HUSBANDRY PRACTICES OF SHEEP IN HULET EJU ENESIE DISTRICT, EAST GOJJAM ZONE, ETHIOPIA

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✉Supporting Information

ABSTRACT: The study was conducted in Hulet Eju Enesie District, East Gojjam Zone, Ethiopia, with the main objective of assessing husbandry practices. The study district was stratified in to Dega, Weina Dega and Kolla agro-ecologies. Six kebeles were selected by proportional allocation methods. For survey, 150 sample households were selected for interviewed by using simple random sampling. In addition, 72 households were selected for group discussion by using simple random sampling, male and female with equal proportion. Collected data from survey were subject to Descriptive statistics, ANOVA and Chi-square ($\chi2$) by using SPSS software (ver. 20). The mean flock size per household was 12.52 in Dega, 9.43 in Weina Dega and 8.32 in Kolla ($P<0.05$). The purpose of keeping sheep were sale (income source), meat and saving purpose as indicated with index value of 0.48, 0.28 and 0.12 respectively. Major feed source varied according to seasons; communal grazing 37.1% from (Sep-Nov), Grazing after math 47% from (Dec-Feb), Crop residue 38.1% from (Mar - May) and private grazing 31.8% from (Jun–Aug). Haricot bean straw (64%) is a major crop residue. Chi-square ($\chi2$) analysis result showed that there was significant difference ($P<0.05$) on types of supplementary feeds in different agro-ecological zones. Atela (97.3%) was dominant supplementary feed. Sheep house constructed attached to the family house and sharing a common wall is the most common sheep house. Mean age for castration and tail docking were 14.84 and 3.77 months respectively. Selection criteria of sheep for castration and fattening were physical characteristics, breed and conformation with index value 0.43, 0.26 and 0.23 respectively. Washera (79.3%), crossbred (12%) and both Washera crossbred and "local "sheep (17.3%) respectively. Age at first mating, age at first lambing, lambing interval, slaughtering age for male, slaughter age for female and marketing age of sheep were 7.47, 12.46, 8.05, 5.96, 6.25, 6.5 months respectively. Litter size (mean 1.55) was significantly ($P<0.05$) different among agro-ecologies. Disease, and parasites, and feed shortage were reported to be the two major constraints of sheep production in the area with index value 0.381 and 0.357.

Keywords: Breed, Castration Practice, Constraints, Culling Practice, Husbandry practice, Opportunities, Tail docking, Weaning

INTRODUCTION

Domestic sheep (*Ovis aries*) were domesticated between 11000 and 9000 BC, and the domestication of the wild mouflon in ancient Mesopotamia (Hiendleder et al., 2002). Sheep are among the first animals to have been domesticated by humans, and there is evidence of sheep farming in Iranian statuary dating to that time. Woolly sheep began to be developed around 6000 BC in Iran, and cultures such as the Persians relied on sheep's wool for trading.

Ethiopia is home for many livestock species and suitable for livestock production. Ethiopia is believed to have the largest livestock population in Africa. In Ethiopia, there are about 27.3 million of sheep of which almost all 99.9% are indigenous breeds, which are managed by resource poor smallholder farmers and pastoralists under traditional systems (CSA, 2015).

Sheep are the second most important livestock species in Ethiopia followed by cattle (Gizaw, 2007) which have become adapted to a range of environments from the cool alpine climate of the mountains to the hot and arid pastoral areas of the lowlands (Tadele, 2010). Sheep have a unique niche in smallholder agriculture from the fact that they require small investments; have shorter production cycles, faster growth rates, greater environmental adaptability and a unique niche in smallholder agriculture as compared to large ruminants (Tibbo, 2006; Notter, 2012).

Ethiopian sheep breeds have great potential to contribute more to the poor farmers, smallholder crop-livestock and pastoral production systems (Kosgey and Okeyo, 2007). Sheep have social and economic importance to the

producers who keep indigenous breeds for meat, hair production and income generation (Kocho, 2007; Ashagre, 2008; Getachew et al., 2011).

