.30	14	144	155	0.27	0.28
Saving	0	84	205	0.21	7	78	150	0.19	0	168	110	0.21	0.20
Manure	0	0	56	0.03	0	6	80	0.05	0	42	30	0.04	0.04
Ceremony	0	0	30	0.01	0	0	56	0.03	0	0	44	0.02	0.02

The Index = sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for giving for each cause of keeping divided by the sum divided by the sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for all causes of preserving in a study site.

3.3. Breeding and Herd Management

3.3.1. Breeding Ram Ownership and Mating System

Farmers breeding practice in the study area is shown in Table 4. Overall, 37.7 % of the respondents have the breeding ram in Lay Gayint (40 %), Farta (38.3 %), and Sekela (35 %) of the answerers. This result was different from 7.33% and 14% of the household were kept their own breeding males in DebreLibanos and Wuchale, respectively (Abera *et al.*, 2014a). In contrast to this, Abera *et al.* (2014b) reported that above 23% and 50% native sheep keepers in Gubalafto and Habru lacked breeding rams types in North Wollo zone, And also districts in Tanqua-Abergelle (93.7%), Kola-Tembien (91.46 %) and Adwa (86%) had their own indigenous breeding ram (Hagos *et al.*, 2018). Whereas Sekela (65%), Farta (61.7%) and Lay Gayint (60%) sheep owners who do not have breeding ram, stated that they tend to use neighbor breeding ram or random mating with available rams at communal grazing and watering points.

Granting to the group discussion with farmers, most farmers were using free grazing, widely in seasons other than summer and the three districts, there are two ways to access rams: the most common strain is at grazing areas/ watering point where masses of related households (that normally settle in close proximity) graze together and the other is rams could be adopted and brought to the flock areas or ewes in heat may be taken two rams. The social network plays major role in sharing of breeding rams and this traditional ram sharing practice important to

breed improvement in organizing of ram use groups involve the communal ram use through different arrangements including ram groups to increase breeding male to breed female ratio. This is a good chance to initiate a community based breeding program. In Farta district mating the ewe from borrowing neighbor rams 65%, communal grazing area 10% and both borrow neighbor ram and communal grazing area 25%. In Sekela district mating the ewe from borrowing neighbor ram, communal grazing area and both borrow neighbor ram and communal grazing area were 81.7%, 5%, and 13.3%, respectively. In Lay Gayint district 59 % borrow ram from neighbor, 9 % mating in communal grazing land, 14% mating in both borrowing from neighbors and in grazing land and very few owners (3.2 %) were used communally (group) rams given by the extension office.

Ram sharing tradition and herd mixing could potentially serve to downplay the risk of inbreeding and to speed up genetic improvement by increasing selection differential. These practices agreed with Abera *et al.* (2014a) report on Selale indigenous sheep and report on Horro and Bonga breeds (Zewdu, 2008). In the present work, in all the three districts most respondents' answer that they were not practicing controlled breeding mating in Lay Gayint, Farta, and Sekela were 76.3 %, 73.3%, and 68.3%, respectively. Moreover, most of the respondents (84%) allow the ram to mate his daughter, mother and sister Lay Gayint, Farta and Sekela were 93%, 85.7%, and 73.3%, respectively. The pattern that allows mating within relatives can be associated with accumulation of inbreeding over time. Those in agreement with that of Getachew *et al.* (2010); Abera *et al.* (2014a) reported that the mating system of small ruminant under smallholder farmers are predominantly uncontrolled. Similarly, studies in the country reported that natural mating was a method to breed different livestock species and almost all farmers practiced this system (Menbere, 2005). Farmers in Sekela (73.3%) and Lay Gayint (66.7 %) districts claimed that they were attempting to identify the sire of the lambs by relating lambs to the color and appearance /shape of rams. Only according to the farmers in Farta 60% of the respondents try to identify the sire of lambs by observing rams during mating, this suggests that farmers practice rams selection and it is important to work breed improvements.

