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Mortality and Reported Clinical Signs in Horro Sheep at Smallholder Farms in East Wollega and West Shoa Zones, Ethiopia

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Abstract

A survey was conducted for a year (2001/2002) in eastern Wollega and parts of western Shoa zone, Ethiopia, to investigate the mortality rate of Horro sheep reared under farmers condition, identify major clinical signs for sheep mortality, study the seasonality of sheep mortality and compare with mortality of sheep flock at Bako Agricultural Research Center. The average survival rates were 95.1%, 97.3% and 86.5% for sheep younger than 3-month, older than 3-month but younger than 12-month and older than 12-month of age, respectively. Survival rate was lowest in adults older than 12-months of age. Survival was significantly affected (at least at $p<0.05$) by season, flock size and sex of animals. Agro-ecology did not have significant ($p>0.05$) influence on survival rate of animals. Nevertheless, survival rate tended to be highest in mid-altitude areas as compared to highland and lowland areas for animals younger than 3-month and older than 12-month of age. The major reported clinical signs were coughing (23.8
%), diarrhea (23.5 %), swelling under the neck (23.5 %), circling movement (14.6
%), emaciation (8.5 %), orf (4.0 %) and others (2.1 %). Identification of the diseases associated with these clinical signs is a priority research area to design appropriate control measures.

Keywords: Clinical signs, Horro, sheep, smallholder farmers, survival rate

Introduction

Sheep productivity is the most important criteria for the evaluation of total profitability in sheep enterprises. High productivity is achieved through optimization of reproduction of ewes as well as survival and growth of lambs (Boujenane *et al*., 1998). Snyman *et al.,* (1998) reported that among others, reproduction and survival rates are traits that are universally important in any environment or livestock production system. Other traits vary in

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importance and can, in some situations, be of little or no value. According to RSA (1995), animal production research in resource poor communities should focus on conception, birth rate and survival, rather than on rates of growth as in more conventional research. Therefore, to produce more effective results, research should focus on reproduction and survival rates.

Sheep survival is of primary economic importance to sheep producers, in that low survival rate results in income losses because fewer animals are available for market and for replacement. Nevertheless, sheep research in the Bako Agricultural Research Center is facing serious constraint of mortality. Though, no in depth identification of causes of death was done due to various reasons (lack of facility at the center, inability to deliver samples timely to other laboratories, high turnover of veterinary staff to follow and collect results of samples sent etc.), mortality rates before yearling age as high as 20% (Solomon and Gemeda, 2000) to 37% (Solomon *et al*., 1995) have been reported for Horro sheep maintained in the center. Identification of causes of mortality and reduction or elimination of these would increase output from the breed. Sheep in the Western region are totally raised under traditional husbandry system where sheep graze and breed under uncontrolled environments. Prior to any further effort towards finding solution to the mortality problem, it requires verification if the problem faced in the research center is also common under farm condition. The current study was carried out to investigate the mortality rate of Horro sheep on smallholder farms, identify the major clinical signs associated with mortality and study the seasonality of sheep mortality, and to compare these with on station information from Bako Agricultural Research Center.

Materials and Methods

The survey was conducted by way of personal interview with farmers in east Wollega and some parts of west Shoa zone of western Oromia. Those farmers who own one or more heads of sheep were interviewed. All together,

120 farmers owning 3338 heads of sheep (2503 females and 835 males) participated in the study, two of which were omitted during analysis as they provided incomplete information. A reconnaissance study was conducted with the objective of locating accessible sites representing different agro-ecologies to conduct the study. Based on the information from the reconnaissance study villages located in lowland (14.7%), mid-altitude (23.8%) and highland (61.5%) areas were identified. Low land, mid-altitude and high land areas dominantly

represent areas with altitude of below 1600, 1600-2000, and above 2000 m.a.s.l., respectively.

