Assessment of Goat Production System in Burie District, West Gojjam Zone, Ethiopia

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Abstract

This study was conducted in four selected rural kebeles (divisions of a district) namely, Woheni Durebetie, Woyenema Ambaye, Denbun and Boko Tabo in Burie district to assess goat production system, and to identify and prioritize goat production constraints. Informal and formal surveys were conducted in the selected kebeles. Purposive sampling method was used for the informal survey and random sampling method was used for the formal survey to select the respondents. A total of 36 and 75 respondents were interviewed for the informal and formal survey, respectively. Farmers in the study area rear goats for home consumption (1%), cash income (29%) and home consumption & cash income (69%) purposes. The mean number of goats owned by one household was 4.8±3.33 heads (n = 75). From the current study, about 25% of the goats in the flock were males and the remaining 75% were females. Browse species found in natural pasture and crop lands are the main feed resources for goats. In addition, farmers usually supplement their goats with common salt, maize grain, food left over and atella (a by-product of home brewed drink). Generally, there is feed shortage problem for goats during the dry and rainy seasons especially in the highland kebeles. Goat diseases and provision of inadequate veterinary service were reported to be major constraints affecting goat production in the study area. To improve the goat productivity and make the goat production sustainable in the study area establishment of new veterinary clinics, provision of adequate veterinary service and improving the goat marketing system should be given more emphasis in future research and development activities. Furthermore, feed production in the highland study kebeles should be improved.

Key words: Goat, production system, production constraints, Ethiopia

Introduction

Ethiopia possesses about 29.7 million goats in rural sedentary areas of the country (CSA, 2016) and they are diverse genetically. According to Tesfaye Alemu (2004), goats in Ethiopia are classified into eight breeds. These are Arsi-Bale, Gumuz, Keffa, Woyto-Guji, Abergelle, Afar, Highland goats and the Somali goats. Goat productivity in Ethiopia is low compared with the apparent potential (EARO, 2000; Solomon Gizaw *et al*., 2010). Goats are found in all agro-climatic zones of the country. Generally, inadequate feed supply both in quantity and quality, diseases and parasites, inadequate management and low genetic potential are among the technical

constraints that limit the small ruminant productivity in the country. Based on recent reports, poor feeds, animal health and inferior genotypes are the input side constraints in goat production in Ethiopia while lack of standardized marketing system and infrastructure to access markets are the main constraints on the output side (Solomon *et al*., 2014).

Ethiopia is home for diverse indigenous sheep and goat populations and favourable production environments (Solomon Gizaw *et al*., 2010). Based on the above source, sheep and goat in Ethiopia are kept under traditional extensive systems with no or minimal inputs and improved technologies. In Ethiopia, the small ruminant production system in different agro-ecological zones is not studied fully and farmers' needs and production constraints have not been identified (EARO, 2000). Currently, several on-farm studies describing production systems have been conducted in Ethiopia (Solomon *et al*., 2014). Assessment of the goat production system and identification and prioritization of the constraints of production is a prerequisite to bring improvement in goat productivity in the country.

Understanding the production system also helps to design appropriate technologies which are compatible with the system. In general, assessment of the goat production system is important to plan development and research activities and bring improvements in goat productivity. In Burie District, the goat production system is not studied and precisely known and goat production constraints are not identified and prioritized. Therefore, this study was conducted to assess the goat production system, to identify and prioritize the goat production system constraints in the district. This study will be useful for other areas with similar agro-ecological zones.

Materials and Methods

Description of the study area

This study was conducted in 2007 (started) and 2008 (completed) in Burie district, in Amhara National Regional State, North Western Ethiopia. Burie district is located between 10˚15′ N and 10˚42′ N and between 36˚52′ E and 37˚7′ E. Burie district has an estimated area of 838.9 square kilometers with altitude range of 713 – 2604 masl (BOFED, 2008; IPMS, 2007). The rainy season in Burie district is from May to September with a mono-modal pattern and a mean annual rainfall of 1386 – 1757 mm (IPMS, 2007). According to IPMS (2007), the long term annual temperature of Burie ranges from 14 ºC to 24 ºC. As the district has different ecological settings, it is suitable for different crops and livestock species production. The land use pattern in the district consisted of about 46.6% cultivated land, 16.3% wasteland, 14.8% shrub, 8.4% natural forest, 6% construction (roads and houses), 6% pasture land, 1% perennial crops and 0.3% water bodies (IPMS, 2007).

