ON-FARM REPRODUCTIVE PERFORMANCE AND BREEDING OBJECTIVE OF SHEEP IN SIX SELECTED DISTRICTS OF TIGRAY, NORTHERN ETHIOPIA.

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ABSTRACT

The study was carried out in Atsibi Wonberta, Wukro Kilteawlaeo, Ofla, Alamata, Enderta and Degua Temben districts of Tigray Regional State of Ethiopia to assess the reproductive Performance and to describe the breeding objective of Sheep in the study area. A total of 12 peasant associations 2 from each district were selected randomly. A total of 180 households 30 from each district were selected randomly for the interview. Data were gathered through semi-structured questionnaire, focus group discussions and field observations. Data collected through questionnaire were described by descriptive statistics using JMP 5, 2002. In this study reproduction performance of sheep is assessed by their age at sexual maturity, age at first lambing, lambing interval, weaning age and lambing pattern. The overall estimated mean age at first lambing of ewes in the districts of Astibi-wonberta, Wukro-kilteawlaelo, Ofla, Alamata, Enderta and Degua-Tembien sheep was 18.15, 16.77, 16.7, 16.83, 17.77 and 16.77 months, respectively. The estimated mean lambing interval of highland sheep in Atsibi-Wonberta (9.6±0.7), Wukro-Kilteawlaelo (8.3±0.8), Ofla (6.3±0.7), Enderta (10.4±0.6), Degua-tembien (8.4±0.5) and Afar (Elle) sheep in Alamata is 7.6±0.5 months respectively. The average weaning age of sheep in the study districts was three to six months. But, in Atsibi-wonberta (30%), Ofla (43.33%) and Enderta (36.67%) districts the average weaning age was greater than six months. Lambing of sheep was the highest during the months of December and November with an index value of 0.34 and 0.26, respectively. Generally the reproductive performance of sheep in this study area implies that the sheep breeds have acceptable age range for breeding though it is late compared to temperate breeds. In the study area for ram selection, farmers target was for breeding purpose and market value and fattening ability of the ram.

Key words: Sheep reproduction; lambing; districts.

INTRODUCTION

Generally Tropical sheep are characterized by slow growth rate, able to breed throughout the year, adapted to live and produce under harsh environment, resistant/tolerant to disease, heat tolerant, ability to use poor quality feed, ability to survive on irregular supply of feed and water (Sahana *et al.*, 2004; Yilmaz *et al.*, 2004; Dixit *et al.*, 2005). Ethiopia has diversified genotypes and largest sheep population estimated to be 26.1 million (IBC, 2007, CSA, 2009). These animals are distributed in all part of the nation with the highest population (75%) found in the highland area of the country (Yacob, 1999).

Early maturing females are also known to have a relatively long and fruitful reproductive life (Mukasa-Mugerwa and Lahlou-Kassi, 1995). It is the single most important factor influencing flock productivity (ILCA, 1990). Age at sexual maturity (ASM), Age at first lambing (AFL) and lambing interval (LI) and weaning age are among the most important components of reproductive performance in sheep (Ibrahim, 1998, Mukasa- Mugerwa *et al.*, 2002, ILRI, 2007). In any small ruminant production system, high reproductive performance is a very important attribute and a major component of the overall production efficiency (Owen, 1976). Good reproductive performance is a prerequisite for any successful sheep production systems. Therefore this study was launched to address the following objectives;

➢ To assess the reproductive performance of sheep in the selected districts

➢ To describe the breeding objective of sheep in the study area.

