

Production System and Husbandry Practices of Sheep Under Farmers' Management Condition in North Western Highlands of Amhara Region, Ethiopia

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Abstract

The study was conducted with the objectives of assessing sheep production and productivity under farmers' management condition in North Western Highlands of Amhara region Ethiopia. Semi structured questionnaires were used to collect data on production, productive performance and socioeconomic aspects. One hundred eighty sheep owner households were randomly selected from six peasant associations. The data were analysed using SPSS statistical software. Mean and standard deviations of sheep flock size of the farmers was about 14.83 ± 10.76 . Sheep hold several roles and breeding was ranked as the first purpose of keeping sheep. Disease and internal parasite incidence ranked as a major constraint followed by shortage of grazing land, breed performance, and lack of feed during dry seasons. The mean flock mortality rate was 16.63 %. The total off-take rate was 37.39% per annum. Traditional sheep production systems in the study area was considered unsatisfactory in feeding and feed management practices. Poor productive and reproductive performances of indigenous sheep breed were investigated. In addition to, the strategy could focus on developing small-scale market-oriented intensive production systems.

Keywords: Flock size, Husbandry Practices, Management, production, Sheep

Introduction

Indigenous sheep breeds have great potential to contribute more to the livelihood of people in low-input, smallholder crop livestock and pastoral production systems (Kosgey and Okeyo 2007). Ethiopia is home for an estimated 25 million sheep (CSA, 2015) and about 14 traditional sheep populations (Gizaw et al 2007). Despite the wide importance and apparent contributions, the attention given to the improvement of the sheep production system is inadequate. Thus, there exist unexploited opportunities for the development of the species especially in sustainable crop-livestock and pastoral systems. It is assumed that the low productivity of sheep is a combined effect of poor management, limited feed resources and high disease pressure (Solomon et al 2008).

This study would be undertaken to make an assessment of indigenous sheep production and productivity performance. The data collected from the survey was used to generate baseline information on traditional sheep husbandry practices of the district and their production environments. The baseline information was used to support sheep management practices and production activities and helped to identify possible causes of threat for sheep productivity performance, and possible actions to alleviate their impacts. The study was to assess the existing production systems, management, associated constraints and productivity performances of local sheep breed's under farmers' management system

Material and Methods

Descriptions of the study area

The study was conducted at Goncha Siso Enesie District, East Gojjam zone, in Amhara National Regional State. It is located 338 km North West of Addis Ababa and 156 km South East of Bahir Dar, the regional capital. The district is located in $10^{\circ}55'N$ latitude and $38^{\circ}05' E$ longitude. The annual rainfall varies from 1100 to 1500 mm. The annual mean temperature varies from $15^{\circ}C$ to $24^{\circ}C$ with a mean of $19^{\circ}C$ (CSA, 2015). The total human population of the district was 156012 with 49.7 % male and 50.3 % female. The total number of rural households of the district was 32687, among which 82.1 % were men and 17.9 % were women headed. The total population of livestock in the study area are cattle, sheep, goats, chicken, equines and honeybees were 140513, 60400, 37100, 42200, 23000, and 11581, respectively (CSA, 2015).

Sampling Techniques

Six representative peasant associations were purposely selected based on its highest sheep production potential. The sampling frame was based on the administrative structure of the district. A stratified sampling approach was used to select the households from sampled peasant associations. Households within peasant associations were the sampling units. Farmers owning sheep were the target population. From these peasant associations 180 were selected randomly and the selected peasant associations were stratified in to small, medium and large population

size of sheep (ILRI 2000).

Methods of data collection

The primary quantitative and qualitative data was collected by using semi structured questionnaires. Informal and formal survey tools were employed to gather information on sheep production and productivity details. Focused group discussions, pair wise ranking and field observation were used to collect data. The sampled households were selected from the list of members' record. In each peasant association, 30 households were selected by using systematic random sampling technique. Each household head of the flock owner in each village was interviewed and information regarding composition, management practices, flock ownership patterns, flock demography, productivity, feed resources and feed management, constraints on production, the socio-cultural and economic importance of sheep production was collected in the survey part of the study. The information gathered was documented and set for analysis.