In Ethiopia, the attention given to the improvement of the sheep production system is inadequate. It is assumed that the low productivity of sheep is a combined effect of poor management, limited feed resources and high disease pressure (Abegaz et al., 2008). Other contributing factors also include low genetic potential, policy issues market, institutional problems, and problem of credit facilities (Gebremariam et al., 2006). And low fertility, prolificacy, weaning, late in age at first lambing, less birth weight and mature body weight and lack of appropriate culling and disposal strategies (Gizaw et al., 2010 ; Tegegne et al., 2011; Gizaw et al., 2013).

In Hulet Eju Enesie district sheep 67.2% from total livestock population. Even though the district has large number of sheep, the potential for sheep production is challenged and there is a knowledge gap in utilizing its maximum potential and the livelihood of the farmers is not improved. There was a need to conduct research survey on husbandry practice of sheep in the district to identify the knowledge gap and document the existing problems in the district. Generally, the overall husbandry practices of sheep are not studied and there was clearly research gap in the area. Therefore, this study was undertaken to fill the existing information gap with regard to husbandry practices of sheep in the study area.

MATERIAL AND METHODS

Description of the study area
The study was conducted in Hulet Eju Enesie District Amhara Region, Ethiopia. It is located in the North West direction 370 km far from Addis Ababa, in the northeast direction 200 km far from Debre Markos and in the southeast direction 120 km far from Bahir Dar. It is bordered with Goncha Siso Enesie in the East direction, Enarge Enawega in the South direction, Debay Telate in the Southwest direction, Sinan Bibugne in the West direction and South Gondar in the north direction. The district is geographically located 10' 45 00--11' 10 00N Latitude and 37' 45 69--38' 10 00 E longitude (BoARD, 2011). In addition, the district consists of 40 rural and 2 urban Kebeles.

The total livestock population in the district is estimated to be 727,157 heads out of which 12.12% cattle, 67.2% sheep, 2.7% goats, 2.36% equines and 15.62% are poultry. The number of livestock per household is about 3.85, 21.37, 0.86, 0.75 and 4.97 heads for cattle, sheep, goat, equines and poultry respectively.

Sampling methods and data collection
Informal survey. Before the main sampling was attempted, discussions were held with the district livestock experts and DAs to gather information about the study kebeles on farmers' husbandry practice of sheep, farming practice, livestock population, to clear on purpose of study and establish collaborations for the study.

Formal survey. Based on the informal survey result, questionnaires were prepared and pretested. After preliminary survey was conducted, prepared and pre tested questionnaires were applied to collect the data.

Data collection
Both primary and secondary data were used on various aspects of husbandry practices of sheep. The primary data were collected from sample respondents through semi-structured questioners, focus group discussion, key informants, field observation and formal survey. The semi structured questioners were held on the following parameters:- socio economic characteristics of household, feed and feed resources, housing, purpose of keeping sheep, health management, disease, breeding practice, opportunities of sheep production, constraints and reproductive performance, feeds and feed resource, labor requirement, composition of livestock mixture.

Focus Group Discussion (FGD): In each selected kebele, which was selected by stratified sampling method. The participants for focus group discussions were selected by using, simple random sampling method. From each selected kebele 12 households, which comprised male and female with equal proportion. Therefore, a total of 72 household were selected for group discussion.

Field observation: Field observation was done to enrich the data about husbandry practice. Key informant interview: the researcher conducted key informant interviews in each selected kebele with individuals who were knowledgeable about husbandry practices. These key informants were included:-male, female, youth, priest (religious father) and kebele administrators.

Sampling techniques
Hulet Eju Enesie district was purposively selected because of its highest sheep population (ARDP, 2014). Sheep production is one of the most important production systems for household asset building in the district. Formal as well as informal methods and multistage sampling technique (purposive, stratified, simple random sampling method)

were used to gather information on husbandry practices. Agro-ecology of the district was used as stratification factor. Agro-ecology of the district was used as stratification factor. The study district was stratified in to three agro-ecologies (NRCD, 2013).