3. MATERIALS AND METHODS

3.1*.* Description of the study area

The study was conducted in six districts namely, Atsbi-Wonberta, Wukro-Kilteawlaelo, Ofla, Alamata, Enderta and Degua-Temben. Atsbi-Wonberta and Wukro-Kilteawlaelo districts are found in Eastern zone of Tigray; while Ofla and Alamata are in Southern Zone of Tigray Regional State. The remaining two districts viz, Enderta and Degua-Temben are part of South Eastern of Tigray Region (figure 1). The mean annual temperature of the study areas varies from 14°c to 22°c. The mean annual rainfall ranges from about 400 mm to around 969 mm. The altitudes of districts were situated at 1500- 3200 masl. The farming system in all of the surveyed districts is a crop livestock mixed farming system. The major crops grown in Southern; South Eastern and Eastern zones of Tigray Regional state are sorghum, Teff (Eragrostis tef), maize in Alamata, Enderta and Wukro-Kilteawlaelo districts. Whereas, wheat, bean, barley, pea, lentil, grass pea, chick pea, rarely linseed wheat and other highland crops in Ofla, Atsibi-Wonberta, Degua-Tembien districts. Cattle, goat, sheep, equines, poultry and honey bees also reared in these districts. Detail description of the above six districts was made as follows (Table 1).
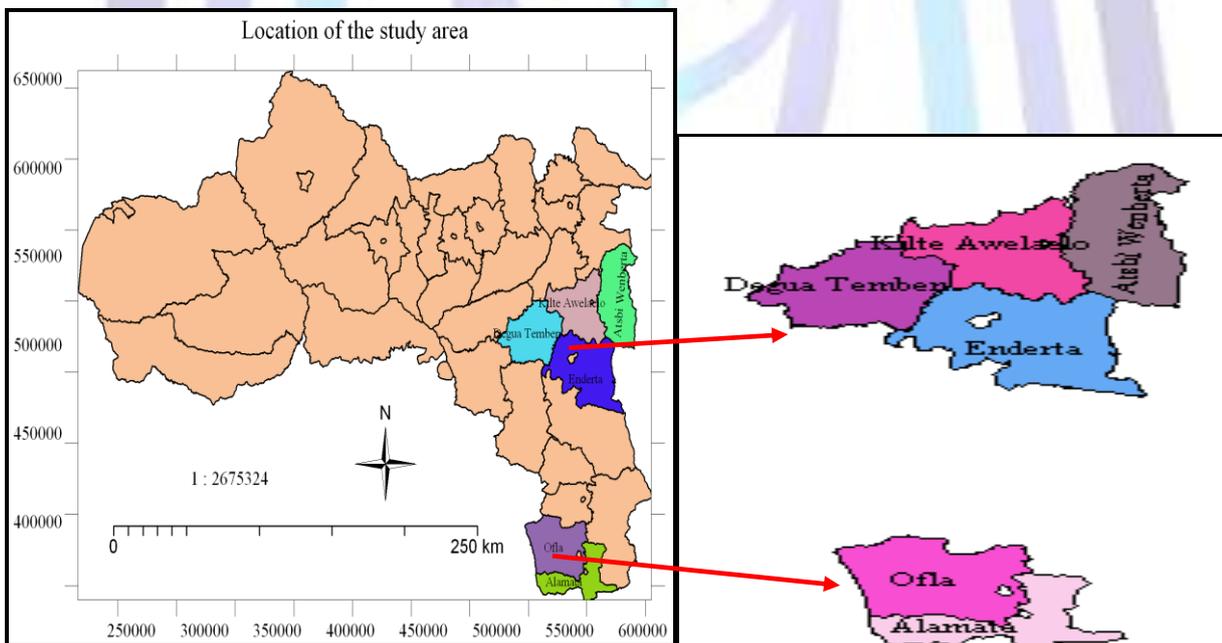

Figure1. Location of the study districts in Tigray Region.

3.2. Selection of the study site

Study sites were selected based on their suitability for sheep production, sheep distribution patterns, agro-ecology, and access to infrastructures like road and public transport. A rapid reconnaissance survey was done before the main survey to know the distribution and sampling framework from which sampling of district was taken. Two districts from each of three Zones (Eastern Tigray, South Eastern Tigray and Southern Tigray) were purposively selected. The selections of districts from the Zones were made to include one dominantly highland and one dominantly lowland district. The districts included in the study are (Atsbi-Wonberta, Wukro-Kilteawlaelo, Ofla, Alamata, Enderta and Degua-Tembien). A total of 12 peasant associations **(**Felege wein, Golgolnaele, Genfel, Aynalem, Menkere, Wonberet, Timuga, Limat, Debri, Maitsedo, Mahibere-silassie and Hagereselam), 2 from each district were selected randomly. A total of 180 households 30 from each district and 15 from each peasant associations were selected randomly for the interview.

