

Characteristics of Urban and Peri-Urban Sheep Production Systems and Economic Contribution in Highlands of Ethiopia

Research Article

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ABSTRACT

This study was initiated to characterize urban and peri-urban sheep production systems and their economic importance in and around the towns of Debre Berhan and Dessie, Ethiopia. The study was undertaken using group discussions, structured questionnaire and personal observations. In both locations the majority of sheep producers were male household heads and predominantly traders in urban and farmers in peri-urban areas. The average family size was more in Debre Berhan peri-urban (5.4) area than Dessie peri-urban (4.8). In Debre Berhan peri-urban areas, 39.3% had a land hold size between 1 and 2 ha and in Dessie peri-urban areas 48.4% respondents had a land hold size of < 0.5 ha. The number of sheep and other livestock population was higher in Debre Berhan peri-urban than Dessie peri-urban area. Except brewery dried grain all other types of feed used for sheep production were similar but the availability was different among the study areas. In both urban and peri-urban areas major available feed types were natural pasture grazing, hay, crop residues, wheat bran and oil seed cakes, by-products from local breweries and legume grains processing. Sheep rearing constitutes the first source of income in Dessie area and the second source of income in Debre Berhan area. Urban and peri-urban sheep production has economic advantages as sources of income and food to the household. High feed cost, lack of improved breed, capital and labor shortages were major constraints. Conducive weather conditions, attractive market price, and availabilities of supplementary feed found in urban areas were considered as beneficial for sheep production. Although, there are constraints for sheep production, available opportunities are to encourage engaging in sheep production. Scientifically proven and efficient feeding packages from locally common available feed resources are required.

KEY WORDS constraints, feed, first objective, income source, sheep production system, urban.

INTRODUCTION

Livestock production represents a major contribution to the physical and economic access to sufficient food for productive and healthy life universally (FAO, 2011b). Moreover, livestock is a fastest growing sector of agricultural economy in developing countries with 40% contribution to the global value of agricultural output and as such supports the

livelihoods and food security of almost a billion people (FAO, 2009). Ethiopia is the leading African country in livestock population but this sector contributes only 16% of the national GDP, 13% of the country's export earnings (MoARD, 2007), and 45% of the agricultural GDP (MOFED, 2010). Therefore, much more effort is required to increase the contribution of livestock to the national economy and food security.

Sheep and goat production play a special role in providing an immediate economic resource for the family. In Ethiopia, various sheep production system categories are practiced such as highland sheep-barley system, mixed crop-livestock system, Pastoral and agro-pastoral production system, ranching, and Urban and peri-urban sheep production system (Solomon *et al.* 2008). Ethiopia is second in Africa and sixth in the world in terms of sheep population (25.9 million, 24% of the total livestock population), though the benefit from this enormous resource has to date been limited due to a multitude of problems (Biffa *et al.* 2006; CSA, 2010). Some studies report that about 64767 sheep are found in major urban and peri-urban areas of Ethiopia. In terms of agro ecology the highland area of Ethiopia is a habitat for 60% of the total sheep flock (Kassahun, 2000). Around 25% of the domestic meat consumption of Ethiopia is provided by sheep (FAO, 2004).

In urban and peri-urban areas there is a shortage of land and space due to expansion of towns, as a result crop production and rearing of large ruminants is likely to be more difficult than sheep rearing. In line with this, FAO (2011a) reported that even if keeping animals in urban and peri-urban areas is not new, the phenomenon of keeping animals in urban and peri-urban areas is increasing in many developing countries.

Sabine and Wyn, (2002) also indicated that due to higher return per unit of land from livestock compared to crops, urban livestock keeping benefits the poor in terms of diversifying livelihood activities. Urban and Peri -Urban Agriculture can be an important entry point for poverty alleviation including the provision of employment to the household family members (FAO, 2009). Some studie reported that in urban areas sheep production can be undertaken either in combination with other livestock species, or with non-livestock cash generating activities.