The sample size to was determined by using (Taro, 1967) formula as shown below;

$$n = \frac{N}{1+N(e2)}$$

Where
n = is the sample size
N = number of population
e = level of 8% error

The sampled households were 25, 75 and 50 from Dega, Weina Dega and Kolla respectively. To identify husbandry practices of lambs from six kebeles a total of 150 households were selected randomly.

Statistical analysis

Collected data were analyzed through SPSS version 20.0 (SPSS, 2011). Descriptive statistics, ANOVA, Tukey HSD test and Chi-square test were applied to summarize the data.

RESULTS AND DISCUSSIONS

Household characteristics

The average age of the respondents was 43.45 ± 0.84 years. This indicated that households are at productive age for proper eager good sheep management. The overall mean family size in the study area was 5.53. Majority respondents were male headed (93.3%) while only small proportions (6.7%) were female headed. Marital statuses of most of the respondents 90% married. Majority (51.3%) of the interviewed household heads were illiterate. And the remaining proportions (48.7%) were literate who were grade 1-12 (38.7%), university degree (0.7%) and religious education (9.3%) and there were higher literacy in Weina Dega (70.6%), followed by in Dega (56%) and Kolla (12%) respectively. According to field observation and interviewed key informant, lower number of literacy level in Kolla area was due to accessibility problem of school far from residential area and no immediate justice for the problem. The occupations of 98% households that included in the study were farmers. This indicated that the management system might be poor.

Purpose of keeping sheep

In Hulet Eju Enesie district, sheep are kept for various purposes as listed in (Table 1). In the district as the ranking index indicated that sale (income sources) was the first purpose of keeping sheep, meat as the second purpose and saving as the third purpose. This result is in line with many authors (Urgessa et al., 2013; Hailemariam et al., 2013; Mohammed et al., 2014) who indicated that the major purpose of keeping sheep is for income source. This implies that sale of sheep to generate cash constitute was the primary purpose among others.

Table 1 - Purpose of keeping sheep ranked by respondents in different agro-ecologies

Response of HH (N= 150) / Reasons	1st	2nd	3rd	Weight	Index	Rank
Sale (income source)	132	18	0	432	0.48	1
Meat	17	90	24	255	0.28	2
Saving	1	19	67	108	0.12	3
Social and cultural function	0	15	26	56	0.06	4
Distribute benefits / risks	0	3	24	30	0.03	5
Scarifies / rituals	1	5	2	15	0.02	6
Manure	0	0	3	3	0.003	7
Total	-	-	-	899	-	-

Index = sum of [3 * respondents for rank 1+2 * respondents for rank 2 + 1 * respondents for rank 3] given for an individual purpose of keeping sheep divided by sum of [3 * respondents for rank 1+2 * respondents for rank 2 + 1 * respondents for rank 3] summed for all purpose of keeping sheep. N = number of respondents

Feed resource availability and utilization

The different feed resources and their seasonal use presented in (Figure 1). Communal grazing, grazing aftermath, crop residues and private pasture were the major types of feed resource in the district. Communal (37.1%) grazing was found to be major feed resource from September-November. Grazing aftermath (47%) used as major

feed resources from December-February. Private pasture (31.8%) was the major feed resource in the area especially from June - August because, during this time, other crops occupy other lands. This result is in line with (Abebe, 2013), who reported that 42.5% of the respondents feed crop residues to their sheep in Burie district, West Gojjam Zone. Communal grazing, private pasture, riverside grazing, grazing stubble, crop residues and road side grazing, respectively are the major feed resources for sheep in eastern Ethiopia reported (Nigussie, 2015).