3.3. Procedures and methods of data collection

Data from primary (observation, questionnaire and interview) and secondary sources (different offices) were collected. Data were generated through use of structured questionnaires, field observation and group discussions and from secondary sources**.** A modified questionnaire was prepared by adopting a questionnaire prepared by Oromiya Agricultural Development Bureau (OADB) for survey of livestock breeds in Oromiya (Workneh and Rowlands, 2004). The pre-tested questionnaires were administered to 180 households by the researcher and development agents.

3.4. Data management and analysis

Data collected through questionnaire were described by descriptive statistics using (*JMP5, 2002)*. Index was calculated to provide ranking of the breeding ram selection criteria and lambing pattern of sheep according to Musa *et al.* (2006).

4. RESULT AND DISCUSSION

4.1. Reproductive performance of sheep

In this study reproduction performance of sheep is assessed by their age at sexual maturity, age at first lambing, lambing interval, weaning age and lambing pattern.

4.1.1. Age at sexual maturity (ASM)

The age at sexual maturity of common highland ram in Atsibi-wonberta was 10.33±2.66 months. While the age at sexual maturity of *Elle* (Afar) ram was 6.87±0.86 and 8.03±1.09 months in Alamata and Enderta districts respectively (Table 2). Similarly, common highland rams (in Ofla, Wukro-kilteawlaelo and Degua-Tembien districts) attains sexual maturity at earlier age than Atsibi with average age of 6.7±0.84, 7.03±1.03 and 7.7±0.99 months respectively. The age at sexual maturity primarily depends on the nutrition supply during the growth period. Well fed ewe lambs may reach puberty at nine months, but when nutrition is poor, puberty may occur as late as twenty months (Gatenby and Humbert, 1991). But the result is not agreed with this range.

4.1.2. Age at first lambing (AFL)

The overall estimated mean age at first lambing of ewes in Astibi-wonberta, Wukro-kilteawlaelo, Ofla, Alamata, Enderta and Degua-Tembien sheep was 18.15, 16.77, 16.7, 16.83, 17.77 and 16.77 months, respectively (Table 2). This variation may be due to season of birth, litter size, maternal parity, nutrition and body condition score. This finding is comparable with previous works done on other breeds in different parts of Ethiopia. For instance, the age at first lambing for Gumuz sheep is 22.22 months (Beniam, 1992) and 13.67 months (Solomon, 2007). However, that of washera and menz sheep breed is 15.46 (Mengstie, 2008) and 18.5 (Abebe, 1999) months respectively. Similarly, the age at first lambing was 17.06 months reported by Niftalem (1990), for Menz breed at Debre Brehan. Generally, this result is in agreement with the report of Wilson and Murayi (1988) they indicated that age at first lambing for most of traditionally managed African ewes' ranges from 15 to 18 months. Similarly, the average ages of lambing for semi-arid and subhumid sub-Saharan countries were 16.9 and 16.2 months, respectively (Otte and Chilonda, 2002). This implies that the sheep breeds in the study area have acceptable age range for breeding though it is late compared to temperate breeds that reach puberty at the age range of 5-12 months (Susan, 2011).

4.1.3. Lambing interval (LI)

The estimated mean lambing interval of highland sheep in Atsibi-Wonberta (9.6±0.7), Wukro-Kilteawlaelo (8.3±0.8), Ofla (6.3±0.7), Enderta (10.4±0.6), Degua-tembien (8.4±0.5) and Afar (Elle) sheep in Alamata is 7.6±0.5 months respectively as presented in (Table 2). Lambing interval is affected by nutrition and management (Aseidu *et al.*, 1983), season (Wilson and Murayi, 1988; Peacock, 1996; Abebe, 1999), sex and breed (Wilson and Durkin, 1983), and year of lambing (Niftalem, 1990). Previous study of Solomon (2007) reported that the average lambing interval of Gumuz breed was 6.64 ± 1.13 months. Aseidu *et al.* (1983) also reported that in western African sheep ewes lambed at even 6 months interval without provision of any supplementary feeding and these sheep breeds in this study area can be considered as one of such Eastern African sheep ewes.

