Global Journal of Animal Breeding and Genetics

ISSN: 2408-5502 Vol. 3 (3), pp. 146-152, March, 2015. © Global Science Research Journals
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Full Length Research Paper

Assessment on production situation and breeding practices of 'Horro sheep' under traditional management in Horro Guduru and East Wollega Zones, West Ethiopia

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Accepted 23 March, 2015

Abstract

A preliminary survey was conducted with the objective of assessing the effect of non-genetic factors on reproductive performance and breeding practices of Horro sheep, and to identify constraints that affect productive potential of this local breed with respect to different agro- ecology. 120 smallholder farmers possessing at least one female sheep during and one year before the study time were included in the study. The farming communities in the study area were living mainly on crop-livestock production where 95.8% (n= 115) respondents depended on both crop and livestock production. Only 1.7% (n= 2), 0.83 %(n=1) and 1.7% (n=2) live solely on crop production, livestock production and off farming respectively. The overall means and SD of flock size per household analyzed in the present study was 9.28 ±7.98 where there was highly significant difference at (P>0.001) among the three districts. Traits studied for reproductive performance were litter size (LS), lambing interval (LI) and number of service per conception(NSPC) and fixed effects were district, parity and ecologic situation. The overall means and SD of LS, LI and NSPC was 268.87± 42.77, 1.57±0.52 and 1.27±0.56 respectively where these traits were significantly affected at (P>0.001) by district and agro-ecology. Parity at lambing had non-significant effect on lambing interval, where as litter size and number of service pre conception were significantly affected at (P>0.01) by parity at lambing.

Keywords: Ethiopia, Horro sheep, litter size, reproductive performance, Wollega.

INTRODUCTION

Among the small ruminants, sheep contribute a substantial amount to the farming household income, mutton and non-food products (manure, skin and wool). They are source of risk mitigation during crop failures, of property security and of monetary saving and investment in addition to many other socio economic and cultural functions (Tibbo, 2006).

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Sheep types in Ethiopia are highly affiliated to specific ethnic communities. Several traditional breeds in Ethiopia are reared by and named after specific communities (Gizaw *et al*, 2007). Horro breed/type is named after the Horro district of the Horro Guduru Wollega zone of Western Ethiopia where this sheep breed is widely found (Kassahun Augechew and Getachew, 1986). These days, the sheep breed is widely distributed in the western part of the country in the area that lies within 35°-38°E and 6°-10°N. Sheep of this type are rather uniform in color, mostly of solid tan (very light brown) to dark brown.

Exceptionally, they may be creamy white, black or spotted. The body is covered with short smooth hair. The face has a straight profile but is somewhat convex in the rams. The ears are of the semi-pendulous type. Wattles are rare and beards are absent (Galal, 1983).

Though some studies were conducted on this sheep breed by Bako Agricultural Research Center, no on-farm detailed analyses of environmental and management factors affecting the reproductive performance and breed improvement opportunities have been documented for Horro sheep in the western part of Ethiopia. Therefore, this study was conducted with the objectives of assessing the effect of non-genetic factors affecting reproductive performance and production constraints that may affect the productive potential of Horro sheep.

MATERIALS AND METHODS

Description of the Study Area

The study was conducted in the Horro and Ababo Guduru districts of Horro Guduru Wollega, and Guto-Gida district of East Wollega zones of the Oromia Regional State in Ethiopia. Horro Guduru Wollega zone is located at about 310 km and East Wollega Zone at 330 km West of Addis Ababa. The area lies between 09º29´N and 37º26´E, at an altitude of approximately 2296 m.a.s.l., with a uni-modal rainfall ranging between 1200mm-1800mm (Olana, 2006). The rainy season occurs from April to mid-October where maximum rain is received in months of June, July and August. Maximum temperature of 23-27^{0}C are reached from January to March, and minimum temperature of 7-15^{0}C are normal from October to November (CSA, 2009).

Survey data sampling and management

For this study, three districts (Horro, Ababo Guduru and Guto Gida) were selected where one 'Kebele' was purposively chosen from each district. 'Kebele' is the smallest administrative structure in Ethiopia. A total of 120 (40 from each district) smallholder farmers possessing at least one female sheep during and one year before the study time were included in the study. The data for lambing history of individual ewe in this study were drawn from 196 ewes; where 80, 72 and 44 ewes were selected from Horro, Ababo-Guduru and Guto-Gida districts, respectively.