Although, urban and peri-urban sheep production is known to contribute to food security, research and development interventions are limited for urban and peri-urban sheep production improvement in Ethiopia. Understanding the sheep production system and economic contribution of a certain locality can help researchers and development practitioners to devise and implement appropriate technology.

Moreover, since the production system and economic contribution of the animals is dynamic, it is important to understand changes that might have taken over the past few years.

Therefore, the present study was initiated to characterize urban and peri-urban sheep production systems and the economic contribution therein and to identify major feed resources and constraints in Debre Berhan and Dessie regions.

MATERIALS AND METHODS

Descriptions of the study area

The study was conducted in urban and peri-urban *Kebeles* (smallest administrative unit) of Debre Berhan and Dessie areas, which are located in the highland parts of Southern Eastern Amhara Regional state. Debre Berhan and Dessie are found in highland escarpment and the major livestock species found in the areas are cattle, goats and sheep (FAO, 2011a). Debre Berhan is located about 120 km North-East of Addis Ababa with altitude between 2800 and 2845 m.a.s.l and an annual temperature between 5 °C and 23 °C (Ermias, 2007). Dessie is located about 400 km North of Addis Ababa with elevation between 2470 and 2550 m.a.s.l (Gebru, 2009). The peri-urban *Kebeles* are rural-urban interface areas and are administered as sub- *Kebeles* with urban *Kebles*.

Sampling procedures and data collection

Kebles were selected for the study within and around the towns based on the potential for sheep production after discussing with agriculture office experts. Accordingly, eight interfacing urban and peri-urban *Kebeles* were selected from each of the study locations. A list of sheep producers from each kebele found within a 7 km radius for Debre Berhan study sites and within a 10 km radius for Dessie was prepared. The total sample size of respondents was determined from the list prepared using the formula given by some studies. Accordingly, the numbers of randomly selected respondents were 132 and 108 from Debre Berhan and Dessie study sites, respectively. Among the total 132 interviewed respondents 42 were from urban *Kebeles* and 90 were from peri-urban kebeles of Debre Berhan. The numbers of respondents from Dessie town *Kebeles* were 46, while 62 respondents were from peri-urban *Kebeles* of Dessie. A structured questionnaire was administered to elicit information on different variables. The questionnaire was administered by trained Development agents, and the accuracy of information gathered was closely supervised by the researcher.

Data analysis

Data were analyzed using SPSS (2011) version 20 software programs. Gender, marital status, common feed resources , management system and feeding practice, objective of sheep rearing and utilization, economic contribution, major income source and constraints were analyzed using descriptive statistics, cross tabulation procedures. Whereas, the family size and number of livestock species data were analyzed using analyses of variance. The significance difference of respondent's proportion among the study areas was computed using the Chi-Square tests.

Differences were considered significant at $P \leq 0.05$. A rank index was calculated for major feed resources, income sources and constraints as: Index= the sum of % respondents on 1st rank \times last rank + ... + last rank \times 1 for individual parameters divided by over all sum of 1st rank \times last rank + ... + last rank \times 1 for over all parameters.

RESULTS AND DISCUSSION

Households' socio economic characteristics

Sex, marital status and land holding size were similar between urban areas, while the average family and land holding size was different between the two peri-urban areas (Table 1). In both Debre Berhan and Dessie urban and peri urban areas the majority of sheep producers were male household heads. Numerically, more respondents in urban areas were traders. Apart from trading, in Dessie urban area 30.4% of sheep producers' had different occupations, including carpenter, daily laborer, and horse cart driver. The predominant occupation for sheep producers was crop farming in peri-urban areas. The average family size was more in Debre Berhan peri-urban (5.4 ± 1.51) areas than Dessie peri-urban (4.8 ± 1.55) areas. No urban sheep producers in the study areas had their own land for crop production and grazing, except 2 / two and 1 / one respondent in Debre Berhan and Dessie respectively. In Debre Berhan peri-urban areas, 35 respondents (39.3%) had a land hold size between 1 and 2 ha and in Dessie peri-urban areas 48.4% respondents had a land hold size of < 0.5 ha.