In Hulet Eju Enesie all households feed crop residues. However, the types of crop residues various based on agro- ecologies of the district. In Dega area, the major crop residues used by households are wheat straw (80%), barley straw (40%) and bean and pea straw/chick pea straw (20%), respectively where in Weina Dega, major crop residues are vetch straw (73.3%), chickpeas straw (70.7%) and haricot bean straw (65%), respectively. Majority of the respondents (97.3%) offer supplementary feed for their sheep. Major of the households (97.3%) feed their sheep Atela (local brewery by-product), common salt (60%), and haricot bean (56%) respectively. About 64% of the respondents kept sheep alone, followed by 19.3% (sheep and goat) and 16.7% with cattle and equine. Majority of the farmers (57.3%) in the area reported feed shortage problem especially in dry season (54.62) majorly in Kolla (82.35%).
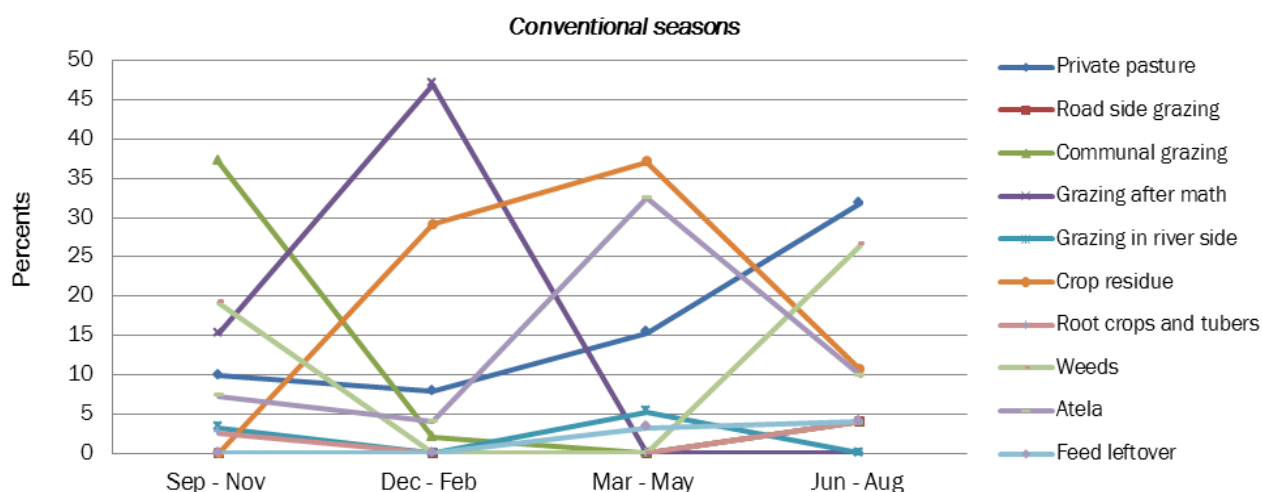

Figure 1 - -Feed resources and their seasonal availability

Water source and watering frequency

River (58.7%) was the major source of water in dry season. The result is in line with (Belet, 2014), who reported 96.3% in Bure, 84% in Atsbi-Womberta, 85.6% in Metema, 56.9% in Gomma, 51.3% in Fogera, 55.2% in Alaba, 44.7% in Alamata and 66.7% in Dale and 88.9% in Wolaita and Siltie zones that river is the major source of water. Rainwater used as the major water source in the rainy season. The result is in line with (Urgessa et al., 2013), who reported that 95.9% of households used rainwater in Ilu Abba Bora Zone of Oromia Regional State Ethiopia. In contrast to this, (Nigussie, 2015; Belet, 2014) found that river and ponds are the main water sources in Wolaita and Siltie Zones and Eastern part of Ethiopia respectively. In dry season, majority of the respondents provided water for their sheep once a day (70%). Focus group discussion indicated that the reason of providing water once a day in the current study was due to low availability of water. However, during the rainy season, 36.7% of households provide their sheep in any time needed. The reason for provision of water at any time needed might be due to plenty of water in the rainy season. In the study, area about 43.3% of the respondents reported, as there was water shortage problem. The reason of water shortage problems were drying of water sources, far distance of water sources and not allowed water source as ranked by respondents with index value 0.55, 0.25 and 0.14, respectively.