It has been reported that the lambing interval of black head Somali (BHS) sheep was 10.9 ± 2.33 months in Shinile and 10.01 ± 2.77 months in Erer district (Fekerte, 2008) and 10.53 months in Werer research station (Beniam, 1992). Peacock (1996) also reported the lambing interval of red Maasai sheep in Kenya pastoral areas 10.4 months. Similarly, the lambing interval for Menz breeds 13.17 months (Niftalem, 1990) and 8.37 months (Abebe, 1999) for the same breed. The lamping interval of Gumuz sheep also 6.64 months (Solomon, 2007).

4.1.4. Weaning age of sheep

The average reported weaning age of sheep is summarized in Table 3. According to the respondents, the overall average weaning age was greater than three months in all of the study districts. In Atsibi-wonberta district about 33.3% (N=9) of the farmers allow the lamb to suckle their ewes for three to four months. However, the remaining weans their lambs five to six months (36.67 %) of age. Majority (60%) of the respondents in Wukro-kilteawlaelo reported that weaning takes place at five to six months of age. The rest wean three to four months.

Generally the average weaning age of sheep in Wukro-kilteawlaelo, Alamata and Degua-Tembien districts was three to six months. But, in Atsibi-wonberta (30%), Ofla (43.33%) and Enderta (36.67%) districts the average weaning age was greater than six months. This increase in weaning age in the later districts might be due to the cold climatic condition and shortage of feed.

4.1.5. Lambing pattern (occurrence of lambing)

The distribution of lambing in the study districts ranged from September to January (Table 4). According to the index ranked by respondents, lambing of sheep was the highest during the months of December and November with an index value of 0.34 and 0.26, respectively, and the least during the months of August and March with an index value of 0.003 and 0.004, respectively.

In general, most lambing pattern occurred during the dry season indicating that conception rates are highest during the long rain season. This result is partially in agreement to the reports of Agyemang *et al.* (1985), and Niftalem (1990) for the menz breed, both on-station and on-farm flocks around Debre Berhan area, where most lambing occurred during the small and big-rainy seasons, which might be attributed to the difference in the availability of feeds at conception in the study areas. Moreover, variation in the size of land holdings to have low grazing land, the amount of availability of fallow lands and shortage of communal grazing lands which are major sources of feed might have contributed for the difference in the season of lambing for the study areas.

4.2. Breeding objectives and adaptive traits

Clear definition of breeding objectives might be difficult under subsistence level of managements with a wide range of production objectives and marketing strategies (ILRI, 2006).

In general, the results of this study suggested that farmers have multiple breeding objectives. These include large body size, coat color type (white, *Jimo,* red or brown and their combination), long and broad tails, early growth/meat production and reproduction, fertility and some adaptive traits in order of their importance. As the farmers said this is in order to get marketing value and then to get large amount of income. In this case an experience from the approaches used by Workneh *et al* (2004) was followed; the traits considered for improvement were production (meat), reproduction, Adaptation and conformation (aggregate of features including color, horns and size). This report was partially in agreement with the previous study of Zewdu (2008) in Adiyo Kaka and Horro districts.

As mentioned by the respondents, in the study area the adaptive traits of sheep were drought tolerance, cold tolerance (Atsibi- wonberta, Ofla and Degua-Tembien distrcts) and heat tolerance walking ability and prolificacy and utilization of feed (Alamata district),. This present study is also agreed with (FAO, 1999, Solomon, 2008) reported that the ability of animals to survive natural calamities is necessarily more important than high productivity. In Alamata and Enderta districts Elle (Afar) sheep and goats were ranked next to camel in adaptability of water shortage. This might be due to sheep had low water requirement than bovine species and it might be because of their fat tailed. Similarly, (Rancourt *et al.*, 2006) report that fat tailed sheep breeds can store energy for the dry seasons

4.3. Ewe and ram selection criteria

Sheep owners in the present study area also considered both morphological and production selection criteria with slightly more emphasis given for morphological characteristics for ram selection than for replacement ewe selection. It was because of this fact that farmers did not report on selection criteria of ewe.