Livestock species and sheep flock size and breed

Except donkeys the number of all livestock species per household was similar ($P > 0.05$) between urban areas in the two study regions whereas the number of cattle, chicken and sheep was statistically different ($P < 0.05$) in peri-urban areas of Debre Berhan and Dessie (Table 2). The donkey population was higher in Dessie urban areas than Debre Berhan urban areas.

The number of sheep and other livestock population was higher in Debre Berhan peri-urban than Dessie peri-urban area.

Though, in urban and peri-urban study areas of Debre Berhan cross breed (Awase and Menze) sheep were found in very few respondents' houses, local sheep breed type were the predominant sheep breed in the study areas.

Common Feed Resources for Sheep

Natural pasture, grass hay, by-product of local brewery making (*Atela*), by products from legume grains (lentil, faba bean, field bean, chick pea and *Lathyrus sativus*) processing, and wheat bran and Niger (*Noug*) seed cake were a major feed resource in study areas (Table 3). In Debre Berhan urban area crop residue, natural pasture grazing and grass hay were the first, second and third major feed resources with rank index of 0.25, 0.18, and 0.17%, respectively.

The first three major feed resources were grass hay, natural pasture grazing and wheat bran and Niger (*noug*) seed cake in Dessie urban area.

Table 1 Sex, marital status and occupation of sheep producers (%) and family size (Mean \pm SD) in study areas

Measured variables	Urban		P-value	Peri-urban		P-value	
	DB	Dessie		DB	Dessie		
Sex	Male	76.2	63.0	0.13	85.60	75.8	0.10
	Female	23.8	37.0		14.40	24.2	
Marital status	Married	71.4	60.9	0.76	82.20	74.2	0.03
	Single	2.4	2.2		5.60	-	
	Widow	14.3	19.6		7.80	11.3	
	Divorced	11.9	17.4		4.40	14.5	
Occupation	Farmer	-	-	0.617	93.3	79.0	0.06
	Civil servant	21.4	19.6		2.2	1.6	
	Trader	47.6	37.0		1.1	3.2	
	Pensioner	11.9	13.0		1.1	3.2	
	Others*	19.0	30.4		2.2	12.9	
Family size		4.7 \pm 1.60	4.3 \pm 1.57	0.23	5.4 \pm 1.51	4.8 \pm 1.55	0.04
Land holding size (%)	< 0.5 ha	50 (1)	100 (1)	0.386	18 (16)	48.4 (30)	0.00
	0.5-1 ha	-	-		19.1 (17)	41.9 (26)	
	1-2 ha	50 (1)	-		39.3 (35)	6.5 (4)	
	2-3 ha	-	-		19.1 (17)	3.2 (2)	
	> 3 ha	-	-		4.5 (4)	-	

DB: Debre Berhan.

SD: standard deviation.

Table 2 Livestock species and sheep flock size (Mean±SD) and respondents on sheep breed (%) in the study areas

Livestock species	Urban		P-value	Peri-urban		P-value
	DB	Dessie		DB	Dessie	
Cattle	3.3±2.34	1.9±0.90	0.07	5.7±2.71	2.7±1.27	0.00
Goat	2.11±2.98	4.2±3.49	0.26	3.4±1.44	2.5±2.38	0.36
Chicken	6.4±5.92	3.5±1.97	0.08	5.5±4.01	3.6±2.10	0.01
Horses	2.0±0.00	1.7±0.50	0.69	1.9±1.05	1.2±0.71	0.09
Donkey	1.8±0.44	3.7±1.25	0.01	2.4±0.98	1.9±2.13	0.15
Sheep	7.5±4.19	9.2±5.83	0.11	16.7±7.88	9.3±7.18	0.00
Sheep breed	Local	92.9	100	88.9	100	0.00
	Cross	7.1	-	11.1	-	

DB: Debre Berhan.
SD: standard deviation.