Human population of the district is estimated at 174,957, of which 143,558 (82%) lives in rural areas (BOFED, 2008). There are 22 rural kebeles and 2 towns in the district. There are about 21,793 and 2,786 households in rural and urban kebeles of Burie District (IPMS, 2007), respectively. Secondary data were collected from different sources. The study kebeles were selected before beginning the informal survey. Four representative rural kebeles were selected for the study by using secondary data and participation of district livestock and crop experts. The criteria used for selection of the study kebeles were agro-climatic and agro-ecological zone of the kebele, goat population and density, accessibility of the kebeles by vehicle and non-adjacent kebeles to one another. The selected kebeles for the study were Woheni Durebetie (*Dega*), Woyenema Ambaye (*Woina Dega*), Denbun (*Woina Dega*) and Boko Tabo (*Kolla*).

Informal survey

Informal survey was conducted in the selected kebeles (Roeleveld and Broek, 1996). Informal surveys are conducted using a checklist to ascertain and complement the preliminary systems understanding which was made based on secondary data analysis. During this study mostly qualitative data were collected from the respondents. But formal surveys are conducted using a questionnaire to provide a quantitative figure for conclusions drawn from earlier phases, to redefine target groups and to test hypotheses about relationships (Roeleveld and Broek, 1996). For the informal survey checklist was prepared and used. The main components of the checklist were breeds and breeding, feeds and feeding, diseases and disease control, housing, meat consumption and production constraints. Farmers to be interviewed from each kebele were selected purposively based on ownership of goats, economic status and living in the kebele for several years. Kebele administrators and religious leaders were selected as key informants and interviewed. For the group interview, farmers from different age, economic status and gender groups were included and interviewed. A total of 36 respondents were interviewed for the informal survey. Goat production constraints were prioritized using pair-wise ranking method for each kebele and single list ordinal ranking method for the district (ARARI, 2005).

To assess the flock composition, data were collected from each kebele during the informal survey field work. Goat flocks in each kebele were selected purposively (based on age and sex composition of the flock) in the grazing fields and every animal in the flock was caught, identified and data were recorded. Body weight of the animals was measured using hanging scale. According to Girma Abebe and Alemu Yami (2008), for light animals hanging scale can be used to measure the body weight of animals. Age of the animals was estimated based on observation of their dentition (Girma Abebe and Alemu Yami, 2008).

Formal survey

A structured questionnaire was prepared based on the informal survey result. The major components of the questionnaire were breeds and breeding, feed resources and feeding, housing, diseases and disease control, meat consumption and production constraints. The questionnaire was pretested before conducting the actual formal survey data collection. The study kebeles that were selected and used for the informal survey were used for the formal survey study. Respondents were selected by using random sampling technique. From each kebele enumerators were selected, given training on data collection and collected the formal survey data from the randomly selected individuals. A total of 75 farmers were selected and interviewed. The goat production constraints for the formal survey result were prioritized using single list weighted category based ranking method (ARARI, 2005). The statistical analysis was done by using SPSS (2003) statistical software. Descriptive statistics were used to summarize the data and ANOVA was done for mean comparison.

Results

Goat characteristics in the study area

Farmers in the study area rear goats for the following main purposes, for home consumption (1%), cash income (29%) and home consumption & cash income (69%). Milking of goats and consumption of goat milk in the study area is not common. Goat producing farmers in the highland study kebeles were concentrated in areas where more natural browse in the vicinity of their homes was found. According to FARM-Africa (1996), the goat types found in the study area were Western Highland goat types. Western Highland goat types are one of the 14 goat types found in Ethiopia and Eritrea. According to FARM-Africa (1996), the mean flock size owned is 8 (SD = 6). In the current study, one household owns on average 4.8 heads of goats (n = 75, SD = 3.33). On average, one household sells 1.7 heads of goats (n = 75, SD = 1.72) per year. According to the current study, one animal in the flock on average weighs 21.6 kg (n = 248, SE = 0.65). Based on mean body weight (BW) of an animal in the flock, the *Dega* kebele goats were heavier ($P<0.05$) in BW (25.0 kg) than the *Woina Dega* and *Kolla* kebele goats (Table 1). This difference may be due to age composition, environmental effect or genotype. According to FARM-Africa (1996), the mean BW of male and female goats in Western Highland goat types were 48.4±9.9 kg and 33.0±6.0 kg, respectively. This result is higher than the current study result.