The current study showed that body size ranked first with an index of 0.42 for selection of breeding rams. Coat colour, horn, mating performance, tail and ear length was ranked second, third, fourth and fifth respectively for whole population (Table 5). Sheep breeders in Atsibi-wonberta,Wukro-kilteawlaelo, Ofla, Degua-Tembien and some part of Enderta districts prefer horned, long eared ram having a colour of white, red, red brown, grey (*Jimo*) with light red at the back, medium tail fat and ram having good body size. While, sheep breeders in Alamata and some part of Enderta districts that having Elle (Afar) breed prefers polled, short eared ram having a colour of white/creamy with light red at the back, medium tail fat and ram having good conformation. Similar results for Menz and Afar sheep breeds were also studied by Tesfaye (2008).

In the study area for ram selection, farmers target was not only for breeding purpose but also they take into consideration the factors or traits that affected the market value and fattening ability of the ram after breeding. For instance, completely black ram in color, ram with abnormal legs, short ear and tail, ram with no horn and small size ram are not selected because such type of ram do not attract buyers and obtained low price. According to respondents, rams with any defects or visible injuries on testis, a ram with one testis descended or with unequal size of testes and having poor libido was not selected for breeding.

5. CONCLUSIONS AND RECOMMENDATIONS

Generally the reproductive performance of sheep in this study area implies that the sheep breeds have acceptable age range for breeding though it is late compared to temperate breeds. In the study area for ram selection, farmers target was for breeding purpose and market value and fattening ability of the ram. Because of this, Sheep producers in the study area select breeding rams based on the physical appearance such as size, color, horn, tail, conformation and libido and hence to improve the productivity of sheep in the study area the farmers and livestock experts should give more emphasis on the economically important traits rather than qualitative traits.

6. ACKNOWLEDGMENT

7. REFERENCES

[1] Abebe, M., 1999. Husbandry practice and productivity of sheep in Lalo-mama Midir woreda of central Ethiopia. An M.Sc Thesis presented to the School of Graduate Studies of Alemaya University of Agriculture, Dire Dawa, Ethiopia. 99p.

[2] Agyemang, K., Negussie A, Voorthuizen K, and Anderson FM,1985. A rapid survey of sheep production in the traditional sector of Debre Berhan, Ethiopian Highlands. http://www.fao.org/Wairdocs/ILRI/x5464B/x5464b10.htm

[3] Aseidu, T.H., Francis H.K and Margaret A., 1983. Note on the effect of body weight and lambing interval on the reproductive performance of West African sheep raised under tree crops. Trop. Agric. 60(1): 61-63.

[4] Beniam, A., 1992. Production performance of Adal and Blackhead Somali sheep under irrigated conditions at Melka Werer. M.Sc Thesis, Presented to the School of Graduate Studies of Alemaya University of Agriculture, Dire Dawa Ethiopia.

[5] Centeral Statistical Agency (CSA), 2009. Report on Livestock and Livestock Characterstics. Agricultural Sample survey. Federal Democratic Republic of Ethiopia Centeral Statistical Agency. Vol.2. February 2009, Addis Ababa.

[6] Dixit, S.P., G.K. Gaur, D.K. Yadav, and Singh, 2005. Characterization of the Rampur Bushair sheep in north temperate region of India. In: S. Galal and J. Boyazoglu. (eds.). *Animal Genetic resource information.* 36, FAO. Rome, Italy.

[7] FAO, 1999. The global strategy for the management of farm animal genetic resources. Executive brief. FAO (Food and Agriculture Organization of the United Nations), Rome, Italy. 43p.

[8] Fekerte, F., 2008. 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 Alemaya University of Agriculture, Dire Dawa, Ethiopia. 115p.

[9] Gatenby, R.M. and. Humbert J. M, 1991. Sheep (1st ed). Tropical Agriculturalist Series, Macmillan Education Ltd., London and Oxford 62-63pp.

[10] IBC (Institute of Biodiversity Conservation), 2007. The State of Ethiopia's Farm animal Genetic Resources: Country Report. A Report on the State of the World's Animal Genetic Resources. IBC, 2007. Addis Ababa, Ethiopia.

[11] Ibrahim, H., 1998. Small ruminant production techniques. ILRI training manual. ILRI (International Livestock Research Institute), Nairobi, Kenya.3:192.

[12] ILCA, 1990. (International Livestock Center for Africa).Livestock Research System Manual. ILCA, Addis Ababa, Ethiopia. Part I. 287p.

