Research Article

Assessments of breeding practices, major constraints and opportunities of sheep and goat production in Sinana district, bale zone, Ethiopia

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Abstract

The study was conducted in selected Rural Kebeles of Sinana District, Bale Zone of Ethiopia with the objectives to identify the breeding practices and assess the major challenges and opportunities of sheep and goat production under taken. Both primary data through structured questionnaire and secondary data from different relevant offices, published and unpublished sources were gathered. A set of semi-structured questionnaire were used to collect data from 120 farmer-owning shoats based on single-visit-interviews. To enrich the primary data, field observations and group discussions were also undertaken. The result of the study indicated that majority of the respondents kept their sheep and goat under free grazing and partly tethered management, respectively during dry and wet season. The main reason for keeping sheep and goat by majority of the farmers (81%) is as a source of money to supplement family income. Almost the entire interviewed households were practices fattening for targeted market. From interviewed respondents 33 (27.5%), 29 (24.17%) and 26 (21.67%) of respondents select animals for fattening based on body conformation, age and local ecotypes, respectively. The most type of feeding systems practices in the study area was free grazing (90.83% during dry; 79.17% during wet season). Natural pasture and crop residues were the main feed resource during the rainy season whereas natural pasture, crop residue, and local brewery by product are the main dry season feeds. Feed shortage, land scarcity, and untimely credit access were the major constraints that hinder sheep and goat productivity in the study area. About 53.9% of interviewed households declared that, sheep and goat health problem were occurred. Overall mortality rate of sheep and goat in study area were 12.9% and 14%, respectively. The highest mortality rate occurred in suckling flock (16% lambs; 16 kids %), young flock (9.6 % lambs; 13% kids) and breeding females (ewes 12% and does 14%) in all study sites. The available opportunities of sheep and goat production in the study area were feasible weather condition followed by availability of adapting local sheep and goat breed, market access and government intervention.

Keywords: feed resource, challenges, opportunities, interviewed

Background and justification

Demand for animal products in Sub-Saharan Africa and generally in the developing countries is likely to rise significantly because of population growth, urbanization and rising income.[1] Livestock production in Africa accounts for about 30% of the gross value of Agricultural production, with 92% of this is coming from the production of beef cattle, dairy cattle, goats, sheep, and chickens.[2] Ethiopia has a diverse indigenous sheep and goat populations, numbering 25 million and 22 million heads, respectively.[3] The country was endowed with largest livestock population that ranks 1st in Africa and 10th in the world, which could enable the country to gain from the growing global markets for livestock products if production and productivity will improve.[4] The total annual meat production (in %) are 63% cattle, 25% sheep and 12% goats.[5] Sheep and goats represent an important component of the farming system by providing about 12% of the value of livestock products consumed and 48% of the cash income generated at the farm level.[5] Sheep and goats are owned by smallholder farmers as an integral part of the livestock sub-sector and contribute to both subsistence and cash income generation.[6] Sheep and goat are rear in various agro-ecological condition of the country. The country livestock sector contributes about 15 to 17% of gross domestic product (GDP), 35 to 49% of agricultural GDP, and

37 to 87% of the household incomes.[7] The estimate of sheep and goat were 23.6 and 23.3 respectively.[4] Despite high population of small ruminants and the existing favorable environmental conditions, the current livestock contribution is below its potential due to various reasons associated with a number of complex and inter-related factors such as feed shortage, disease, and drought.[8]

In Sinana District of Bale Zone, productivity of sheep and goat as in case of most of the ruminants is markedly low due to several genetic and environmental factors besides the institutional, environmental and infrastructure constraints. Therefore, improvements in small ruminant's productivity, which is low in Ethiopia specifically in Sinana District, Bale Robe Zone and will achieved through identification of production constraints. Assessments of sheep and goat production constraints are pre-requisites to bring improvement in small ruminant productivity. In the study area, small ruminants like sheep and goat production system, its major constraints and opportunities are not adequately studied and hence, assessments of the existing sheep and goat production systems and their constraints are an important tool to inform researchers about the actual problems farmers face and the opportunities that exist within the systems. Therefore, this study was conducted to collect information on the production system, major constraints, and opportunities of sheep and goat production in the study area.