Table-4. Farmers breeding practice.

Breeding and herd management	Farta		Lay		Sekela		Overall	
	N	%	N	%	N	%	N	%
Breeding ram presence								
Yes	23	38.3	24	40.0	21	35.0	68	37.7
No	37	61.7	36	60.0	39	65.0	112	62.3
Allow rams to mate close relatives								
Yes	51	85.0	56	93.3	44	73.3	151	83.9
No	9	15.0	4	6.7	16	26.7	29	16.1
Allow your ewe to mate by any ram								
Yes	56	93.3	53	88.3	58	96.7	167	92.8
No	4	6.7	7	11.7	2	3.3	13	7.2
Allow your ram to serve other than your ewes								
Yes	47	78.3	60	100	58	96.7	165	91.7
No	13	21.7	-	-	2	3.3	15	8.3
Identify sire of lambs								
Yes	57	95.0	52	86.7	59	98.3	168	93.3
No	3	5.0	8	13.3	1	1.7	12	6.7
How to identify sir of lamb								
Appearance and color	17	28.3	40	66.7	44	73.3	101	56.1
Knowing the sire during mating	36	60.0	15	25.0	12	20.0	63	35.0
Both	7	11.7	5	8.3	4	6.7	16	8.9

N=number of respondents.
% = percentage.

3.4. Breeding Rams Selection Criteria

Choice standards for selecting breeding rams as ranked by farmers in the survey area is given in Table 5. The existed sheep breed is definitely the result of long-term man-made and natural choice. In the study area selection of ram for the next generation was common. The foremost measure to select breeding ram was the appearance/conformation (0.38) accompanied by growth rate (0.34) and coat color (0.13) and tail type (0.10). According to focal group discussions with farmers more preferred color is brown/ red and snowy and the preferred tail type was short fatty tail. These selection practices agreed to Zewdu (2008) report on Horro and Bonga breeds. Similarly, this result was in lined with Getachew (2008) report appearance or conformation ranked first for both Afar and Menz sheep owners with an index of 0.35 and 0.29, respectively and this result was similar with in selecting a breeding ram, appearance /conformation ranked first for both DebreLibanos and Wuchale sheep owners with an index of 0.42 and 0.311, respectively (Abera *et al*., 2014a). And also this result was comparable with appearance or body size was ranked first by sheep owners in Basonawerena and Angolelatera with an index of 0.32, and 0.26, respectively (Haile *et al*., 2015).

Table-5. Breeding rams selection criteria rank value.

Selection criteria	Districts												Overall
	Farta				Lay Gayint				Sekela				
	1st	2nd	3rd	Index	1st	2nd	3rd	Index	1st	2nd	3rd	Index	Index
Appearance/ conformation	456	121	20	0.38	288	198	70	0.41	216	231	160	0.36	0.38
Tail type and size	12	154	160	0.10	96	209	200	0.08	84	143	70	0.11	0.10
Horn	0	0	40	0.05	72	24	40	0.06	0	10	9	0.04	0.05
Growth rate	144	319	20	0.33	228	165	150	0.32	252	198	120	0.35	0.34
Adaptability	0	0	10	0.03	0	0	20	0.02	0	11	30	0.05	0.03
Color type	60	11	170	0.13	12	33	70	0.10	96	44	160	0.17	0.13
Character	12	0	20	0.02	36	22	20	0.07	24	22	30	0.05	0.03
Pedigree	36	33	130	0.12	0	22	20	0.10	72	0	10	0.09	0.10

The Index = sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for giving for each selection criteria divided by the sum divided by the sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for all selection criteria in a study site.