[13] ILRI, 2006. Animal Genetics Training Resource, version 2, 2006. Ojango, J.M., Malmfors, B. and Okeyo, A.M. (Eds). International Livestock Research Institute, Nairobi, Kenya, and Swedish University of Agricultural Sciences, Uppsala, Sweden.

[14] JMP5 (2002). SAS Procedure Guide for Personal Computers, Vers. 5th Edn. SAS Institute, Cary NC. USA.

[15] Mengistie, T., 2008. On-farm performances of Washera sheep at Yilmanadensa and Quarit districts of the Amhara National Regional State. A thesis submitted to the Department of Animal and Range Sciences, Awassa College of Agriculture, School of Graduate Studies, Hawassa University Awassa, Ethiopia. 117p.

[16] Mukasa-Mugerwa E, and Lahlou-Kassi A, 1995. Reproductive performance and productivity of Menz sheep in the Highlands of Ethiopia. *Small Rumin. Res..* 17:167-177

[17] Mukasa-Mugerwa, E., Anindo, D., Sovani, S., Lahlou-Kassi, A., Tembely, S., Rege, J.E.O. & Baker, R.L. 2002. Reproductive performance and productivity of Menz and Horro sheep lambing in the wet and dry seasons in the highlands of Ethiopia. *Small Ruminant Research.* 45, 261–271.

[18] Musa, L.M-A., Peters, K. J. and Ahmed , M-K. A., 2006. On farm characterization of Butana and Kenana cattle breed production systems in Sudan. Livestock Research for Rural Development. 18, 56-61.

[19] Niftalem, D., 1990. On farm study of the reproduction and growth performance of Menz Sheep around Debre Brihan area. An M.Sc Thesis presented to the School of Graduate Studies of Alemaya University of Agriculture, Dire Dawa, Ethiopia. 103p.

[20] Otte, MJ., and Chilonda P, 2002. Cattle and small ruminant production systems in sub-Saharan Africa: A systematic review. Livestock information sector analysis and policy branch, FAO Agriculture department, Rome.

[21] Owen, JB., 1976. Sheep Production. Bailliere Tindall book, Cassell and Collier, Macmillan Educ. Ltd., London, U.K.pp.66-68.

[22] Peacock, C.,1996. Improving Goat Production in the Tropics. Manual for Development Work. Farm Africa and Oxfam.UK and Ireland.

[23] Rancourt, M., Fois N, Lavin MP, Tchakerian E, and Vallerand F, 2006. Mediterranean sheep and goat production: An uncertain future. *Small Rumin. Res..* 62:167-179.

[24] Sahana, G., Jain A, and Maity SB, 2004. Characterization and evaluation of Jalauni sheep. In: S. Galal and J. Boyazoglu (eds.). Animal Genetic Resource Information, 34. FAO (Food and Agricultural Organization of the United Nation). Rome, Italy.

[25] Solomon, AG., 2007. *In Situ* Characterization of Gumuz Sheep under Farmers Management in North Western Lowlands of Amhara Region M.Sc Thesis presented to the School of Graduate Studies of Haramaya University of Agriculture, Dire Dawa, Ethiopia. 86p.

[26] Susan, S., 2011) A beginner's Guide to Raising Sheep. Copyright 2011© Sheep 101 and 201. http,//www.sheep101. info/201/ewerepro.html.

[27] Tembely, S., 1998. Small ruminant production in Ethiopia: prospects for improving productivity. Pp.82-90. In proceedings of the Fifth National Conference of Ethiopia Society of Animal Production, Addis Ababa, Ethiopia, 15-17 May, 1997, ESAP, Addis Ababa.

[28] Tesfaye, G, 2008. Characterization of Menz and Afar Indigeneous sheep breeds of smallhoders and pastoralists for designing community based breeding sterategies in Ethiopia. MSc Thesis presented to the school of graduate studies of Haramaya University. 158p.

[29] Wilson, R.T., and Durkin, J.W. 1983. Livestock production in central Mali: Weight at first conception and ages at first and second parturition's in traditionally managed goats and sheep. J. Agri. Sc. Cambridge. 100:625-628.

[30] Wilson, R.T., and Murayi, Th. 1988. Production characteristics of African long-fat-tailed Sheep in Rwanda. Small Ruminant Research. 1: 3-17.