Farmers usually get their first breeding goats from buying from the market (77%), gift from parents/ relatives (8%) or buying from their residence kebeles. From the current study result, females (75%) were more in number in the flock than males (Table 2). This is comparable with the result of FARM-Africa (1996). It is reported in this source that about 27% of the animals in the flock are males and 73% of the animals in the flock of Western Highland Goats are females. Those

females which were mature predominate in the flock while for males; young males predominate in the flock (Table 2). This may be due to the purpose of goat production in the study area. As the main objective of goat production in the area is for meat production either for sale or home consumption, most of the males are slaughtered or sold at young age. Females predominate in the production system as they are retained for breeding purpose.

Table 1. Mean body weight (mean±SE)measure of goats in the flocks in the different agro-ecological zones in Burie district

Agro-climatic zone	Body weight (kg)	N
Dega	25.0±1.21[a]	61
Woina Dega	21.3±0.92[b]	125
Kolla	18.6±1.24[b]	62

SE = Standard error; kg = kilogram; Means with different superscript letters within a column are significantly different (P<0.05)

Table 2. Sex and age composition of the goat flocks in the study kebeles of Burie district

Estimated age (year)	Sex of the goat					
	Male		Female		Total	
	N	%	N	%	N	%
< 1	44	71	65	35	109	44
1	1	2	0	0	1	0.4
1 to 2	7	11	21	11	28	11
2	2	3	27	15	29	12
3	4	7	19	10	23	9
> 3	4	7	54	29	58	23
Total	62	25	186	75	248	100

N = Number of animals

Goat feed resources and feeding

The main feed resources for goats are browse species found in natural pasture and crop land during the dry season (Table 3). In addition, most farmers supplement common salt, food leftover, maize grain and *Atella* (a local beer residue, *Tella*) to their goats (Table 4). Supplementation of growing kids is not common in the study area. Farmers supplement common salt or boiled salt solution to the dam to make the animals produce more milk to the new born kid. It is not common feeding crop residues to goats in the study area.

Farmers buy several materials from the market for their goats. Most of the farmers in the area buy salt (69% of the respondents) to feed their goats. In addition, some farmers buy noug seed cake (9% of the respondents) for their goats.

Table 3. Major feeds for goat production during different seasons in the study kebeles of Burie district (N = 75)

Major feed resources	Sept. – Nov.		Dec. – Feb.		March – May		June – August	
	N	%	N	%	N	%	N	%
BNPO	57	76	48	64	55	73	56	75
BSO	7	9	13	17	12	16	10	13
BNPS	11	15	13	17	7	9	8	11
Other	0	0	1	1	1	1	0	0
NR	0	0	0	0	0	0	1	1

N = Number of respondents; BNPO = Browse in natural pasture only; BNPS = Browse in natural pasture and stubble; BSO = Browse in stubble only; NR = No response

There was feed shortage (browse) problem for goat production in the study area especially in the highland kebeles (29% of the respondents). In general, there was feed shortage problem in the dry season from March to May. During this period the browse species shed their leaves and there is less leaves available to be consumed by the goats. In addition, in the rainy season, as the crop land will be covered with food crops, goats will be confined to browse species found in communal grazing lands only. The browse species found in the communal grazing lands are limited in amount and do not supply adequate amount of feed to the animals during the rainy season. Generally, feed is abundant for goats in the area from November to January.