3.5. Castration Practice

The percent of respondents who practiced ram castration and method of castration is presented in Table 6. The ratio of respondents who practiced castration and the average age of castration different from area to area. Both Sekela and Lay Gayint 91.7 % of the respondent practiced castration. In Farta district 81.7 % of the respondent have practiced castration. Traditional method of castration is practiced by more than 50% of respondents, in Farta (66.03%) and Lay Gayint (61.7 %) districts. And 31.8 % in Sekela district used traditional castration methods. In study districts wooden material locally known as '*Biter*' and smooth and circular waterway stone locally known as '*Alollo*' was used for traditionally closed castration. More than 50 % of the rams in all the three study districts castration age of rams were from 1.5 up 2 years in Lay Gayint (70.7 %), Farta (64.2%) and Sekela (53.3 %). In Farta 33.9 %, in Sekela 26.6%, and in Lay Gayint 17.2 % of the respondents practiced ram castration at the age of greater than two years. These results castrated comparable with the farmers in both Watchable and Debre Libanos districts rams from 2 years to 2.5 years of age (Abera *et al*., 2014a). Alemayehu (2011) reported castration age of 6 months to 18 months in Konta, Mareka and Tocha districts of southern Ethiopia.

The motivation for the castration of rams across the three studied districts was mainly to improve fattening so that it can get a good price in local markets. In Sekela (70.3 %) Lay Gayint (63.3 %) and Farta (54.9 %) districts castrate rams for fattening purpose. In addition, 16.7 % in Sekela district, 15.0 % in Lay Gayint and 9.8 % in Farta

district performed castration to control/breeding/ pregnancy from unwanted ram. In Farta district 33.3 % of the respondent practiced castration for both fattening and control breeding.

Most of the farmers the reasons that have not practiced castration are selling the ram at an early age in Lay Gayint 100 %, 93.1 % in Sekela and 87.5 % in Farta districts.

Table-6. Castration practices of districts.

Activities		Districts						Overall	
		Farta		Lay Gayint		Sekela			
		N	%	N	%	N	%	N	%
Do you practice castration	Yes	49	81.7	55	91.7	55	91.7	159	88.4
	No	11	18.3	5	8.3	5	8.3	21	16.4
Reasons of castration	Control breeding	5	9.8	9	15.0	9	16.7	23	13.8
	Fattening	28	54.9	38	63.3	38	70.3	104	52.1
	Both	17	33.3	7	3.3	2	3.7	26	13.4
	Better temperament	1	1.9	5	8.3	5	9.3	11	6.5
Age of castration	Less than 12 months	1	1.9	7	12.1	12	20.0	20	11.3
	1-2 years	34	64.2	41	70.7	32	53.3	107	62.7
	1.5 to 2 years	35	66.1	48	82.8	44	73.3	127	74.0
	Greater than 2 years	18	33.9	10	17.2	16	26.6	44	26.0
Castration methods	Modern	18	33.96	22	36.7	30	68.2	70	46.5
	Traditional	35	66.03	38	61.7	14	31.8	87	53.5

N = number of respondents.
% = Percentage

3.6. Breeding Ewe Selection Criteria

Selection criteria for selecting breeding ewes as ranked by farmers in the study districts are shown in Table 7. In the study districts, farmers had different selection criteria for female sheep as breeding ewe. The foremost measure to select breeding ewe was the appearance/size (0.29) followed by coat color (0.18) and growth rate (0.17) and lambing interval (0.12). In whole, the study districts the primary criterion was appearance/size the index was Lay Gayint (0.31), Farta (0.29) and Sekela (0.28). This result was similar with selection criteria was reported by Getachew (2008) in Menz district and farmers in Angolelatera give due attention primarily towards appearance (Index=0.33) (Haile *et al*., 2015). In Farta, coat color, growth rate, lambing interval, lamb survival, and age at first lambing were ranked second, third, fourth, fifth, sixth with an index of 0.18, 0.14, 0.12, 0.10 and 0.08, respectively.

Table-7. Breeding ewe selection criteria rank.