[31] Workneh, A., Van Dorland A and Rowlands J. (eds), 2004. Design, execution and analysis of the livestock breed survey in Oromiya Regional State, Ethiopia*.* OADB (Oromiya Agricultural Development Bureau), Addis Ababa, Ethiopia, and ILRI (International Livestock Research Institute), Nairobi, Kenya. 260 pp.

[32] Yacob, A., 1999. The Predicament of The Ethiopian Pastoralist: Shrinking Resources And Tenures Insecurity. Proceeding Of The National Work Shop On Challenges And Opportunities For Research And Development In Pastoral And Agro Pastoral Are Of Ethiopia. December 16 – 18, 1998 DHP Ethiopia and MUC.

[33] Yilmaz A, Ozcan M, Ekiz B, Ceyhan A and Altinel A, 2004. The production characteristics of the indigenous Imroz and Kivircik sheep breeds in Turkey. pp. 57-66. In: S. Galal and J. Boyazoglu (eds.). *Animal genetic resource information,* 34. FAO. Rome, Italy.

[34] Zewdu E, 2008. 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 Haramaya University of Agriculture, Dire Dawa, Ethiopia.143p.

Table1. Description of the Study Area

Name of Woreda	Distance (Km) from Adiss Ababa & Mekelle respectively	Attitude (masl)	Mean annual temperature (^{o}C)	Mean annual rainfall (mm)	Total human population (CSA,2008)
Atsbi-Wonberta	843N & 65NE	918-3069	19	400	112,234
Wukro-Kilteawlaelo	823 N & 45 N	1977	19.7	400	129,896
Ofla	620 N & 158 S	2300-3200	14	942	142,803
Alamata	600 NE & 180 S	< 1500	22	693	118,557
Enderta	766 N & 12 S	1185-2169	22	500	114,277
Degua-Temben	828 NW & 50 N	1595-2760	18	969	113,526

masl= meter above sea level

Table2. Reproductive performance (mean ± SD) of sheep in the study districts.

Name of Districts	ASM (mean)		AFL	LI
	Male(mean ±SD)	Female(mean ±SD)	mean± SD	mean± SD
Atsibi-Wonberta	10.33 ±2.66	11.37 ±2.22	18.15±2.15	9.6±0.7
Wukro Kilteawlaelo	7.03 ±1.03	8.43 ±0.89	16.77±1.22	8.3±0.8
Ofla	6.7 ±0.84	8.30 ±0.92	16.7±0.99	6.3±0.7
Alamata	6.87 ±0.86	7.97±0.81	16.83±1.02	7.6±0.5
Enderta	8.03 ±1.09	9.27±0.83	17.77±0.86	10.4±0.6
Degua-Tembien	7.7 ±0.99	8.9±1.03	16.77±1.19	8.4±0.5

* ASM= age at sexual maturity, AFL= age at first lambing and LI= lambing interval

Table3. Summary of reported weaning age of sheep in the study area.

District		Average weaning age		
		3-4 months	5-6 months	>6 months
Atsibi-Wonberta	N	10	11	9
	%	33.33	36.67	30
Wukro-Kilteawlaelo	N	12	18	-
	%	40	60	-
Ofla	N	7	10	13
	%	23.33	33.33	43.33
Alamata	N	17	13	-
	%	56.67	43.33	-
Enderta	N	11	8	11
	%	36.67	26.67	36.67
Degua-Tembien	N	9	21	-
	%	30	70	-

* N= Number of Animals

Table4. Lambing pattern of sheep in the study area

Months	Rank R1	Rank R2	Rank R3	Index
January	20	40	4	0.14
March	-	-	4	0.004
May	1	-	21	0.02
August	-	-	3	0.003
September	21	3	26	0.09
October	27	26	64	0.19
November	31	65	40	0.26
December	80	46	18	0.34

*R1= rank 1, R2= rank 2and R3= rank 3

Table5. Breeding rams selection criteria and ranking of the importance of these criteria

Criteria	R 1	R2	R 3	I
➢ Size	127	21	33	0.42
➢ Color	27	132	8	0.33
➢ Horn	18	5	95	0.15
➢ Ear	-	-	9	0.01
➢ libido	8	14	19	0.07
➢ Tail length	-	8	16	0.03

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

Author's Biography

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