Statistical analysis

Both quantitative and qualitative data was analysed by using SPSS statistical software. From the statistical software, descriptive statics was used to observe frequency, percentage and mean

Results and Discussion

Sources of income for the farmers

Fifty two percent of the respondent ranked crop products first as main sources of income followed by sale of sheep and other livestock species, products and by-products which together accounted for 32 % of the respondents. Farmers mostly sold sheep to cover small expenses and immediate cash needs to purchase cloths, industrial products for home consumption and school fees. Moreover, sheep are sold during emergency and at the time of crop failure for loan repayments and buying grains. The major income source of the farmers obtained in the present survey was in line with the report of Bureau of Agriculture (BoA 2015).

Livestock composition, flock size and structure

The interviewed households had owned in total 985 cattle, 2670 sheep, 88 goats, 246 donkeys, 37 horses, 7 mule and 743 poultry. The survey results revealed that sheep were the most common species of animals kept in all the study areas. Cattle, poultry, equines and goats ranked second to fifth, respectively. The average number of sheep per household was 14.83 heads. The overall average number of livestock per household was 5.5 cattle, 14.8 sheep, 2.6 goats, 1.6 equines and 5.12 chickens. An average holding per household in terms of tropical livestock unit (TLU) for livestock (excluding chicken) is 6.55 and of these cattle, sheep, goat and equines constitute an average of 3.85, 1.48, 0.26 and 0.96, respectively. The total TLU holding of this study higher than results reported for Wolaita (3.6) and Dawuro (5.6) and lower than the reports of Alaba (8.0) (Tsedek 2007).

Sheep flock structure

The average number of sheep per household was 14.83±10.76 (mean ± SD) heads. Of the total sheep owned by the interviewed farmers, 69.6 % were females, 23.8 % entire males and 6.6 % castrates. The ratio of breeding males to breeding females was 1: 5.01, breeding females being about 50.9 % of the flock.

Sheep Production Management and Husbandry Practices

Objectives of sheep production system

The main objectives of sheep rearing based on ranks of the production systems by smallholder farmers in each PAs is presented in Table 1. Knowledge of reasons for keeping animals is a prerequisite for deriving operational breeding goals (Jaitner et al 2001).

Table 2. Ranking of sheep production objectives for the supply of food and income.

Parameters	Ranks number of respondents(N=180)						weight	%	ranking
	1 st	2 nd	3 rd	4 th	5 th	6 th			
Sale(income sources	92	70	17	0	1	0	972	25.7	0.257(1)
Input	77	34	62	5	2	0	899	23.8	0.238(2)
Meat	8	70	93	9	0	0	797	21.1	0.211(3)
Saving	1	3	5	58	113	0	441	11.7	0.117(5)
Manure	0	0	0	2	2	176	186	4.9	0.049(6)
social and cultural functions	2	3	3	106	62	4	485	12.8	0.128(4)

Index= sum of (6 X number of household ranked first + 5 X number of household ranked second + 4 X number of household ranked third + 3 X number of households ranked fourth + 2 X number of household ranked fifth + 1 X number of household ranked sixth) given for each purpose divided by sum of (6 X number of household ranked first + 5 X number of household ranked second + 4 X number of household ranked third + 3 X number of households ranked fourth + 2 X number of household ranked fifth + 1 X number of household ranked sixth) for all purpose of keeping sheep in a production system.

Feed and feeding systems

The main feed resources for their livestock were private grazing land, crop residues, crop aftermath, hay and communal grazing lands. The general practice followed was to let sheep to graze freely on wheat or barley aftermath, during the dry season and on private grazing lands and communal grazing land during the small rain. Dry and wet season feed shortages were partly offset by livestock owners through the preservation of crop residues and hay from their private grazing land. During severe feed shortage periods, most flock owners offer crop residues of wheat, teff, maize and barley mostly available in the area. Sheep generally grazed for 2 to 12 hours an average of 8.74 hours a day with any time needed.