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Materials and methods

Description of the study area

Sinana district is located in the Northwestern part of Bale zone. The total area of the district is about 1168 km^2. The district has 20 rural kebeles. The altitude of the district ranges from 1650 to 2950 m a.s.l. From the total area of the district, about 73.54% is plain land, 3.7% is hills, 9.6% is mountains, 12.3 % is rugged, and 0.86 % is gorge. The annual average temperature is 16.5o c where as the minimum and maximum temperature is 9°c and 23°c respectively. The annual average rainfall is 1105mm where as the minimum and maximum rainfall is 1060 and 1150 mm respectively.[9] Farmers in the district experienced mixed farming system of both crop and livestock. The major crops produced in the district are wheat, barley, pulses, and oil crops. Rainfall pattern of the district is characterized by bi-modal rainfall distribution. The district has two distinct seasons, i.e. Belg, which extends from March to July and Meher, which extends from August to January.[10]

Sampling techniques and sample size

From the total of rural kebeles in Sinana Districts, three rural kebeles were selected purposively based on the experience of sheep and goat production. From each rural kebele, 40 farmers and 120 farmers were selected by using systematic random sampling.

Data collection method

To collect data, structured questionnaires were developed and pre-tested for consistency and applicability of the objectives of the study. Focal group discussions were made to enrich the primary data.

Data management and analysis

The data collected were analyzed by using SPSS software version 20. The results were reported using descriptive statistics, such as mean, percent, and frequencies and presented in form of tables, charts, and graphs. The major sheep and goat constraints were summarized by index ranking methods.[11] Index ranking method (weighted averages) was used to obtain the major sheep and goat production constraints in the study area.

Result and discussion

Production system, purpose of keeping and flock size of sheep and goat

As an integral part of the mixed farming system, livestock production in the study area plays a substantial role in the household food security. The major livestock reared in the area were cattle, sheep, Goat, and poultry. Analysis of the Sheep and Goat production system in the area indicated that 100 (83.3%) of the respondents kept their sheep and goat under extensive system followed 20 (16.7%) who practice semi-intensive system of management. Sheep and goat production plays a significant role in the life of man whether in the rural or urban areas in a variety of ways. From the results of the current study, the predominant reason for keeping sheep and goat by majority of the farmers (80.8%) were as a source of money to supplement family income. The rest (19.2%) of farmers kept for use during festivities and direct consumption. The result shows that most farmers keep sheep and goat for sales in order to meet family expenditures. This finding is similar with that of Getachew et al.[12] and Gebretsadik et al.[13]

Sheep flock in the study sites were significantly different; and are 5.71 in RK1, 6.89 in RK2 and 4.4 in RK3 (Table 1). The average holding of sheep in the study sites is higher than an average holding of sheep (0.96) 0.96 in Dira Dawa town.[14] The average goat holding in the study area were 3.97 (0.37) lower than average holding of goat 5.03 (0.48) in Dira Dawa town.[14] Across the three-study sites household keep mixed species composition, and according to ILCA[15] this decrease competition for feed, reduces risk by lessening the dependency on one species for meat, milk, and increases the likelihood of meeting basic consumption needs. The reasons for the variations could be due to the natural wealth base such as feed availability and capital wealth base of the respective communities. The extent of cropping and the type of crop, in turn, determine the quantity, quality, and distribution of animal feed resources throughout the year; on the other hand, the feed resource base and disease challenge determine the animal production system.[16] Moreover, the area having different agro ecology, which determined availability of, feed for sheep and goat and diversify source of income.