Secondary data on population, crop and livestock production and meteorological variables were collected from offices of agriculture in the area. The climate of the study area was characterized by a uni-modal rainfall of which more than 80% falls in the months of May to September. Annual average rainfall is higher than 1100ml. Total area of the survey sites ranges from 20.5 to 147.4 thousand hectares.

A structured questionnaire was used for data collection during the different seasons of a year (2001/2002). Visits were made in four different seasons of the year i.e. in Season 1 (December to February), Season 2 (March to May), Season 3 (June to August) and Season 4 (September to November). All information related to deaths and causes of deaths were collected. The information later transcribed for data analysis. The questions were posed in afan Oromo, except for Anger Gutin areas of east Wollega zone where non-afan Oromo speakers (settlers) were interviewed in Amharic.

Data were analysed using CATMOD procedures (SAS, 1996) and sub class proportions were calculated and their standard errors were estimated using the LOGMLVAR procedure of Rege and Sherington (1996) as implemented by Rege (1997). Survival was studied at three different age classes ($X \leq 3$ month, 557 males and 565 females; $3 < X \leq 12$ month, 221 males and 280 females; and $X > 12$ month, 57 males and 1658 females). Survival was defined as "1" if the animals were alive at the three different ages described above and as "0" otherwise. The model included fixed effects of season, agro ecology (lowland, mid-altitude and highland), flock size category (categories 1 = 1 to 5 head of sheep, 2 = 6 to 10 head of sheep, 3 = 11 to 15 head of sheep, 4 = 16 to 20 head of sheep, and 5 = 21 and above head of sheep) and sex (male, female). For purposes of these analyses, flock size was categorised into discrete classes, as CATMOD is not designed optimally for continuous model effects. In addition to the fixed effects mentioned, the major clinical signs before death identified by the respondents were computed using frequency analysis.

Results and Discussion

Sources of variation considered and the associated probability levels are presented in Table 1, while predicted probabilities of survival rates at different ages are presented in Table 2. The survey showed that 20.5% of the

respondents own less than 5 heads of sheep while only 6.8% own more than 21 heads of sheep. In the current study, males and females constituted 25.0% and 75.0% of the flock, respectively. Breeding females above one year of age constitute about 49.7% of the total flock. Only about 2.0% of the sheep flocks were breeding rams above a year of age. The relatively fewer mature rams as compared to breeding females may reflect that male animals are sold or consumed early in life while the opposite sex is retained for breeding.

The average flock survival rates were 95.1%, 97.3% and 86.5% for animals younger than 3-month, older than 3-month but younger than 12-month and older than 12-month of age, respectively. Survival rate was lowest in sheep older than 12-month of age. This could be due to the inclusion of all aged animals in this age group. Comparable on-farm results were not found in the literature. Nevertheless, survival rates obtained in the current study were higher than those reported for Horro sheep maintained at Bako Research Center (Solomon *et al*., 1995; Yohannes *et al*., 1995; Solomon and Gemeda, 2000). Very high stocking rate, herding large number of sheep (sometimes more than 120 heads of sheep) together, deterioration of the grazing area, and disease build up with time might have contributed to the high death losses of the flock maintained in the Center (Solomon and Gemeda, 2000). From the difference observed in survival rate between the on-station and on-farm flocks it appears that there exists potential to improve survival rate of Horro flock maintained at Bako Research Center to the level observed on farm by identifying the factor(s) lacking in the center.

Survival rate was significantly ($p<0.001$) affected by season (Table 1). It was lowest in season 2 and 4 for animals older than 12 month of age. For those younger than 3-month of age survival was lowest in season 3 and 4 (Table 2). This is probably due to a decline in the condition of their dams as a result of parasitic burden in these seasons, leading to lowered milk production, coupled with parasitic infestation of the lambs themselves. Survival rate was highest in season 1 for all age classes. Solomon *et al.,* (1995) also reported that survival rate was higher during the dry season (November to February) as compared to the long rainy season (June to October) for Horro flock maintained at Bako Research Center. Despite the poor grazing condition in the dry season (seasons 1 & 2), the high parasite infestations of the pasture during the wet season (Muktar *et al*., 1993) and the low minimum temperature which predisposes the animals to pneumonia (Solomon *et al*., 1995) might have contributed to higher death losses in seasons 3 and 4.