Water source and utilization

About 56.7% of the total households reported that they encounter water shortage for their flocks. From the sheep flock owning households of about 38.9%, 22.1%, 21% and 17.95 were drying of water sources, Provides other livestock's than sheep, far distance from water sources and not allowed to use water sources for sheep respectively (Table 2.).

Table 2. Reasons of water shortage problem

Parameters	Number of respondents (n=102)				weight	%	ranking
	1 st	2 nd	3 rd	4 th			
Drying of water sources	91	11	0	0	397	38.9	0.389(1)
Far distance from water sources	11	35	9	47	214	21	0.21(3)
Not allowed to use water sources	0	13	55	34	183	17.9	0.179(4)
Provides other livestock's than sheep	0	43	38	21	226	22.1	0.221(2)

Index= sum of (4 X number of household ranked first + 3 X number of household ranked second + 2 X number of household ranked third + 1 X number of households ranked fourth) given for each purpose divided by sum of (4 X number of household ranked first + 3 X number of household ranked second + 2 X number of household ranked third + 1 X number of households ranked fourth) for all reasons of water shortage problem.

Castration

Majority of the (82.8%) sheep owners practice castration. About 80.1% of the sheep owners use traditional castration method to castrate their sheep. Sheep owners reported that they crash the vas deference using rounded stone locally known as 'allelo' and 18.9% of the sheep owners use berdizzo for castration. Rams were castrated at age of 2.4 years. Keeping castrated sheep for extended period of time 3.5 years (range of 0.38 to 7 years) for the district sheep breeds were reported. Keeping castrated sheep for prolonged period of time could not be profitable so that shortening the fattening period of castrated sheep using supplementary feed might be considered in order to increase the return obtained from the sheep farm. As compared to Afar and Menz sheep castration time (1.7 and 1.5 years) respectively (Getachew, et.al 2010) castration practices was higher due to cultural value that does not castrate lambs.

Reasons of castration for the district sheep owners were to improve fattening (78.9%), to avoid unnecessary mating (3.9%) and for all of the above reasons (17.2%). Selection criteria of Goncha Siso Enesie district the interviewed household were conformation, physical characteristics breed and age (Table 3).

Table 3. Selection criteria of sheep castration and fattening

Parameters	number of respondents(n=153)				weight	%	ranking
	1 st	2 nd	3 rd	4 th			
Conformation	123	27	3	0	579	34.5	0.34(1)
Physical characteristics	78	70	3	2	530	31.6	0.32(2)
Breed	27	47	77	2	405	24.1	0.24(3)
Age	2	1	3	147	164	9.8	0.1(4)

Index= sum of (4 X number of household ranked first + 3 X number of household ranked second + 2 X number of household ranked third + 1 X number of households ranked fourth) given for each purpose divided by sum of (4 X number of household ranked first + 3 X number of household ranked second + 2 X number of household ranked third + 1 X number of households ranked fourth) for all selection criteria of sheep castration and fattening.

Culling

Most farmers (90%) culled animals for sale at times of financial difficulties. According to 29.6%, 26.8%, 8.9%, 18.3% and 16.4% of the households Infertility (reproductive problem), old age and disease problems (sick), physical defects and unwanted physical characteristics such as black colour, height respectively were the most common reasons for culling of sheep in Goncha Siso Enesie district (Table 4). According to the interviewed household of the sampled PAs infertile, old ewes, male and female lambs accounts 97.2% sequentially were first to be culled. And 1.1% rams, 1.1%ewes and 0.6% castrated sheep for household meat consumption were occasionally culled.