Table 1 Livestock composition across the three-selected RKs of Sinana district

Livestock composition	Kebeles			Overall mean (SE)	Test	
	RK1 Mean (SE)	RK2 Mean (SE)	RK3 Mean (SE)		F- value	P-value
Cattle	3.12 (0.5)[a]	4.13 (0.5)[b]	2.41 (0.5)[a]	3.22 (3.09)	2.95	0.06
Sheep	5.71 (0.8)[a]	6.89 (0.8)[a]	4.4 (0.8)[b]	5.67 (0.39)	12.28	0
Goat	3.62 (0.61)[a]	4.37 (0.68)[a]	3.92(0.47)[a]	3.97 (0.37)	1.99	0.14
Chicken	3.3 (0.47)[a]	3.83 (0.68)[a]	3.95(0.40)[a]	3.69 (0.34)	1.86	0.16

**different subscripts indicates significant differences at p<0.05 between means with in rows

SE means standard error, RK, rural kebeles

Selection criteria for fattening of sheep and goat

Almost the entire interviewed households were practices fattening for targeted market (specific holidays) and few of them depend on target market season. Selection criteria for sheep and goat fattening were shown in Table 2. From interviewed respondents 33 (27.5%), 29 (24.17%) and 26 (21.67%) of respondents select animals for fattening based on body conformation, age and local ecotypes, respectively. The survey result indicated that fattening was one of the farming activity in the area using homemade concentrates using the human food grains so provision of supplementary feeds at affordable price.

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Table 2 Fattening of sheep and goat in three-selected RKs of Sinana district

Criteria	Percentage
Conformation (height, length and appearance)	33 (27.5%)
Physical characteristics (color, horn, tail length and width, ear etc.)	21(17.5%)
Age	29 (24.17%)
Breed (known local ecotypes)	26 (21.67%)
Others	11 (9.17%)

RK, rural kebeles

Table 3 Feed resource in three selected rural kebeles of Sinana district

Feed types	RK1 (%)	RK2 (%)	RK3 (%)	Overall (%)
Grazing	26.75	28.56	44.8	33.37
Crop residues	22	20.22	21	21.07
Local brewery by product	13.13	11.24	10.2	11.52
Wheat bran	6.02	6.43	10.15	7.53
Herbaceous shrubs	5.47	6.37	6.8	6.21
Chat left over	8.55	7.75	4.28	6.86
Grain and legume	1.27	15.2	2.01	6.16
Others	17.1	18.15	2	12.42

Others, Fruit peels, Kitchen left over and Grinding by products, RK, rural kebele

Major feed sources in the area

According to the response of respondents, feeding whatever available in their surrounding was common. Availability of different feed sources vary depending on the area where the households were located in references to market, cafeterias, miller house and grazing land which is either private or open area and type of crop cultivated. Major feed resources were grazing (33.37%), which includes road and fence side grazing, private or government land area grazing, free roaming on waste disposal and purchase grass from different sources is common (Table 3). The non-conventional feeds used by smallholder sheep and goat holders include the traditional brewery and liquor residue (Atella), chat, vegetables and fruit wastes, and leftover foods.

Feeding systems of sheep and goat

The most type of feeding systems practices in the study area were free grazing (90.83% dry; 79.17% wet season) and partly tethering (46.67% dry; 50% wet season) and fully tethered (6.67% dry; 8.33% in wet season). According to Rischkowsky et al.[17] the four sheep feeding system identified in West Africa; free grazing, scavenging in the roads and tethering, semi-intensive and confine both in dry and wet season. Tethered grazing was practiced to decrease labor requirement, especially in the study sites. According to the responses of respondents during group discussions, theft and predator is a common and challenges for goat and sheep owner. Most frequently, the predators (hyena) enter in to barn and attack their flock.