Sheep housing

All farmers in Hulet Eju Enesie district shelter their sheep during the night to protect them from predators and adverse climatic conditions. In Hulet Eju Enesie, district 57.65% of respondents sheltered their sheep in a house attached to the main house. With agree this result, (Urgessa, 2013; Nigussie, 2015) indicated that 46% and 55.9% of respondents used a house made adjacent to main family house and separate from family house in Ilu Abba Bora Zone of Oromia Regional State Ethiopia and in Eastern Ethiopia respectively. In contrast to this result, (Kocho, 2007; Abebe, 2013) reported that about 98.6% and 58% of respondents accommodate their sheep flocks in the main houses together with the family members in Alaba district and Burie district West Gojjam zone, respectively.

Weaning practice of sheep

In Hulet Eju Enesie district, only 7.3% of the total respondents practiced weaning. According to focus group discussion the reason of less practicing of weaning in the district was due to their poor knowledge on weaning. In addition, from the interviewed respondents who practiced weaning, wean their sheep usually around 5 months. The current finding is not fit with the recommended weaning age of Ethiopian sheep reported 3 month is common (Abebe, 2008). About 83% of the respondents in the district practiced tail docking. The mean age of tail docking (female sheep) was 3.77 months which was not significantly different (P>0.05) between agro-ecologies. The reason of tail docking was to facilitate mating (Kocho, 2007).

Castrating of sheep

In the study area 100% of household respondents practiced castration of sheep. Majority of households (71.75%) castrate their sheep to fatten and sale. The average age to castrate sheep was 14.84 months. Here castration might become more difficult and painful with age and the chances of complications increase. The current finding might be increase unwanted breed and delay fattening time of sheep in the area. The current finding is quite higher than (Hamito, 2009), who reported castration should be practiced at early age as soon as possible (three weeks age if extended). Majority of the farmers (55.3%) use Burdizzo castration method.

Culling practice of sheep

Majority (82%) of farmers practiced culling of sheep. The reason of culling varied according to agro-ecologies. In Dega area, the major reason of culling sheep was old age. In Weina Dega, the major reason of culling sheep was health problem where in Kola area the major reason of culling sheep was old age.

Sheep breed and breeding management

In Hulet Eju Enesie district sheep were not characterized. However, according to (Gizaw et al., 2007; Awgichew and Abegaz, 2008) who reported that Washera sheep are found in Eastern and western Gojjam of Amhara region. In the district sheep types varied in different agro-ecologies. In Dega area, all households had 100% "local" sheep. In Weina Dega area, households have 69.3% of "local" sheep, 13.3% Washera crossbred, 17.3% both Washera crossbred and "local" sheep respectively. In Kola area, 84% households had "local" sheep and 16% Washera crossbred sheep. About 8.7% of farmers practiced cross breeding. 79.3%) of households have "local" sheep. The main reasons of having/choosing more "local" sheep in the area was unavailability of other breeds, disease resistance due to environmental adaptability and needless amount of feed per a day due to medium sized body relatively Washera cross. Washera crossbreed in the study area; this might be due to their better meat and milk production and nursing ability, large birth weight of lambs and reach slaughtering age within short period (Mekuriaw et al., 2012). The current finding is in line with (Abebe et al., 2013).