Table 4. Feed supplements for goats during different seasons in the study kebeles of Burie district (N = 75)

Feed supplement type	Sept. – Nov.		Dec. – Feb.		March – May		June – August	
	N	%	N	%	N	%	N	%
MGO	3	4.0	4	5.3	3	4.0	4	5.3
AO	6	8.0	16	21.3	13	17.3	13	17.3
FLO	9	12.0	4	5.3	8	10.7	5	6.7
MGA	7	9.3	9	12.0	3	4.0	1	1.3
MGAFL	10	13.3	7	9.3	6	8.0	4	5.3
AFL	4	5.3	9	12.0	6	8.0	7	9.3
Other	7	9.3	6	8.0	14	18.7	14	18.7
NR	29	38.7	20	26.7	22	29.3	27	36.0

N = Number of respondents; ALF = *Atella* and food leftover; AO = *Atella* only; FLO = Food leftover only; MGA = Maize grain and *Atella*; MGAFL = Maize grain, *Atella* and food leftover; MGO = Maize grain only; NR = No response

Housing of goats

Farmers use different types of goat houses in the study area. Farmers use the main house, house attached to the main house and a separately constructed goat house for goat housing (Table 5). If

the goats are housed in the main house, the room will be separated and partitioned by walls made of locally available materials. Farmers house all sex and age groups of goats together. But bucks (5% of respondents), fattening goats (16% of respondents) and kids (64% of respondents) are usually separated from the others. Locally available materials are used to build goat houses. The roof is usually made of corrugated iron sheet (72%), and the wall in the highlands is made of eucalyptus tree and it is usually plastered with mud. Some farmers have a goat house with a roof made of grass (25%). The wall of the lowland goat houses is made of lowland woods and it is not usually plastered with mud as the ambient temperature in the area is very high.

Table 5. Type of goat houses used by farmers in the study kebeles of Burie district

Type of goat house	N	%
Main house	21	28
House attached to the main house	26	35
Separately constructed goat house	27	36

N = Number of respondents

Diseases and disease control

Goat diseases are the main constraints in goat production in the study area. Foot rot, skin disease, internal parasites, pasteurellosis and diarrhea (blood stained) are some of the main goat diseases in the area. Abortion is also one problem in the study area. When goats get sick, farmers in the highland kebeles take their animals to the nearest public veterinary clinics. But in the lowland kebele, farmers medicate their goats buying drugs themselves from the market (75%). This is due to absence of veterinary clinic in the kebele. Generally, there is inadequate veterinary service in the study area. Most of the veterinary clinics are remote to farmers' residences. Vaccination of goats is not common in the study area. Traditional medicine is also used for sick goat treatment.

Farmers buy different drugs to treat their sick goats. Most of the farmers in the study area buy anthelminitics (92% of the respondents) for the treatment of their sick goats. Other drugs bought and used for sick goats' treatment were Ampicillin, Penicillin and Oxytetracycline. The farmers buy the drugs from the local market and treat their animals themselves. This has a serious impact on the development of drug resistant microbes in animal production. Buying drugs for sick goats' treatment is especially common in the lowland kebele (*Kolla*) as the veterinary service in the area is too far from farmers' residences.

Goat meat consumption per household

Farmers slaughter goats in different occasions. Easter, Christmas and before the fasting period of Easter (Lent) are the main occasions on which farmers slaughter goats at home. Sometimes goats are slaughtered by households before and after fasting periods (Easter and August), on weddings, during religious festivals and when a households likes to consume goat meat at home. On average,

about 57% of the respondents slaughtered goats at home the previous year. Based on the data from the formal survey, one household slaughtered 0.9 heads of goats (n = 75, SD = 0.98) the previous year. Young male goats are slaughtered mostly. Females at young age, sterile females, old age females or fattened goats are also slaughtered occasionally. Usually, there is no colour preference for the goats that are going to be slaughtered at home. In some cases, farmers rear goats but they do not slaughter and consume goat meat due to cultural problems. According to FARM-Africa (1996), there is a cultural taboo against goat meat and milk consumption in the study area.