Sheep and goat health management

Out of the total interviewed households, 53.9% declared that sheep and goat death occurred in the year 2010/2011. Overall mortality rate of sheep and goat in study area were 12.9% and 14.0% (Table 5) respectively. The highest mortality rate occurred in suckling flock (16.24% lambs; 16.3 kids %), young flock (9.64 % lambs; 13.24% kids) and breeding females (ewes 12.06% and does 14.1%) in all study sites. Reports of Denksew and Girma[18] studies at Hawassa showed higher results for lambs <3 months and lambs 3-6 months (3-6 months). For the most part of breeding females died due to car accident, kicked by person, and swallowing of plastic. According to the reports of Otte and Chilonda,[19] the mean lamb and kids' mortality are 26.7 and 27.8 percent in the traditional system of Sub Sahara Africa (SSA), respectively. Different sheep and goat disease, which caused mortality of sheep and goats, were Pneumonias, Pasteurellosis, and sheep pox, bloating and ingestion of plastics materials, car accidents, and predators.

Sheep and goat production constraints

Small ruminant production in the studied areas was constrained by different problems were shown in Table 6. Small ruminant production in area prioritized the major constraints as; availability and cost of feeds, limitation of land for the expansion of production and poor extension services. Both problems were directly related to each other; as the population/urbanization increase land allocate for constriction, which decreases the land available for livestock grazing. There is a problem of availability and price of feeds. Usually sugarcane tops and grass was sold in the market as animal feed. Additionally, prices of concentrate feeds were among the major problems in small ruminant production. Following to feed related problems, availability of land for small ruminant production is the next important constraint in the studied area. According to Berhanu et al.[20] livestock health is the second important problem followed by feed shortage, which is the first critical problem for Ethiopian livestock productions. Though small ruminant producers are interested to expand the production, the land available for production cannot let them to do so. This is in line with Denksew and Girma[19,21] that showed the main problems which hamper the expansions of sheep and goat flock were shortage of feed and land for grazing.

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Table 4 Feeding systems practices in three-selected RKs of Sinana district

Feeding systems practices	RK1		RK2		RK3		Total	
	N(40)	%	N(40)	%	N(40)	%	N (120)	%
Dry season feeding practices								
Free grazing	25	41.67	35	58.33	49	81.67	109	90.83
Partly tethered	32	53.3	18	30	6	10	56	46.67
Fully tethered	0	0	5	8.33	3	5	8	6.67
Confined	3	5	2	3.33	2	3.33	7	5.83
Wet season feeding practices								
Free grazing	29	48.33	33	55	33	55	95	79.17
Partly tethered	24	40	20	33.33	16	26.67	60	50
Fully tethered	0	0	3	5	7	11.67	10	8.33
Confined	7	11.67	4	6.67	4	6.67	15	12.5

RKs, rural Kebeles

Table 5 Mortality of sheep and goat flocks in selected rural kebeles of Sinana district

Flock structure	Sheep		Goat	
	Mean(SD)	Rate (%)	Mean(SD)	Rate (%)
Suckling flock	0.18 (0.5)	16.24	0.13 (0.4)	16.3
Young flock (3-6 months)	0.16 (0.5)	9.64	0.15 (0.5)	13.24
Breeding female	0.23 (0.5)	12.06	0.17 (0.53)	14.1
Intact/breeding male/	0.11 (0.33)	18.5	0.05 (0.2)	13.43
Castrated/fattening	0.12 (0.2)	16.7	_	_
Overall mortality	12.90%	14.00%		

SD, standard deviation

Table 6 Constraint of sheep and goat production in three selected rural kebeles (RK) of Sinana district

Location of study area	Constraints	1st ranked	2nd ranked	3rd ranked	4th ranked	PI
RK1	lack of grazing area	27	11	15	0	0.33
	Feed shortage	10	33	11	1	0.31
	lack of land for production	16	7	15	2	0.23
	Health problem	2	5	11	21	0.13
RK2	Feed shortage	10	38	9	0	0.33
	lack of grazing area	11	11	31	0	0.26
	lack of land for production	25	3	12	0	0.25
	Health problem	11	3	2	25	0.16
RK3	Feed shortage	30	15	6	0	0.4
	lack of grazing area	7	34	4	2	0.32
	lack of land for production	7	6	8	0	0.14
	Health problem	2	5	14	9	0.14