Intensive lambing season was observed in October months and November followed by May and June months (Figure 2). This result is in line with (Gemiyu, 2009), who reported that higher parturitions observed in April to June as well as October to December in Alaba, Southern Ethiopia. The major reason of high lambing intensity of sheep in October and November in the current finding was might be due to presence of plenty feeds then they easily become pregnant and give birth. In addition, high lambing intensity in May and June might be associated with the growing of grass due to beginning of small rain.
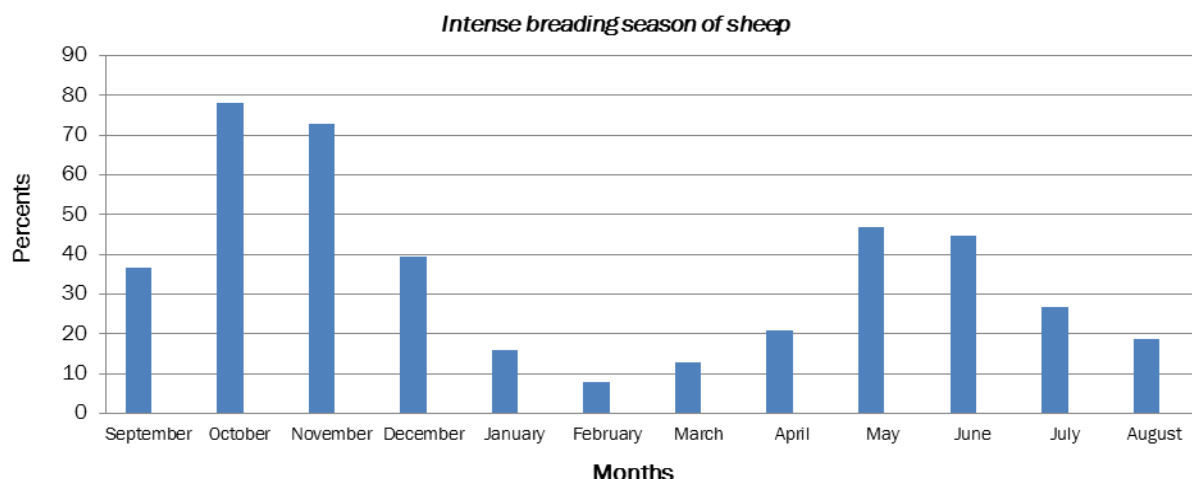

Figure 2 - Intense breeding season of sheep in the study area

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Sheep health management

Major diseases types that affect productivity of sheep in the study area were Berere (Faciolosis), Adfik (Pasteurolosis) and Fentata (Sheep pox) with the value of 65.3%, 36% and 32%, respectively in (Table 2). This result is in agreement with these authors (Nigussie et al., 2015; Belet, 2014).

About 90% of the households take sheep to veterinary clinics for treatment. The remaining households treat their sheep by using drug bought from markets (5.9%) and local traders (4.55%). Majority (52.1%) interviewed respondents located for veterinary center at (1-5km) distance. About 97% of interviewed household treat their sheep with payments in the district. This is in line with (Urgessa et al., 2013). About 69% of interviewed households get vaccine, which is given after outbreak (91.3%) of disease. This might be lack of awareness. About 14% of household respondents got vaccine from open market mainly due to its cheapness (76.7%) but this, types of vaccine is might not assured of its quality (might be expired), the seller might not told the correct dose.

Table 2 - Sheep diseases in the district

Reported symptoms	Expected disease type		Response of HH N (%)
	Local name	Common name	
Immediate death, lack of appetite, swell on neck and weight loss	*Berere*	Faciolosis	98(65.3)
Stand hair, lump, distressed breathing and watery discharge	*Fentata*	Sheep pox	49(32)
Cough, anorexia, bloody mucosa discharge and high fever	*Yesanebamech*	Pneumonia	20(13.3)
Hobble, unable to feed, blisters in their mouth painful	*Afemaze*	FMD	5(3.3)
High blood in urine faces and milk and fever	*Mante*	Anthrax	37(24.7)
Mucosa discharge from noise, animal go off feed, emaciated and have diarrhea	*Adifik*	Pasteurolosis	54(36)
HH= households, N = number and % = percentage			

Labor allocation and gender role in sheep management

All household members involved in sheep management activities with a varied degree. About 48.4% of interviewed respondents indicated that wives and girls performed cleaning sheep barn. About 32% of the wives were responsible for taking care of lambs. Feeding (31.1%), taking care of sick animals (46.8%), fattening management (54.4%), house construction (60.4%) and selling of animals (76.7%) were performed by husbands. Husbands performed majority (83.4%) of decisions on use of income and benefits.

Reproductive performance of sheep

Reproductive performance of sheep in the area is presented in (Table 3). The overall age at first mating, age at first lambing, lambing interval, slaughtering age of sheep, marketing age of sheep obtained was 7.47 months, 12.46 months, 8.05 months, (5.96 months for male sheep and 6.25 months for female sheep) and 6.56 months respectively. The average litter size of sheep was 1.55.