Table 4. Ranks of common culling reasons in the district

Parameters	Number of respondents (n=164)					weight	%	ranking
	1 st	2 nd	3 rd	4 th	5 th			
Old	53	78	17	14	2	658	26.8	0.268(2)
Sick	3	3	9	13	136	216	8.9	0.089(5)
Reproductive problem	93	53	17	1	0	730	29.6	0.296(1)
Physical defects	2	21	82	56	4	451	18.3	0.183(3)
Unwanted physical characteristics	12	11	39	80	22	403	16.4	0.164(4)

Index= sum of (5 X number of household ranked first + 4 X number of household ranked second + 3 X number of household ranked third + 2 X number of households ranked fourth + 1 X number of household ranked fifth) given for each purpose divided by sum of (5 X number of household ranked first + 4 X number of household ranked second + 3 X number of household ranked third + 2 X number of households ranked fourth + 1 X number of household ranked fifth) for all ranks of common culling practices.

Housing and house management

About 47.8% of respondents accommodate their flocks in the main houses together with the family members. Confining of flocks in separate barns (only 11.1% respondents) is uncommon and adjoining structures (41.1% respondents) are more common types of sheep housing in the district. The major reason for housing flocks at night with the family is to minimize attack by predators and to avoid theft. Predators rarely destroy barns and also main houses and causes complete loss of flocks. Fox and dog are the major predators. Keeping of flocks in the main house is more common in the study area than other reports in the country (Berhanu, 1998; Markos, 2003).

Docking

Cutting the fat tail of female sheep is a common practice in the district. About 97.2% of the respondents of the sampled PAs practiced docking of female lambs at the age of 4.7 months. There is no standardized specific site of cutting. According to the farmers, docking practices are done for the purposes of mating and improve conception rate (86.1%) and 11.1% of the interviewed farmers practiced for cultural activities that comes from their elders, improve body condition. Farmers use hot sharp knife to avoid bleeding and contamination by germs.

Marketing economic and social aspects

Farmers sell live sheep particularly during holidays, Ester, Meskel and New Year festivals and during the rainy and cold dry season for the purchase of food items especially from July to November when there is acute shortage of food grains. Farmers also sell sheep when they need cash for small household expenditures. Sufficient crop production associated with normal rainfall distribution shifts the sale of most of the sheep during festivals and holidays. On the other hand, crop failures and abnormal rainfall patterns in a year would lead to the sale of many sheep from July to November. At such situations most farmers become victims of nature and loose or highly reduce their flocks. In addition, the price of sheep deteriorates dramatically since the supply highly exceeds the demand.

Table 6. Fattening practices of sheep for targeted to marketing season

Parameters	Number of respondents (N = 83)						weight	%	ranking
	1 st	2 nd	3 rd	4 th	5 th	6 th			
Christmas	1	64	13	5	0	0	393	25.7	0.257
New year	6	8	53	16	0	0	296	19.4	0.194
Easter	75	7	1	0	0	0	489	32	0.32
Meskel	1	3	17	62	0	0	275	18	0.18
Edalfe	0	0	0	0	23	2	48	3.1	0.031
Arefa	0	0	0	0	2	23	27	1.8	0.018

Index= sum of (6 X number of household ranked first + 5 X number of household ranked second + 4 X number of household ranked third + 3 X number of households ranked fourth + 2 X number of household ranked fifth + 1 X number of household ranked sixth) given for each purpose divided by sum of (6 X number of household ranked first + 5 X number of household ranked second + 4 X number of household ranked third + 3 X number of households ranked fourth + 2 X number of household ranked fifth + 1 X number of household ranked sixth) for all fattening practices of sheep for targeted to marketing season.

Flock off take rate

The annual off-take rate of 37.39 %. Out of the total rate 71.3%, 23.6%, 3.8% and 1.3% for sold, slaughtered, transferred and gift, respectively. The finding of this study are lower than to the reports of Tesfaye (2008) (38.5%) but greater than to the reports of EPA (2006) (33%) and dose to FAO (2004) for national estimates (37%).