Table 3 Percent rank and index of respondents on major feed resources in the study areas

Feed	1 st rank		2 nd rank		3 rd rank		4 th rank		Index	
	DB	Dessie	DB	Dessie	DB	Dessie	DB	Dessie	DB	Dessie
Urban										
Pasture	26.2	30.4	9.5	31.1	17.5	3.2	11.1	-	0.18	0.22
Hay	21.4	63.0	14.3	26.7	12.5	-	18.5	-	0.17	0.33
CR	33.3	-	28.6	2.2	15.0	3.2	3.7	-	0.25	0.01
WB and NSC	-	-	9.5	31.1	32.5	51.6	14.8	11.1	0.11	0.21
LGBP	16.7	6.5	7.1	6.7	2.5	35.5	29.6	44.4	0.12	0.16
Attela	2.4	-	31.0	2.2	20.0	6.5	22.2	38.9	0.16	0.06
BDG	-	-	-	-	-	-	-	5.6	-	0.01
Peri-urban										
Pasture	53.3	41.9	21.1	31.7	21.6	17.6	1.3	-	0.28	0.30
Hay	15.6	51.6	40.0	36.7	23.9	3.9	3.9	-	0.23	0.32
CR	31.1	4.8	35.6	20.0	23.9	15.7	1.3	10.3	0.28	0.12
WB and NSC	-	-	1.1	10.0	2.3	41.2	28.9	17.2	0.04	0.13
LGBP	-	1.6	1.1	3.3	5.7	13.7	23.7	55.2	0.04	0.10
Attela	-	-	1.1	-	22.7	-	40.8	6.9	0.09	0.01
BDG	-	-	-	-	-	7.8	-	10.3	-	0.03

DB: Debre Berhan.

CR: crop residue.

WB: wheat bran; NSC: Niger (Noug) seed cake; LGBP: legume grain by products and BDG: brewery dried grain.

Similarly, in peri-urban area of Debre Berhan natural pasture grazing, crop residue and grass hay were the first three major feed resources, whereas grass hay, natural pasture grazing and wheat bran and Niger seed cake were the first three major feed resources in Dessie peri-urban area. By products from local breweries and legume grain processing were also considerable feed resources in Debre Berhan and Dessie study locations, respectively. Brewery dried grain was used as feed only in Dessie area.

Sheep management system and feeding practice

As shown in Table 4 the proportion of respondents on management system and grazing practice was similar ($P>0.05$) between urban areas of the two study locations. On the other hand, grazing practice patterns were different ($P<0.05$) between peri-urban of the two study locations. The major management system was improved type as reported by 83.3, 76.1, 72.2 and 71.0% of urban and periurban respond-

ents of the two respective study locations. In all study areas dominant proportion of sheep producers have plans to increase their flock size for the future.

A greater proportion of respondents were practicing free grazing of sheep in Dessie urban (46.4%) than Debre Berhan urban (28.0%) area during dry seasons, whereas, semi-grazing was the grazing method during both seasons in Debre Berhan urban.

In most cases in Debre Berhan peri-urban sheep grazed freely in dry season. Semi-grazing was common grazing practice during dry (75%) and wet (53.3%) seasons in peri-urban of Dessie. Semi-grazing was a type of grazing undertaken by herding the sheep for less than 4 hours per day. In the case of free grazing, sheep stay outside homes by roaming or grazing for about 8hrs. Tethering was also undertaken during dry season by a small number of sheep producers in both areas of urban and wet seasons in all study areas.