Table 3 - Average productive and reproductive parameters of sheep

Parameters / Agro-ecologies	Dega (N= 25) Mean ± S.E	Weina Dega (N= 75) Mean ± S.E	Kolla (N= 50) Mean ± S.E	Overall (N= 150) Mean ± S.E	P-Value
Age at first mating (month)	7.54 ± 0.19	7.50 ± 0.18	7.39 ± 0.14	7.47 ± 0.11	0.855
Age at first lambing (month)	12.56 ± 0.19	12.47 ± 0.19	12.39 ± 0.14	12.46 ± 0.11	0.868
Lambing interval (month)	8.28 ±0.17	8.03 ± 0.13	7.97 ± 0.13	8.05 ± 0.08	0.431
Average litter size	1.92 ± 0.05[a]	1.49 ± 0.06[b]	1.44 ± 0.07[bc]	1.55 ± 0.04	0.000
Slaughter age (month) male	6.26 ±0.34	6.03 ± 0.19	5.70 ± 0.23	5.96 ± 0.13	0.333
Slaughter age (month) female	6.48 ± 0.32	6.28 ± 0.200	6.08 ± 0.22	6.25 ± 0.13	0.601
Marketing age (month)	7.06 ± 0.36	6.28 ± 0.24	6.54 ± 0.25	6.50 ± 0.16	0.225
a, b, c, means with the different superscripts across rows are significantly different (P<0.05), SE= standard error. N = number of respondent					

Constraints

Major constraints for sheep production were disease and parasite, feed and grazing land shortage and water shortage with index value of 0.381, 357 and 0.063 respectively. This result is in agreements with (Urgessa et al., 2013; Hailemariam et al., 2013), who reported that the main limited sheep production in the study area, were disease and parasite in Ilu Abba Bora Zone of Oromia Regional State, Ethiopia.

Opportunities of sheep production

In the study area, from total livestock population sheep accounts 67.2% but their production was least (ARDP, 2014). This number indicated that, as there is huge number of sheep flock in the district and it might be great opportunity to start sheep production. Key informant indicated in the district there was enough grazing land that used as communally and uncultivated lands that used for crop and animal forage production. If this grazing land properly managed, it could be a good source of good quality feed to boost sheep production in the area. In addition, presence of diverse agro-ecology is might be great opportunity for farmers in the area.

Key informants and focus group discussion indicated that the great opportunity now a days for farmers in the district was, the government (district agricultural office) supply Washera ram by importing from Dangla and Adiet. Washera sheep have been more preferred by the farmers for their large body size, smooth hair, fast growth, big fat tail and attractive coat color, so that this was be great opportunities for farmers.

The improvement in veterinary service from time to time, availability of improved forage seeds, the improvement in extension service from time to time and presence of NGOs (such as Sustainable Land Management) might be some opportunities to engage in sheep production tasks for farmer in the district.

The demand for mutton has increased due to an increase in income and increased population hence in the district and in the country. In addition, there is a growing demand for sheep in both the domestic and export markets. Young male flocks have huge demand by the export abattoir. Establishing of slaughtering and meat processing facilities like Ethiopian meat producer-export association, Abyssinia export abattoirs PLC, Ashraf. Sheep price is increasing in different part of the country this is due to increase mutton demand. These might be an opportunity for farmers to participate in sheep production in the district.

CONCLUSION AND RECOMMENDATIONS

In general, it concluded that the husbandry practices of sheep in Hulet Eju Enesie district observed was dominantly traditional production system. Even though sheep flock size was high, as sheep is the dominant farm animal, their expected role was low due to poor husbandry practice of sheep. Therefore to use this largest opportunity efficiently, health improvement program and market oriented production system should properly implemented. Since sheep in the study area were not characterized, characterization of the "local" sheep should be done. Treatment crop residue and adapted improved forages will alleviate the existing feed problems in the area.

DECLARATIONS

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Authors' contribution
All authors contributed equally to this work from starting proposal writing up to preparation of manuscript.

Competing interests
The authors declare that they have no conflict of interest with respect to the research, authorship or publications of this manuscript.

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