Before conducting the formal survey, group discussion was held with key informants (elders, herders, and veterinary and animal science experts) of the respective zone's and district's Agriculture Offices. A single-visit-multiple-subject formal survey technique was used to interview the household heads using structured questionnaire. The questionnaire was designed to generate information related to agricultural land and livestock holding, sheep housing, watering, feeds and feeding system, flock structure and composition, disease prevalence and treatment practices, sheep production constraints and marketing. Focus group discussions were also conducted to generate additional information on sheep production practices, markets and market actors, policy and regulatory issues.

Reproductive data collection and analysis

Reproductive traits, Lambing interval (LI), service per conception (NSPC) and litter size (LS) were studied. The fixed effects fitted in the model for LI and LS were districts (Horro, A/Guduru and G/Gida), agro-ecology of the study area and parity at lambing (1,.., $\geq$6) and type of birth at lambing (single, twin). General linear model (GLM) procedures of SAS (SAS 2002) were used to analyze reproductive data. The quantitative and qualitative data were coded and analyzed using the means and frequency procedures of Statistical Package for Social Sciences (SPSS, 2011). Chi-square test was also used to examine differences between levels of significance of different quantitative variables among parity at lambing, agro-ecology and districts.

RESULTS AND DISCUSSION

Livestock and Landholding and Characteristics

Landholding and Characteristics

The study area is characterized by mixed crop-livestock system. The farming communities in the study area were living mainly on crop-livestock production where 95.8% (n= 115) respondents depend on both crop and livestock production. However, 1.7% (n= 2), 0.83 %(n=1) and 1.7% (n=2) live only on crop cultivation, livestock rearing and off farming, respectively. The means and SD of land holding for individual householders in the study area was 3.08 ha (n = 40, SD = 1.09), 2.70ha (n = 40, SD = 1.42) and 2.20ha (n= 40, SD = 2.07) for Horro, Ababo Guduru and Guto Gida districts, respectively. The overall means and SD of total agricultural landholding was non-significant among the three districts ($p = 0.08$) Table-1. Nonetheless, the means and standard deviations of total landholding per individual householder analyzed in this study agree with the mean landholding in Guduru district of Oromia Regional state reported by Demissu *et al*, 2013.

Livestock Structures

The livestock holding of the study districts is shown in Table-1. Cattle are most predominant and most important species of livestock owned, followed by sheep. Goats, horse, mules, donkey and chicken are parts of livestock

Table 1: Means and SD of Agricultural land and Livestock holding

Land and Livestock holdings	Districts				
Landholding	Horro	A/Guduru	G/Gida	Overall	Sign
Total landholding	3.08±1.09 [a]	2.71±1.42 [a]	2.20±2.07 [a]	2.66±1.61	0.081
Crop landholding	2.47±0.99. [a,b]	2.46±1.35 [a,b]	1.63±1.62 [a]	2.19±1.39	0.007
Grazing landholding	0.64±0.35. [a,b]	0.26±0.19 [c]	0.43±0.62 [b,c]	0.44± 0.45	0.001
Livestock holding					
Cattle herd	9.23 ± 4.38	11.30±6.23	5.58±5.27	8.70± 5.82 [a]	0.000
Sheep flock	15.85 ± 9.86	7.60±4.54	4.55±2.90	9.28± 7.98 [b]	0.000
Chickens	10.10 ± 6.89	9.63±6.51	5.93±5.32	8.54± 6.49 [c]	0.006
Equines	3.87± 2.54	1.50±1.55	1.45±1.30	2.26± 2.17 [d]	0.000

Means and SD with different superscript in the same column indicates significant difference among districts

Table 2: Purpose of sheep production and keeping male and female sheep in flock

	Male sheep								Female sheep							
Level of preference	**Meat**		**Breeding**		**Income**		**Saving**		**Meat**		**Breeding**		**Income**		**Saving**	
Sometimes	**N**	**F**	**N**	**F**	**N**	**F**	**N**	**F**	**N**	**F**	**N**	**F**	**N**	**F**	**N**	**F**
	9	7.5	40	33.3	11	9.2	80	66.7	22	18.3	2	1.7	24	20	40	33.3
Not at all	33	27.5	12	10	-	-	5	4.2	34	28.3	6	5	10	8.3	44	36.7
First	3	2.5	37	30.8	71	59.2	13	10.8	3	2.5	91	75.8	27	22.5	2	1.7
Second	46	38.3	12	10	21	17.5	15	12.5	21	17.5	15	12.5	45	37.5	22	18.3
Third	29	24.2	19	15.8	17	14.2	7	5.8	39	32.5	5	4.2	13	10.8	10	8.3