Table 4 Respondents on management and grazing system in the study areas (%)

Parameter		Urban		P-value	Peri-urban		P-value
		DB	Dessie		DB	Dessie	
Management system	Traditional	16.7	23.9	0.28	27.8	29.0	0.50
	Improved	83.3	76.1		72.2	71.0	
Future management plan on flock size	Increase	85.7	91.3	0.31	75.6	75.8	0.56
	Decrease	14.3	8.7		24.4	24.2	
Dry season grazing	Free grazing	28.0	46.4	0.38	75.3	25	0.00
	Semi-grazing	68.0	50.0		24.7	75	
	Tethering	4.0	3.6		-	-	
Wet season grazing	Free grazing	30.8	41.4	0.58	31.5	28.3	0.00
	Semi-grazing	65.4	51.7		67.4	53.3	
	Tethering	3.8	6.9		1.1	18.3	

DB: Debre Berhan.

Economic contribution of sheep production

The proportion of respondents on first objective of sheep production, age of sheep at slaughter, and the time of slaughter was different ($P \leq 0.05$) between the study areas (Table 5).

Live animal sale was the first objective of sheep production. More respondents, in urban and peri-urban areas of Debre Berhan and Dessie, respectively, can slaughter the sheep during holidays. Mainly, the age of slaughtered sheep ranges from 6 months up to nearly one year and were unfinished.

Sheep was an income source for urban and peri-urban sheep producers with other income sources including live-stock and milk, crop, eucalyptus tree and non-agricultural activities (Table 6). Non-agricultural source of incomes included trade, carpentry, day labor, salary, hand crafts, house rent and transport such as horse cart. Sheep production was the 2nd and 1st income source in urban of Debre Berhan and Dessie. In peri-urban Debre Berhan and Dessie, sheep production was the second and first income source, respectively.

Constraints for sheep production

As described in Table 7 in urban areas of Debre Berhan and Dessie the 1st, 2nd, 3rd and 4th ranked major constraints identified were high cost of feed, lack of improvement in breed, lack of capital and labor shortage. Similarly, in peri-urban area of Debre Berhan and Dessie the 1st and 2nd major constraints were cost of feed and lack of improvement in breed. In the study areas there were also other constraints like inadequate space, disease, lack of veterinary service, theft, water shortage, inconsistent market price and car accidents.

The present study identified that urban and peri-urban sheep production was undertaken as a sideline activity with other agricultural and non-agricultural activities.

The predominant occupation for sheep producers was farming in peri-urban areas and trading in urban areas. Similarly, sheep producers' occupation in urban areas of Nigeria is trading, technician, teaching, civil servant and retired personnel (Okanlade and Cornelius, 2011).

Family size in the present study areas was less than the number of family size previously reported by Getachew *et al.* (2010) in Menz area and similar with family size (5.7), of the adjacent rural areas of Debre Berhan peri-urban, which is reported by Hassen *et al.* (2010). In urban areas almost all sheep producers were landless while the high proportions of respondents in peri-urban of Debre Berhan had the land hold size within the range of the previous reports from adjacent rural areas. But, the land hold size in Dessie area is smaller in size in disagreement with the former studies.

Compared to other livestock species, the existence of a higher number of sheep per household in the present study was similar to findings presented in the report of Firaw and Getnet (2010) that a large population of sheep is found in Basona Woreda, which is surrounding woreda for Debre Berhan peri-urban kebeles.

The numbers of sheep per household in the present study was less than the number of sheep in rural households reported by Getachew *et al.* (2010); it is 31.6 in Menz area, which is found in the same Zone with Debre Berhan. In the other urban and rural parts of Ethiopia the number of sheep per household ranges from 3.6 up to 6.7 (Zealelem *et al.* 2012; Shenkute *et al.* 2010), which is less than the number of sheep in the present study areas. This variation implies that the number of sheep per household is different between agro ecologies and production systems of Ethiopia and the present study areas are good potential areas for sheep production. According to Okanlade and Cornelius (2011) report also the total flock size per house hold is 5-10 in urban areas of Nigeria.