Selection Criteria	Districts												Overall
	Farta				Lay Gayint				Sekela				
	1st	2nd	3rd	Index	1st	2nd	3rd	Index	1st	2nd	3rd	Index	Index
Appearance/size	324	121	110	0.29	386	66	80	0.31	312	198	80	0.28	0.29
Age at 1st lambing	36	198	140	0.08	24	220	30	0.10	48	66	90	0.09	0.09
Lambing interval	132	143	50	0.12	0	110	120	0.11	96	110	80	0.13	0.12
Growth rate	108	121	50	0.14	120	77	50	0.15	132	143	140	0.22	0.17
Coat color	48	0	0	0.18	0	33	70	0.19	0	33	50	0.16	0.18
Lamb survival	12	88	90	0.10	24	11	10	0.05	84	88	110	0.08	0.08
Liter size	60	0	30	0.06	12	0	70	0.04	12	0	20	0.01	0.03
History	0	55	30	0.03	108	66	150	0.05	24	22	20	0.03	0.04

The Index = sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for giving for each selection criteria divided by the sum divided by the sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for all selection criteria in a study site.

Coat color, growth rate, lambing interval , age at first lambing and lamb survival and pedigree were ranked second, third, fourth, fifth, and sixth with an index 0.19, 0.15, 0.11, 0.10, 0.05 and 0.05, respectively. In contrast to Farta and Lay Gayint farmers, Sekela farmers do not include coat color as secondary criterion for selecting breeding ewe. Instead growth rate (0.22), coat color (0.13) , lambing interval (0.13), age at first lambing (0.09) and lamb survival (0.08) were ranked second, third, fourth, fifth and sixth, respectively. During group discussion of Farmers in Sekela district said they do not preferred more twining rate because that decline growth rate of their lambs.

3.7. Coat Color Preferences

Farmers coat color preferences in the study districts is shown in Table 8. The discernment of a farmer for a particular coat color might be associated with socio-cultural patterns, market demand, disease tolerance, and environmental factors. Among the broad scope of colors, farmers do receive a preference only for certain types of colors. In Farta (0.36) and Lay Gayint (0.42) districts most of the communities were preferred coat colors such as solid red or light brown colors. In Sekela district the mixture of white and red/*Gosem* (0.51) color was more preferable followed by red (0.311) (Abegaz *et al*., 2005) also reported that in the East Wellega and West Shewa farmers preferred white and brown colored sheep. Black colored animals were not preferred by across the three sites, because of less demand for black sheep in the market and cultural taboo for home consumption. Almost all respondents in the study area, sheep color like black, mixed, spotted, gray and white/Jebema, were not preferred. The reported preference for coat color in this particular study is in agreement with the report of Zewdu (2008) in Adiyo Kaka and Horro communities and the report of in DebreLibanos and Wuchale districts.

Table-8. Color preferences of the study districts.

Preferred color	Districts												Overall
	Farta				Lay Gayint				Sekela				
	1st	2nd	3rd	Index	1st	2nd	3rd	Index	1st	2nd	3rd	Index	Index
White	69	26	24	0.33	18	20	39	0.22	15	20	22	0.18	0.21
Red	51	72	6	0.36	84	60	2	0.42	63	32	7	0.31	0.36
White and red	60	22	30	0.31	78	38	12	0.36	112	46	11	0.51	0.39

The Index = sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for giving for each preferred color divided by the sum divided by the sum of [3 for rank 1 + 2 for rank 2 + 1 for rank 3] for all preferred colors in a study site.

4. CONCLUSION AND RECOMMENDATION

The existed sheep breeds was played multi-functional roles in this mixed crop-livestock production system. Income generation, meat production through improving growth rate, lambing interval, appearance, age at first lambing, coat colour and physical appearance were found to be the breeding objectives of farmers. Small flock size characterized by replacing sire from own flock and mating of relatives is predominant in the area. This would cause a negative consequence on the genetic improvement and increment of inbreeding. Thus, designing alternative breeding strategies to key out the optimum number of traits to be considered and size of flocks to be mixed is crucial before setting up a breeding plan.

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