Agro-ecology did not have significant ($p>0.05$) influence on survival rate of animals. Nevertheless, survival rate was relatively high in mid-altitude areas as compared to highland and lowland areas especially, for lambs younger than 3-month and for those older than 12-month of age (Table 2).

Survival rate of lambs younger than 3 months of age and of those older than 12-months of age was significantly (at least $p<0.05$) affected by flock size. It was lowest for large flock size as compared to small flock size, especially for those animals younger than 3-month and older than 12-month of age (Table 2). Flock size had no significant difference on survival rate for those older than 3-month but younger than 12-month of age. The cause for the difference of survival rate between flock sizes could not be explained, but it could probably be related to the unavailability of feeds to fill their larger gut and differences in owner's management practices. Being kept in larger flock size might have hindered the flocks to forage enough feeds to fill their larger gut. Study conducted at ILRI Debre Berhan Research Station (Ewnetu *et al*., 1998) showed that the digesta (weight of digestive content) of Horro sheep is larger by 0.7 kg than that of the Menz sheep, which lends support to the above speculation. In addition to this, in the study areas although water and grazing land are theoretically available to all on an equal basis, regular attention to watering by the owner was rarely practiced. Many owners also keep their animals penned until late in the morning and animals could not graze for longer hours.

In general, grazing management was different for the dry and rainy seasons. During the dry season, the majority of owners released their animals to roam freely. In contrast, animals were either herded or tethered during rainy season to protect crop fields. Supplementary feeding of animals was not common in the study areas, except for leftover kitchen refusals. There are some improved management practices reported earlier by Gemeda *et al.,* (2002b), which could improve survival rates. These include ensuring that the young suckle their dam at birth and subsequently, attention to cleanliness of night bedding by regular removal of feces, removal of external parasites (especially ticks by hand) and supplementary feeding of household scraps and crop residues.

In the current study, the sex effect, over which least control can be exerted, significantly ($p<0.001$) influenced survival rate. Mortality rate was higher in males than females (Table 2). The sex differences obtained for animals

younger than 3 months of age is in agreement with results reported in the literature (Gama *et al*., 1991; Schwulst and Martin, 1993; Gemeda *et al*., 2002a). Furthermore, in Horro flock maintained at Bako Research Center male lambs had a higher mortality rate than female lambs to yearling age (Solomon *et al*., 1995; Solomon and Gemeda, 2000).

The clinical signs in sick animals identified by the respondents were coughing (23.8%), diarrhea (23.5%), swelling under the neck (23.5%), circling movement (14.6%), emaciation (8.5%), orf (4.0%) and others (2.1%) (Table 3). Association of the clinical signs with specific diseases may help in designing management practices and veterinary care directed towards reduction of mortality. According to respondents control measures for these major health problems are hampered by inadequate veterinary service caused either by absence of veterinary service in their vicinity or shortage of medicaments or inability of farmers to pay for it. In majority of the cases, sick animals were treated by farmers themselves using traditional herbal remedies. Almost all of the respondents attributed lack of veterinary services in their vicinity for not practicing modern health care. In the surveyed areas, health care in terms of vaccination, anthelmintic and other treatments are only available for large ruminants despite some of the farmers expressed willingness to pay for treating small ruminants.

Conclusion

The current study revealed that on-farm survival rate of Horro sheep was affected by season. Despite the poor grazing condition in the dry season (season 1 & 2), survival rate was higher as compared to the wet season (season 3 & 4) in lambs and sheep older than one year of age. Differences between seasons could be due to the high parasite infestations of the pasture during the wet season and the low minimum temperature that may predispose the animals to pneumonia. Thus, major parasites that could predispose the animals to diseases during the wet season should be looked into. The choice of particular lambing season and use of strategic supplementary feeding should also be considered.