Table 5 Respondents on objective of sheep rearing and utilization in study areas (%)

Measured variables		Urban		P-value	Peri-urban		P-value
		DB	Dessie		DB	Dessie	
First objective	Slaughter	31.0	8.7	0.01	18.9	4.8	0.01
	Sale	69.0	91.3		81.1	95.2	
Slaughter age	6 month-near 1 year	54.8	93.2	0.00	77.5	98.4	0.00
	1-2 years	38.0	6.8		9.0	1.6	
	> 2 years	7.1	-		13.5	-	
Slaughter frequency	Holidays	40.0	38.6	0.99	60.7	29.0	0.00
	Once	11.9	13.6		2.2	17.7	
	Twice	19.0	18.2		9.0	30.6	
	Thrice and more	28.6	29.5		28.1	22.6	

DB: Debre Berhan.

Table 6 Respondents on major income sources in urban and peri-urban of study areas (%)

Income sources	Urban							
	1 st		2 nd		3 rd		Index	
	DB	Dessie	DB	Dessie	DB	Dessie	DB	Dessie
Crops	2.4	-	-	-	-	-	0.01	0.00
Sheep	2.4	32.6	92.7	80.6	50.0	-	0.40	0.46
Other livestock	2.4	-	7.3	2.8	25.0	100	0.08	0.19
Non agricultural sources	92.9	67.4	-	16.7	25.0	-	0.51	0.36
Per-urban								
Crops	74.4	29.0	11.2	19.0	1.8	7.7	0.41	0.22
Sheep	15.6	24.2	26.2	60.3	57.1	61.5	0.26	0.42
Other livestock	2.2	4.8	35.0	12.1	28.6	7.7	0.18	0.08
Non agricultural sources	4.4	40.3	27.5	8.6	12.5	23.1	0.13	0.27
Eucalyptustree	3.3	1.6	-	-	-	-	0.02	0.01

DB: Debre Berhan.

Table 7 Percent rank and index of respondents on major constraints for sheep production (%)

Constraints	1 st rank		2 nd rank		3 rd rank		4 th rank		Index	
	DB	Dessie	DB	Dessie	DB	Dessie	DB	Dessie	DB	Dessie
Urban										
Breed	4.8	28.3	25.0	23.9	24.0	25.0	60.0	30.0	0.20	0.26
Feed	73.8	54.3	19.4	32.6	12.0	12.5	-	-	0.38	0.34
Labor	4.8	2.2	19.4	21.7	36.0	37.5	20.0	30.0	0.17	0.18
Capital	16.7	15.2	36.1	21.7	28.0	25.0	20.0	40.0	0.25	0.22
Peri-urban										
Breed	32.2	12.9	25.0	31.5	13.0	42.5	19.0	37.5	0.25	0.27
Feed	53.3	51.6	30.3	37.0	13.0	12.5	4.8	-	0.33	0.34
Labor	10.0	16.1	10.5	20.4	38.9	10.0	52.4	50.0	0.20	0.20
Capital	4.4	19.4	34.2	11.1	35.2	35.0	23.8	12.5	0.21	0.19

DB: Debre Berhan.

The total flock size in present study areas is within this range except in Debre Berhan peri-urban. Though the cross breed are faster growing, they do not tolerate disease and feed shortage while, local sheep breeds are characterized by early lambing, survival on less quality and quantity of feed, disease tolerance and twin delivery ability as compared to cross breeds. The predominance of local breeds of sheep in the present study areas bears similarity with results from previous reports. [Getachew *et al.* \(2010\)](#); [Solomon *et al.* \(2008\)](#) and [Tibbo \(2006\)](#) reported that although the Menze sheep breed is highly adapted to the harsh environment of

the area, their productivity is low and the cross breeding program also failed due to different technical and organizational problems. So, efforts should continue with respect to improving productivity of local breeds through long term (effective breed improvement to develop appropriate breed) and short term (feed, feeding, nutrition, housing, health, and improvement to exploit the maximum potential of existing local breed) measures.

