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, Ofia, 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-Kilteawlaeo, Ofia, 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-Kilteawlaeo (8.3±0.8), Ofia (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%), Ofia (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, Ofa, Alamata, Enderta and Degua-Temben. Atsbi-Wonberta and Wukro-Kilteawlaelo districts are found in Eastern zone of Tigray; while Ofa 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 Ofa, Atsibi-Wonberta, Degua-Temben 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).
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, Ofa, Alamata, Enderta and Degua-Tembien). A total of 12 peasant associations (Felege wein, Golgolnaele, Genfel, Aynalem, Menkere, Wonberet, Timuga, Limat, Debrì, Maitseodo, 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 Atsbi-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 Ofa, 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 Atsbi-Wonberta, Wukro-kilteawlaelo, Ofa, 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 result 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 Chlonda, 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 Atsbi-Wonberta (9.6±0.7), Wukro-Kilteawlaelo (8.3±0.8), Ofa (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 lambing 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 (Atsbì-wonberta, Ofla and Degua-Tembien districts) and heat tolerance walking ability and prolificacy and utilization of feed (Alamata district). This present study is also agreed with (FAO, 1999, Soloman, 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 because of 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

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Table 1. Description of the Study Area

| Name of Woreda       | Distance (Km) from Adiss Ababa & Mekelle respectively | Attitude (masl) | Mean annual temperature (°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                           |
| Ofia                 | 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-Tembien        | 828 NW & 50 N                                         | 1595-2760       | 18                           | 969                       | 113,526                           |

*masl= meter above sea level

Table 2. 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 |
| Atsbi-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  |
| Ofia                | 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

Table 3. Summary of reported weaning age of sheep in the study area.

| District           | Average weaning age |
|--------------------|---------------------|
|                    | 3-4 months | 5-6 months | >6 months |
| Atsbi-Wonberta     | N          | 10     | 11     | 9     |
|                    | %          | 33.33  | 36.67  | 30    |
| Wukro-Kilteawlaelo| N          | 12     | 18     | -     |
|                    | %          | 40     | 60     | -     |
| Ofia               | 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
Table 4. Lambing pattern of sheep in the study area

| Months  | R1 | R2 | 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 2 and R3= rank 3

Table 5. Breeding rams selection criteria and ranking of the importance of these criteria

| Criteria   | R1 | R2 | R3 | 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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