In the present study, the most common clinical signs investigated as major causes of mortality were coughing, diarrhea, swelling under the neck, circling movement, emaciation, orf and others. Identification of the diseases associated with these clinical signs is a priority area for research. It was also investigated that farmers themselves treat sick animals traditionally with

herbs. Thus, further study is warranted to verify the efficacy of the traditional veterinary practices of the farmers.

Comparing with the center's information, higher survival rate was observed for sheep maintained under the smallholder management condition. The reasons for the low survival rate of Horro sheep at the center may be the large flock size, because herding up to 120 head of sheep per flock is a usual practice of the farm. Thus, to alleviate problems related to flock size, determination of optimum flock size (heads of sheep tended together) that could improve production, reproduction and survival rate of sheep maintained under a specific grazing condition is warranted.

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Table 1. Maximum-Likelihood analysis of variance of survival rate at different ages

Source	Degree of freedom (df), chi-square and significance levels for:					
	X ≤ 3 month		**3 < X ≤ 12 month**		**X > 12 month**	
	df	chi-square	df	chi-square	df	chi-square
Intercept	1	488.64***	1	166.23***	1	93.27***
Season	3	32.20***	3	25.33***	3	35.90***
Ecology	2	2.32^{NS}	2	2.05^{NS}	2	1.62^{NS}
Flock size category	4	11.05*	4	2.93^{NS}	4	14.06***
Sex	1	38.73***	1	37.48***	1	7.44**
Likelihood ratio	79	121.82***	73	82.40^{NS}	61	82.45*

* = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$; NS = $p > 0.05$

Table 2. Predicted probabilities of survival rate at different ages

Effect	Predicted probability and standard errors for:		
	X ≤ 3 month	**3 < X ≤ 12 month**	**X > 12 month**
Overall	95.1 ± 0.99	97.3 ± 0.99	86.5 ± 0.98
Season			
1	98.3 ± 0.99	98.8 ± 0.99	95.0 ± 0.99
2	95.1 ± 0.99	92.2 ± 0.98	82.5 ± 0.97
3	91.7 ± 0.99	98.5 ± 0.99	85.4 ± 0.97
4	92.0 ± 0.99	96.2 ± 0.99	76.7 ± 0.96
Agro-ecology[1]			
Lowland	94.2 ± 0.99	97.7 ± 0.99	86.3 ± 0.97
Medium Altitude	96.1 ± 0.99	96.4 ± 0.99	88.3 ± 0.97
Highland	94.8 ± 0.99	97.6 ± 0.99	84.7 ± 0.97
Flock size			
1 to 5	96.2 ± 0.99	96.0 ± 0.99	89.6 ± 0.97
6 to 10	96.0 ± 0.99	97.5 ± 0.99	88.7 ± 0.98
11 to 15	93.2 ± 0.99	96.6 ± 0.99	88.1 ± 0.97
16 to 20	96.2 ± 0.99	98.5 ± 0.99	87.5 ± 0.97
> 21	92.9 ± 0.98	97.2 ± 0.98	75.8 ± 0.94
Sex			
Male	92.0 ± 0.99	93.1 ± 0.98	80.4 ± 0.95
Female	97.1 ± 1.00	99.0 ± 1.00	91.0 ± 0.99

[1] Lowland = less than 1600 m asl Medium Altitude = 1600 to 2000 m asl Highland = above 2000m asl

Table 3. Clinical signs observed in sick animals

Clinical signs	Major clinical signs reported	
	Number	**Percentage**
Coughing	78	23.8
Diarrhea	77	23.5
Swelling under neck	77	23.5
Circling movement	48	14.6
Emaciation	28	8.5
Orf	13	4.0
Others	7	2.1

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