N = Number of householders, F = frequency in percent (%)

structure, which strengthen farmers' ability to overcome risks of disaster and food insecurity. The average cattle holding/household in this study was 9.23 ± 4.38, 11.30±6.23 and 5.58±5.27 for Horro, A/Guduru and G/Gida districts respectively. The cattle holding was significantly lower (P<0.001) in G/Gida than Horro and A/Guduru districts. The overall means and SD of cattle/household (8.70± 5.82) in this study was higher than the average holding (3.6) in Gomma district of Jimma zone reported by (Belete, 2009), 6.0 cattle/household in Miesso district west Hararghe zone as reported by (Hussen, 2007) and 7.53 cattle/household in Ilu Ababora zone reported by Urgessa *et al*, 2012.

The means and SD number of sheep per household were 15.85 ± 9.86, 7.60±4.54 and 4.55±2.90 animals for Horro, A/Guduru and G/Gida districts, respectively. The average flock size per household obtained in the present study was 9.28 (7.98) sheep that agrees with the average number of sheep holding in western highlands of Ethiopia reported by (Taye *et al,* 2010). There is highly significant difference in Sheep and goat holding at (p < 0.001) among the three districts. That means the means and standard deviations of sheep holding was significantly higher for Horro district (15.85 ± 9.86) than for A/Guduru (7.60 ± 4.54) and G/Gida (4.55 ± 2.90).

Purpose of Sheep Production

Farmers in the study area rear sheep to use for cash income, slaughtering during festivals, produce as a means of live bank that enable them sale to cover their agricultural inputs and children's school facility expenditure. The most popular sheep breed in the study area were Horro sheep where other different and non distinct breeds are also found. Table-2 below shows the level of preference of sheep production and objectives of respondents. About 59.2% respondents indicated that the primary objective of keeping male sheep was for income generation while 30.8%, 10.8% and 2.5% respondents were keeping male sheep for saving, breeding and meat consumption purpose respectively. Female sheep in the study area are mainly (75.8% respondents) kept for

Figure 1: Sheep herding practices and grazing management of A/Guduru district

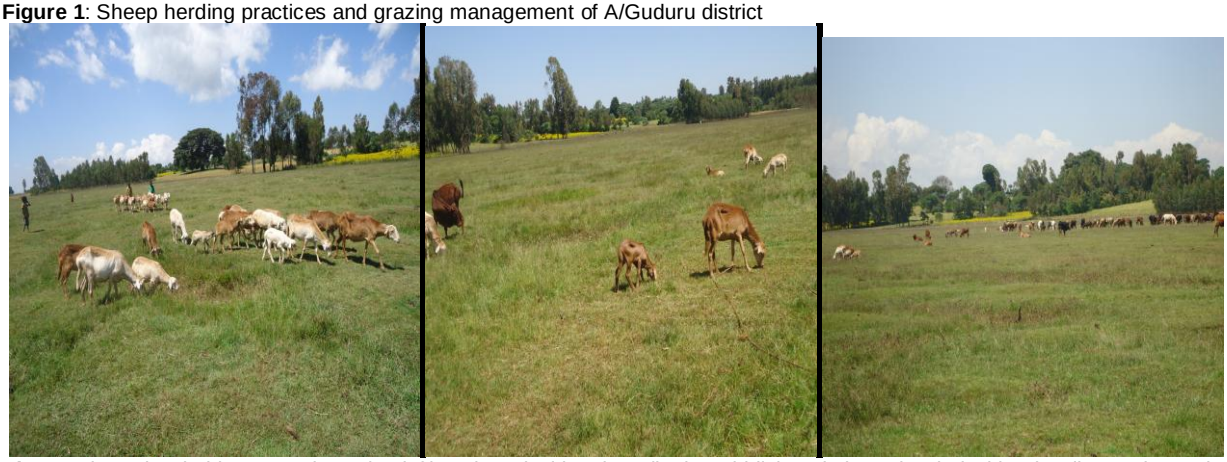

Photo: Sheep herded by young boys (up left), tethered with calves (in the middle) and sheep herded with other livestock species (up right) on communal grazing field in Ababo Guduru district

breeding purpose where 22.5%, 2.5% and 1.7% respondents were keeping female sheep primarily for income, meat consumption and savings respectively.