Mating /breeding

In general, none of the households control mating of their ewes with rams. The rams were with the flocks for service throughout the year. In most of the household flocks, the age of male and female for first service was not

pre-determined. Mating occurs at random whenever the female comes in to the oestrus with or without the knowledge of the flock owner.

Gender and Labor Allocation in Sheep Management

All activities regarding sheep management in all the study areas was similar and done by the family labour. Although all household members were involved in sheep management activities to a varied degree, respondents reported specific responsibilities of each individual's household members (Figure 1).

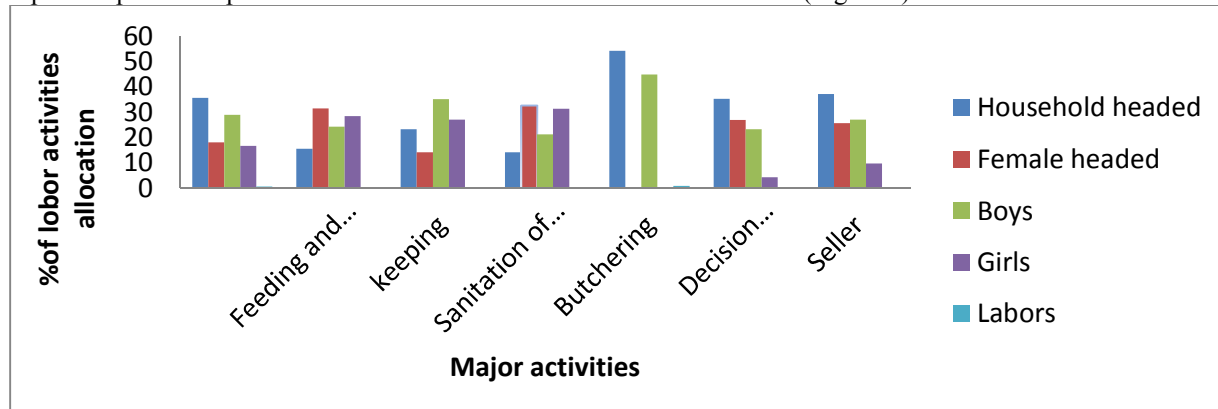


Figure1. Major activities division on sheep husbandry practices of the family members.

Seasonality in lambing/conception/breeding

Lambs were born in every month of the year across the surveyed district, and most frequently between November and December followed by the months from March to May (Figure 2). In general; it was found that 70.4% of the lambing occurred during this season indicating that the conception rates were highest. These are because of accessibility of feed sources as the key informants put the main reason for this time during group discussion.

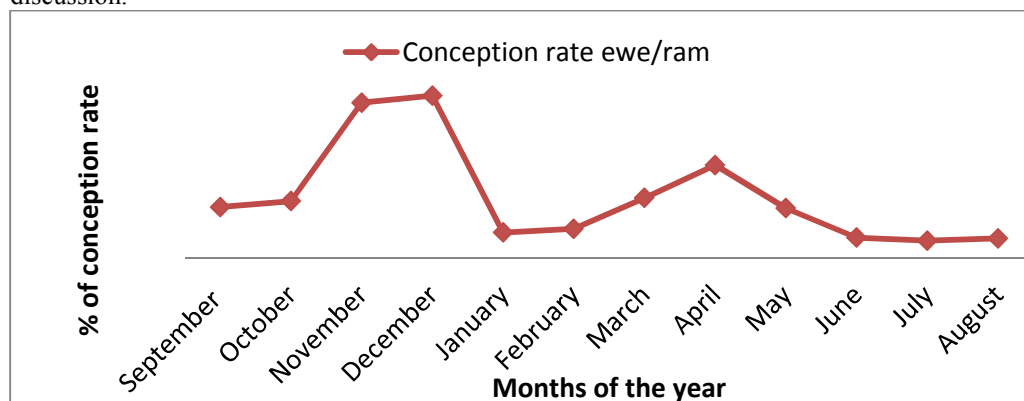


Figure2. Intensive breeding and conception season /months during the year.