Most of the feedstuffs found in urban and peri-urban areas of Ethiopia are from household wastes, by-products from various industries, few forage plants and roadside

grazing (Solomon *et al.* 2008). Natural pasture grazing, native pasture hay, crop residue, wheat bran and noug seed cake, legume grains processing by products, attela and brewery dried grain identified by the present study have similarity with previous report.

Greater index figure for grass hay as a feed resource in Dessie area are supported by the report of Firaw and Getnet (2010), who stated that hay conservation practices are well adopted in Dessie Zuria Woreda. In Dessie town many flouring and oil press factories are found, due to which more respondents use wheat bran and noug seed cake as feed for sheep. Brewery dried grain used as feed resource in Dessie study area is related with the presence of Brewery Factory in Combolcha Town, which is near to Dessie Town. More availability of local brewery making By-product (Atela), in Debre Berhan areas is related to the tradition of local brewing and greater use by the dwellers. On the contrary in Dessie local brewing is not common and consequently availability of associated by-product is limited. In Debre Berhan town there are cooperatives engaged in legume grain processing for human food, due to that plenty of by-products are produced. But, these by-products are transported to Adama and Mojo towns for fattening of livestock, and not much of this by-product is used as feed for sheep as compared to its availability. As a result of more livestock fattening activity in Adama and Mojo Towns these by products are more expensive than in Debre Berhan areas.

The sheep management systems in study areas is mainly improved, because, there is better use of supplementary feeds, separated shelter from family home, disease control and preventive remedy, and feeding trough. Barbara *et al.* (2006) also reported that in urban and peri-urban areas of Maroua and Cameroon, sheep management practices and flock productivity differed little from those in rural areas. As a result of shortage of grazing land and other roughage feeds sheep production in urban areas incurs more cost.

In the case of urban sheep producers grazing is undertaken on road sides and other vacant lands reserved for different purposes and in some case also on rented land from Kebele. In Dessie area barley is sown during February (the short rainy season) and it is harvested during June and its residue, barley straw is used for wet season feeding. Moreover, in Dessie areas, the wet maize Stover is also used as a feed resource around September and dry maize Stover from December to February. In Debre Berhan study area mostly ``attela`` is mixed with crop residues, different types of legume grain processing by products and wheat bran either all together or independently. The way of feeding in the case of ``noug`` seed cake is by soaking in water over night and then mixing with other feed ingredients or alone depending on the availability. In Dessie areas feeding of

chopped maize Stover and brewery dried grain with or without spraying of salted water is one method of feeding. But, the amount of mixed feed, type of mixed feed, time of feeding, feeding based on the age and physiological class is arbitrary. Due to this, it is difficult to evaluate the effectiveness of feeding.

In both Debre Berhan and Dessie study areas feeding of grass hay, wheat bran, noug seed cake and the finest parts of legume processing by products are prioritized for feeding of fattening sheep, and next for lactating ewes then, for the other flocks. Solomon *et al.* (2010) reported that supplementary feeds are only given for fattening sheep and goat in one of rural district of the same zone with the present study. In Debre Berhan peri urban study area cooked legume and cereal grains are some feed ingredients for fattener sheep feeding. The fattener sheep are fed indoor from two month up to six month in most case, but there are exceptions in the case of old castrated ram fattening, the fattening period may be more than six months, especially in Debre Berhan peri urban study area.

The present study showed that for the majority of respondents live sale is the primary reason for rearing sheep.