Male sheep are mainly kept for income generation and risk mitigation while females are reared for reproduction/breeding, however, ewes could also be used for income generation for the time when purchase of agricultural inputs are demanded and for children's school material fulfillment. The objective of sheep production for income generation analyzed from respondents opinion in this study is in agreement with that of (Tsedeke, 2007, Getahun, 2008 and Belete, 2009) who reported that small ruminants are mainly kept for income generation in many parts of Ethiopia. In the study area, small ruminants are also important for cultural purpose such as manure production, social heritages, for trembling teff (*Eragrostis tef*) sowing ground and sacrifice while the use of milk from small ruminants is not common.

Husbandry and Management of Sheep

Feeding and Watering

Like other parts of the highlands of the country, the main feed source is communal grazing land, crop residues and crop stubble (Abebe, 2000 and Getahun, 2008). Most respondents had answered that they were herding their sheep together with other livestock species during the day while some respondents herd separately and small number of respondents were tethering their animals. Sheep are herded mainly during summer when food crops are on the field, 80.83% respondents were herding their sheep, 14.17% of sheep flock were left unherded while 4.16% of respondents were tethering their animals. Sheep with other livestock in Horro and A/Guduru were mainly herded and tethered on communal grazing lands where they are herded and/or tethered alone in G/gida district. Livestock structure and grazing practices though enable biodiversity and maintenance of ecosystem might sometimes prone sheep to internal parasite outbreaks such as Faciolasis and Haemonchiasis reported by Dr. Melkamu, A/Guduru district's veterinarian (personal discussion with key informants).

During winter (dry season), when crop fields are free 64.17% of sheep producers leave their animals unherded, 34.17% producers still herd their sheep while only 1.66% use for tethering. Some farmers in the study areas are recognising the difference of supplementing or not supplementing during feed shortage. In the study area, priorities were given to adult female ewes, followed by young lambs where adult males were less or none supplemented. The supplements were grass hay, teff (*Eragrostis tef*) and noug (*Guizota absysinica*) straw, cracked maize, sprouted bean, local brewery by-product "*atela*" and salt. The major source of water used for livestock drinking identified in this study was river, where borehole water, tap water and dam water were also used in order.

Housing

Farmers in the study area shelter their sheep during night throughout the year to protect from cold and rain, predators and theft. Sheep were housed mainly with calves and sometimes with equines from which they are fenced by a woodlot. However, 83.33% farmers interviewed and farming family possessing large flocks have separate housing for their sheep, while only 16.67% of producers keep their sheep in family house. The separate house was usually built adjacent to the family house or separately. According to the information obtained by focus group study, there is a difference in the productivity of sheep between those tied to those housed freely, i.e., tied animals were healthier and productive than those housed freely. Farmers explained that sheep

Table 3: Sheep grazing, watering and housing management practices

Grazing, watering and housing management	Season of production			
	Dry season		Wet season	
	N hh	%age	N hh	%age
Grazing management				
Herded	41	34.17	97	80.83
Unherded	77	64.17	5	4.17
Tethered	2	1.66	18	15.00
Source of watering				
Tap water	8	6.67	8	6.67
Borehole	18	15	16	13.33
River and dams	94	78.33	96	86.00
Housing management	N hh	%age		
In family house	20	16.67		
Separate housing	100	83.33		

N hh= number of householders interviewed

Table 4: Means (± SD) for effects of district and parity on lambing interval, litter size and number of service per conception

Effects and levels	Lambing interval in days	Litter size	Number of service per conception
N	195	195	195
Overall means	268.87 ± 42.77	1.57 ±0.52	1.27 ±0.56
District	***	***	***
Horro	254.68 ±36.44	1.77 ±0.45	1.05 ±0.27
A/Guduru	267.08 ±39.69	1.51 ±0.53	1.58 ±0.73
G/Gida	297.27 ± 45.21	1.32 ±0.47	1.14 ±0.35
Parity	NS	**	**
1	277.06 ±49.02	1.29 ±0.46	1.24±0.49
2	272.00 ±47.87	1.62±0.49	1.14±0.35
3	262.55 ±41.62	1.70±0.55	1.23±0.56
4	265.00 ±25.72	1.72±0.46	1.33±0.48
5	270.00±32.86	1.36±0.50	1.82±0.98
> 6	262.50±33.54	1.60±0.50	1.45±0.76