Goat production constraints in the study area

There are several constraints in goat production in the study kebeles of Burie District. From all the goat production constraints identified, goat diseases, lack of adequate veterinary service, feed (browse) shortage, predators and marketing problem are the main goat production constraints in the study area (Tables 6 and 7). But there were differences in the priority of constraints among the different kebeles. For example, in Woheni Durebetie kebele, lack of adequate veterinary service, goat diseases and feed shortage were the first, second and third priority constraints, respectively. However, in Denbun kebele, goat diseases and feed shortage were the first and second priority constraints. In this kebeles, those constraints that have the same figure are considered to be equal priority constraints. There was a difference in the priority of goat production constraints between the informal and formal survey results (Table 6 and 7). This may be due to the number of farmers interviewed during the informal and formal surveys. As the number of farmers interviewed during the formal survey is large (i.e. 75), the priority of constraints from this result may be more realistic than the informal survey.

Table 6. Rank of goat production constraints in the study kebeles in Burie district (informal survey result)

Constraint identified	Woheni Durebetie	Woyenema Ambaye	Denbun	Boko Tabo	Total score	District Priority
Goat diseases	2	1	1	1	5	1
Lack of adequate vet service	1	5	4	6	16	3
Feed shortage (browse shortage)	3	3	2	6	14	2
Leech	6	2	4	6	18	6
Water shortage	6	5	4	4	19	8
Technical Knowledge shortage	6	5	4	2	17	5
Marketing problem	6	4	4	5	19	7
Predators	4	5	4	3	16	4

Table 7. Rank of goat production constraints in the study kebeles of Burie district (formal survey result)

Constraint identified	1st Priority (5)	2nd Priority (4)	3rd Priority (3)	4th priority (2)	5th priority (1)	Weighted score	District Priority
Goat diseases	37	18	5	3	0	278	1
Lack of adequate vet service	2	5	11	4	2	73	4
Feed shortage	0	6	1	1	0	29	7
Labour shortage	3	5	6	4	0	61	5
Financial shortage	6	3	4	1	2	58	6
Technical knowledge shortage	0	2	3	4	4	29	8
Marketing problem	1	4	13	10	1	81	3
Predators	23	20	4	2	1	212	2

Discussion

The largest goat population of the world is found in Africa (41%) and in the Indian sub-continent (32%) (Steele, 1996). Goats are reared for several purposes in the world depending on the breed, environment and socio-economic circumstances. Generally, goats provide meat, milk, fibre and cash income to their owners. Goat owners in the study area get cash income and meat for household consumption from goat production. Consumption of goat milk and use of fibre is not common in the study area. In some cases, there are households that rear goats and do not consume goat meat due to cultural constraints. According to Kassahun Awigchew *et al*. (1991), small ruminants provide 12.5% of the value of livestock products consumed on the farms and 48% of the cash income generated by livestock, though they represent only 6.6% of the capital invested in farm livestock.

Goat diseases were one of the main constraints in goat production in the study area. Foot rot, skin disease, internal parasites, pasteurellosis and diarrhea were the main diseases in the study area. According to Aklilu Feleke (2008), pasteurellosis, goat pox and orf are the main goat diseases in Burie District. Based on different recent research reports in Ethiopia, goat diseases are the main constraints in goat production in several production systems (Arse Gebeyehu *et al*., 2013; Gebreegziabher Zereu *et al*., 2016; Netsanet Zergaw *et al*., 2016; Tegegn Fantahun and Askale G/Michael, 2017). According to Solomon *et al*. (2014), poor feeds, animal health, inferior genotypes, lack of standardized marketing system and infrastructure to access markets are the main constraints in goat production in Ethiopia recently. Based on another report, prevalence of diseases and parasites is the major constraint in sheep and goat production in Ethiopia (Solomon Gizaw *et al.*, 2010). According to the same source, high mortality is the main factor for the observed low off-take rates of sheep and goat in Ethiopia.

In Burie District veterinary service is provided by both the public and the private sector. These services are specially found in urban areas. There was poor veterinary service provision in rural and very remote areas. According to Aklilu Feleke (2008), about 48.1% of the respondents do not have access to modern veterinary services in the study area. The veterinary service provision was inadequate and it was especially very poor in the lowland kebele. To avoid animal losses, farmers buy drugs from the market and treat animals themselves. This is especially common in the lowland kebele as the veterinary service provision site was remote to their residences. Treating animals by buying drugs from the market is also reported in other parts of the country (Alganesh Tola *et al.*, 2004). Provision of adequate veterinary service to rural and very remote areas will save animal losses as well as illegal use of drugs by farmers. This practice will encourage the development of disease resistant microbes in livestock diseases. According to Aklilu Feleke

(2008), expansion of the veterinary service and detailed epidemiological study is recommended in the study area.