In agreement with this study, Getachew *et al.* (2010) reported that income source is the first objective of the households in Menze areas for sheep production. In urban areas of Ghana Financial consideration was the main reason why producers kept small ruminants and the provision of animal protein to the urban community is also substantial (Baah *et al.* 2012). In addition to live animal sale, sheep contribute to the protein need of the family mainly during holidays in the present study areas. New Year, X-mass, Epiphany, Easter, Assumption (Filseta) are Holidays for Christians and holidays for Muslims are Id Al Fater, Id Al Adha (Arafa), and Mawlid. In both study areas mainly sheep producers' slaughter male lamb with the average age of nearly one year. It is known that due to low growth rate arising from inherent and environmental factors such as nutrition the lambs are not slaughtered for some time. Sheep production is the first source of income in Dessie urban and peri-urban areas and the second source of income in Debre Berhan urban and peri-urban areas. In line with this Muhammad (2008) found that sheep were a considerable source of additional income for civil servants and traders in urban and peri-urban areas of Nigeria. Agriculture is most often not the only or even the dominant activity of urban households (FAO, 2007). In relative terms due to more crop faller and less land holds size in Dessie region, income from sheep is more important than in Debre Berhan region. Moreover, in relation to crop failure due to shortage of rain and less land hold size the crop residue is reduced in Dessie region and as a result unlike sheep it is difficult to maintain large ruminants with such very scarce feed. Firaw

and Getnet (2010) also reported that the Dessie Zuria Woreda is moisture deficit and has rugged topography with highly degraded soils which are not generally suitable for cropping. From both study locations all respondents sale skin in addition to live animal sales as the source of income. The contribution of sheep as a source of income is different due to the variation in sheep price from season to season. The main reasons for expensive price of sheep are holidays and in some cases during summer when the river becomes full, farmers cannot bring their sheep from a long distance to the market. This is the good opportunity for urban and peri-urban sheep producers to get good price for their sheep.

In some seasons the sheep contributes less to their income due to low price as a result of feed shortage, labor problem, drought problem, problem with disease, fasting (less consumers), and when the sheep come from every direction during winter. The income from sheep rearing mainly contributes to school fees, social and cultural expenditure, clothing, food, household items and goods, crop production and medical expenses. On the other hand, high feed cost, lack of quality breed, lack of capital, labor shortage, inadequate space, disease and lack of veterinary service, theft, water shortage, inconsistent market price, car accidents and the presence of poisonous plants are all phenomena which compromise the ability to rear sheep. Problems with disease are typically related to feeding, e.g. Lack of feed or over feeding of the animals. Livestock keeping in urban areas takes place under more challenging circumstances due to different factors such as inadequate feed, lack of capital, improved genotype and limited space (Shenkute *et al.* 2010; Abebe *et al.* 2002; Sabine and Wyn, 2002).

High cost of feeding, theft of animals, problems with feeding off-season and achieving variety in feed are challenges for small ruminant production in urban areas (Okanlade and Cornelius, 2011). Sheep rearing was found to be aided by conducive weather, attractive market price, availability of by-products from pulse grain processing and local beverage distilleries and local presence of edible oil press and flour mill factories. Furthermore, natural resource conservation and grazing deterrence action undertaken by different development organizations can help to increase the availability of grass hay for sheep feed in the future.

CONCLUSION

In the study areas sheep production is undertaken as a secondary activity to crop production in peri-urban areas and trading in urban areas. Average sheep flock size is greater in Debre Berhan than in Dessie areas. Except for brewery dried grain the types of feed resources are the same, but the availability of feed resource is different between study ar-

reas. The sheep feeding practice is mainly free-grazing during dry seasons and semi-grazing during wet seasons plus stall feeding as a supplement or in its own right. However, the feeding management practices are untested and arbitrary, there is a tendency to overfeed or underfeed the animals. Urban and peri-urban sheep production in the areas has economical advantages through sale of large sheep or other flocks or direct use for family consumption. The major constraints identified in the study areas are high costs associated with feed, lack of quality breeds, and lack of capital and labor shortage. Conducive weather, attractive market price, availability of by products from different products, natural resource was all found to be beneficial for sheep production in the study areas. Though, there are constraints for sheep production, available opportunities are to encourage engaging in sheep production. Scientifically proved and efficient feeding package from locally common available feed resources are required.

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