Constraints and Opportunities of Sheep Production and Management

Major constraints to sheep production and management

Sheep health and disease

Overall, 26.4% flock owners rated diseases and parasites as the main cause of mortality. Fasciolosis, pneumonia, sheep pox, pastorolosis, blackleg and anthrax were reported as the most prevalent flock health threats across all the sites. Major diseases and parasites causing mortality and morbidity in this study are in agreement with reports of Markos (2003) for goats in Awassa Zuria woreda.

Flock Mortality Rate

Based on the reported current stock of sheep and numbers of deaths over 12 month's period prior to the survey, the overall annual mortality rate for the whole sample flock was 16.63 %. From these lambs and ewes took 4.79% and 9.25% respectively. This report shows ewe's mortality rate is higher than lambs. The total mortality rate reported in the present study was comparable to Tesfaye (2008) (15%) for Dessie Zuria Menz sheep, Yetaye et al (2000) (16.84 %) for Menz sheep, Asmamaw (2001) (13 %) for Horro sheep around Bako area under station conditions, Workneh et al (2004) (15 %) for Oromiyia sheep breeds and Kassahun (2005) (49% to 83%) for Menz sheep for mortality before one year of age.

Table 5. Sheep flock mortality rate by age classification

No.	Age classification	Number of death	%
1	Lambs	128	4.79
2	Adult lambs	51	1.91
3	Ewes	247	9.25
4	Rams	11	0.41
5	Castrated	9	0.34
6	Total	444	16.63

Table 7. Major cause of sheep mortality in the study area

Parameters	Number of respondents (N=180)						weight	%	ranking
	1 st	2 nd	3 rd	4 th	5 th	6 th			
Disease and parasitic infection	110	63	7	0	0	0	1003	26.4	0.264
Nutritional deficiency	62	105	12	1	0	0	935	24.7	0.247
Mechanical cause	7	10	78	62	19	4	632	16.6	0.166
Predator	0	0	19	55	71	35	418	11	0.11
Undetermined	1	2	54	39	65	19	498	13.1	0.131
External parasite	0	2	10	23	26	119	313	8.2	0.082

Index= sum of (6 X number of household ranked first + 5 X number of household ranked second + 4 X number of household ranked third + 3 X number of households ranked fourth + 2 X number of household ranked fifth + 1 X number of household ranked sixth) given for each purpose divided by sum of (6 X number of household ranked first + 5 X number of household ranked second + 4 X number of household ranked third + 3 X number of households ranked fourth + 2 X number of household ranked fifth + 1 X number of household ranked sixth) for all major cause of mortality.

Major sheep feed from natural pasture, crop residues, browse and bushes, crop residues, thinning, weeds, local brewery by products (attela) and fodder plants identified in this study are also major feed source of sheep in Ethiopia (Markos, 2003) A marked seasonal variation in the quantity and quality of feed supply and the acute problem of feed supply during dry season found in this study is in agreement to ILRI (2000).

Opportunities and strategic options for improvement of sheep production and management

The opportunities and strategic options for improvement of sheep production and management in the study area were Institutional support for livestock research and development, improving livestock extension service delivery, strengthening marketing services.

Conclusions

The traditional sheep production system in the study area was considered unsatisfactory in feeding and feed management practices. The management practices observed was similar to other traditional production systems. In the study area there was serious feed shortage during the main rainy season compared to similar agro-ecological zones. The main feed resources to livestock in the district were natural pasture, crop residues, stubble grazing from fallow lands, forest and shrub areas. The other main problems in the study areas were seasonal outbreak of disease, internal parasite and external parasite. The strategy could focus on developing small-scale market-oriented intensive production systems depending on the characteristics of the existing production systems and agro-ecologies. Improvement of grazing lands, crop residue utilization, adoption of high yielding forage crop varieties and conservation structures should be the most feasible feed improvement options in highland mixed crop livestock production systems. The future focusing area for disease prevention and control mechanisms of veterinary services could be done ("prevention is better than cure for livestock").

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