Based on the informal survey result, the market price of goats was low compared with sheep in the study area. During the study the market price per head in Burie town market was 248.1 and 289.8 Birr for goats and sheep, respectively. In addition, the market price per kg of animal was 9.6 and 10.9 Birr for goats and sheep, respectively. There is also seasonal demand for meat and price of goats. It is reported that there is a high fluctuation in goat market supply and demand in the country (Solomon *et al*., 2014). According to EARO (2000), there is small ruminant demand and price increases during festivals. Different reports in the country reveal that there is a presence of marketing problem in goat production (Solomon Gizaw *et al.*, 2010; Solomon *et al*., 2014).

There was feed shortage problem for goat production in the highland study kebeles (Woheni Durebetie, Woyenema Ambaye and Denbun) (Table 6). Feed shortage was not a severe problem in the lowland (*Kolla*) study kebele (Boko Tabo). Feed shortage is common both during the dry and rainy seasons in the study area. Several reports reveal the presence of feed (browse) shortage in goat production in different production systems. According to Agajie Tesfaye *et al.* (2002), critical months of feed shortages for livestock production occurred especially in June and July. As the browse species have decreased recently due to crop production expansion in the highland mixed farming systems of the area, this problem made the goat production system less sustainable. Currently, the main constraint for livestock production in the country is feed shortage. According to Kassahun Awigchew *et al*. (1991), small ruminant production in the country is constrained by disease, parasite and feed shortage. It is estimated that there is a 40% deficit in the national feed balance (Kassahun Awigchew *et al*., 1991). A recent study in the Amhara Region shows that the feed produced in the region only satisfies 83% of the maintenance requirement (17% deficit) and 69% of the production requirement (31% deficit) of the livestock population found in the region (Firew Tegegne and Getnet Assefa, 2010). Generally, there is feed (browse) shortage problem in goat production in the country in different production systems (Arse Gebeyehu *et al*., 2013; Gebreegziabher Zereu *et al*., 2016; Netsanet Zergaw *et al*., 2016; Tegegn Fantahun and Askale G/Michael, 2017). Introduction of an alternative feed source is recommended in Burie District (Aklilu Feleke, 2008).

There is seasonal fluctuation in the availability and quality of feed supply in the country in general. According to Alganesh Tola *et al*. (2004), from a study conducted in the Western part of the country, the livestock production constraints are identified to be feed shortage, disease, poor genetic potential of indigenous livestock species and wild life damage on small ruminants. Among these constraints, feed shortage was found to be the most threatening. According to Agajie Tesfaye *et al.* (2002), from a study conducted in the central highlands of Ethiopia, the livestock production constraints are feed shortage, animal disease, inadequate veterinary service, shortage of cash and shortage of water supplies. Currently, as the human population is increasing, pasture and grazing

lands are being converted to crop lands for food production to feed the increasing human population (Agajie Tesfaye *et al*., 2002; Alemayehu Mengistu, 2005). This trend is contributing for the feed shortage problem for livestock production in the country.

There is a decline in browse species in the highland study kebeles of the study area. Due to the feed (browse) shortage and marketing constraints in the highland study kebeles the goat production at the small holder level is getting less sustainable. Farmers lack interest to continue rearing goats in the highland kebeles of the study area.

Conclusions

Diseases and predators, marketing problems and lack of adequate veterinary service are the main constraints affecting goat production in the study area. Thus, veterinary service provision needs to be improved and aware needs to be created on the consequences of using drugs purchased from the local market for the treatment of sick goats and this should be augmented by regulatory control of such practices. Improvement in market information and creation of market linkage would be essential to alleviate the prevailing marketing problems. Moreover, attention should be given to improved feed production because of its effect on animal health, productivity and survival.

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