N= number of ewes under study
Significantly different **, P<0.01; highly significant difference***, P<0.001; NS, Non significant difference

housed freely lay one over the other because of their social behaviour and pregnant animals, young lambs and weak animals are the most vulnerable groups injured. Newborn lambs in the first week of birth are separated from their dam and cared for at home during the day when sheep were taken to grazing and before they get into their house upon their return in the afternoon. This is a common practice in other parts of the country (Abebe *et al*, 2000, Mengistie, 2008 and Tesfaye, 2008). Farmers use temporary pens built by homemade materials and bedded to keep newborn lambs that enable lambs kept dry, clean and warm. Suckling occurs in the morning before the dam leaves for grazing, in the mid-day and when the flocks are back from grazing in the evening. Some farmers separate the dams for at least the first three days of parturition and provide care for both lambs and dams indoor. These increase the dam-lamb bond and help to protect the lamb from chill, strong solar heat and other environmental stresses thereby increase lamb survival as also reported by (Mukasa-Mugerwa *et al,* 2000).

Reproductive Performance

The means and standard deviations of the effects of district and Parity on, liter size (LS), lambing interval (LI) and number of service per conception (NSPC) for Horro sheep are presented in Table-4. The results of the present study with regard to the reproductive performances of Horro sheep concur with reports in the

literature from the tropical regions (Abassa, 1995; Mengiste, 2008 and Fikrte, 2008). The report in Ethiopia has also confirmed the results of the present study showing the lambing interval to be in the range of 199 days to 313 days (Abebe *et al*, 2000; Mengiste, 2008 and Fikrte, 2008). There is highly significant difference at (p >0.001) in lambing interval, prolificacy and number of service per conception among districts.

The means and standard deviations of parity at lambing had no significant effect on lambing interval. However, there is non-significant variation among parity where ewes in their middle parity (2-4) had shorter lambing interval (LI) and the ewes in their early (first parity) and later parities (beyond fifth) showed shorter LI. Some researchers showed that as parity increases the lambing interval decreases (Mengiste, 2008). The ewes in their middle parity (second to fourth parity) may attain their physiological maturity that might have contributed to have shorter LI than ewes in their early and older ages. Ewes after parity six are older which were made to stay in the stock because of their best reproductive performance, and might became animals with shortest lambing intervals. 'Lamb ewes' on their first parity also had an extended mean lambing interval, because this animal groups are still on their stage of growth and development in addition to their reproduction for replacement stock.

The overall means and SD of liter size (LS) and number of service per conception (NSPC) in this study had also significantly affected at (P > 0.01) by district. The litter size per ewe per birth was 1.77 (0.45), 1.51 (0.53) and 1.32 (0.47) for Horro, A/Guduru and G/Gida districts, respectively. The result of this study is higher for sheep of Horro and A/Guduru districts than mean litter size (1.34) of Horro sheep as reported by (Solomon and Gemeda, 2000), where the LS of G/Gida district is in agreement with the previous report. The means and standard deviation of NSPC was significantly affected by district at (P > 0.001) where it was higher for A/Guduru and the lowest for Horro district, (Table-4). Parity at lambing had also significant effect (P >0.01) on LS and NSPC in this study. Litter size was increasing with parity from second to fourth lambing where it was lower on the first parity and declining on parity five. The rise up of litter size observed as parity is advancing from sixth parity onwards, which might be because of the selection of ewes reproducing best while least performing were culled out.

CONCLUSIONS

- The study has demonstrated that the non-genetic factors exerted a significant effect on reproductive and productive performances of ewes.
- The results call for intensive extension services, heath care and improved breeding practices to increase ARR and LS and reduce NSPC and LI of ewes in order to improve the productivity of ewes of sheep breed/type studied.
- The increase in reproductive efficiency and productivity could be offset by higher mortality of lambs and adult animals unless the management system is not favoring the sheep production.
- Detailed studies of the farming system, feeding system, constraint identification and farmers' participative intervention is suggested for an increase of sheep production in the villages of the study area in particular and of the county in general.
- The study revealed that using breeding males of unknown source and large number of stocks without breeding male became the main reason for an extended LI and low ARR. And calls for artificial insemination, utilizing semen of superior males for the genetic improvement of sheep in the western Ethiopia.

Acknowledgements

The authors would like to express their earnest indebtedness to Wollega University, the research sponsor and for the continued financial and material support. Special thanks are forwarded to the enumerators of this research data, Miss. Diribe (Wollega University staff), and Mr. Tibebu, Mr. Habtamu and Mr. Gebeyehu (all rural development agents) for their concern and interest in collecting appropriate data for the research work to be successfully completed in the planned time.

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