PI, Priority Index, RK1, 2, 3,=numbers of rural Kebele

Opportunities for sheep and goat production

Despite there were many constraints that affect sheep and goat production in the study area, there were also a couple of opportunities to improve sheep production such as presence of good breed, government intervention, credit and market access, presence of NGOs, road and infrastructure and favorable agro-ecology. From the study, as indicated in Table 7, favorable agro-ecology was the primary opportunity with an index value of 0.313. The second opportunity of sheep and goat production is presence of adaptable local breed with an index value of 0.236 and market access and government intervention were ranked as third and fourth opportunities with index values of 0.207 and 0.129 respectively. With regard to government interventions, Sinana Agricultural Research center and Mada walabu University have been engaged in supporting and providing an opportunity to improved technologies and capacity building through training on small ruminant production.

Table 7 Opportunities of Sheep and Goat Production in selected RKs of Sinana district

NO	Variables	1st	2nd	3rd	4th	5th	6th	F -sum	PI	Rank
1	Presence of good breed	3	37	10	5	3	1	265	0.236	2
2	Presence of NGOs	1	4	0	2	7	33	79	0.07	5
3	Credit access	0	3	0	3	6	14	50	0.045	6
4	Gov't intervention	0	1	14	21	7	7	145	0.129	4
5	Market access	1	14	32	2	11	0	232	0.207	3
6	Favorable agro-ecology	57	0	1	1	1	0	351	0.313	1

PI, Priority Index, RKs, rural Kebeles

Conclusion

In the study area the majority of the flock is composed of young (lambs and kids) and breeding females (ewes and does). Main purpose/reason of keeping sheep and goats were as source of income and saving. Sale of sheep and goat to fulfill immediate household cash needs accounted the main flock exit route for which sheep and goats are at immediate disposal. Natural pasture and crop residues were the main feed resource during the rainy season whereas natural pasture, crop residue, and local brewery by product are the main dry season feeds. The main reason for keeping sheep and goat by majority of the farmers (81%) is as a source of money to supplement family income. Almost the entire interviewed households were practices fattening for targeted market. From interviewed respondents 33 (27.5%), 29 (24.17%) and 26 (21.67%) of respondents select animals for fattening based on body conformation, age and local ecotypes, respectively.

The most type of feeding systems practices in the study area was free grazing (90.83% during dry; 79.17% during wet season). Feed shortage, land scarcity, and untimely credit access were the major constraints that hinder sheep and goat productivity in the study area. About 53.9% of interviewed households declared that, sheep and goat health problem were occurred frequently. Overall mortality rate of sheep and goat in study area were 12.9% and 14%, respectively. The highest mortality rate occurred in suckling flock (16% lambs; 16 kids %), young flock (9.6 % lambs; 13% kids) and breeding females (ewes 12% and does 14%) in all study sites. Generally, small ruminant production in the studied areas was constrained by different problems; prioritized as the major constraints; availability and cost of feeds, limitation of land for the expansion of production and poor extension services. The available opportunities of sheep and goat production in the study area were feasible weather condition followed by availability of adapting local sheep and goat breed, market access and government intervention.

Recommendation

I. The farmers should develop the habit of cultivating improved forage following different forage development strategies and feed conservation mechanisms like silage and hay, treat crop residues by physical and chemical treatment such as Urea treatment.

II. Producer of small ruminants should give emphasis on good management, because most constraints raised by less management practices.

III. The farmer store some feed for dry period, using concentrate supplements, purchase of forage.

IV. Provision of training on sheep and Goat production and flock management as well as consumption habit of goat milk for the producer should be made for the future.

V. Improving genetic potential of sheep and Goat by selection increases sheep and Goat reproductive potential.

VI. Expanding improved forage species to overcome the scarcity of feed which will be encountered during dry seasons.

VII. There should be forage promotion program to expand improved forage availability.

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Conflicts of interest

The author declares there is no conflict of interest.

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