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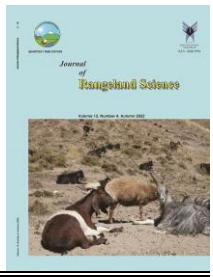

Research and Full Length Article:

Farmers Perception, Abundance and Utilization Practices of *Acacia* Species and its Pod as Animal Feed in Borana Zone, Mio District, Southern Ethiopia

Kassa S. Retta[A]*, Boru Kanu[B], Ahmed Hassen[C]
[A]Department of Animal Sciences, College of Agriculture and Natural Resources, Mekdela Amba University, South Wollo, Ethiopia *(Corresponding author), Email: kassashawel@gmail.com
[B]MSc. Student, Department of Animal Sciences, College of Agriculture and Natural Resource, Jinka University, Jinka, Ethiopia
[C]Department of Animal Sciences, Debrebirhan University, Debrebirhan, Ethiopia

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Abstract. Now a day, due to climate change and deforestation, the density of *Acacia* species are decreasing in the pastoral areas. Therefore, the research was conducted with the objective to assess the existing management, utilization practices and density of *Acacia* species in Mio District in the year 2019. Five representative kebeles (the smallest administrative unit below District) were purposively selected, and from each kebeles, 15 representatives were purposively selected with the assumption that they had sufficient knowledge about the area to collect surveying data. The major livestock feed resources available in the study area were natural pasture, browse species, crop residues and hay. The purpose of keeping livestock in the study area varied based on the species of livestock kept. The primary purpose of keeping cattle and camel were for milk, while it was for meat and income generation in case of small ruminants. Shortage of feed was the first production constraint for cattle followed by shortage of grazing lands. Moreover, the major constraints for small ruminant were health problem followed by predators. Pods, twigs and flowers of *Acacia* Spp. were utilized by livestock as a source of feed. However, the leaves were the most available feed resources in the study area. *Acacia* species were grown on grazing land, crop land, in the house compounds or shelter belts between crop plots. *Acacia tortilis* is the highest in relative density, relative cover (43.3%) and important value (100%). In general, *Acacia* species pod could be used to improve animal performance through improving the nutritive value of low-quality feed resources. Conserving nutritionally important *Acacia* species like *Acacia tortilis* are paramount important for the environment and animal feed. Further study is suggested to assess the nutritive value of *Acacia* pods and leaves which are consumed by livestock but not considered here.

Key words: *Acacia*, Density, Pastoralist, Relative cover, Relative frequency

Introduction

In Ethiopia, availability of feed in both quality and quantity is the root causes for the poor performance of the livestock sector. Rangeland based livestock production is one of the most important agricultural sub-sectors and a primary means of livelihood for pastoral and agro-pastoral communities (Georgis *et al.,* 2010). Due to the large number of livestock population, the rangelands allocated to grazing are shrinking from time to time in all production systems. As a result, animals are allowed to graze without giving rest, which affects the carrying capacity and ultimately livestock production (Ahmed *et al.,* 2017). Indigenous browse species adapted to the existing climatic variability are becoming the major feed resources in semi-arid rangelands by supplying protein and energy to maintain livestock production (Ahmed *et al.,* 2017). They reduce seasonal feed resource supply, produce more biomass, and are more nutritious than natural grazing lands.

Trees and shrubs of the genus *Acacia* are probably the most dominant woody species in the dry tropics of sub-Saharan Africa (Mengistu *et al.,* 2003). There are about 135 species of *Acacia* in Africa today; many of them are widely spread throughout the arid and semi-arid tropics of western, eastern and southern Africa, either as pure stands or in mixtures with allied woody species (Pellew, 1980). Species of the genus provide high quality animal fodder, timber, fuel wood, charcoal, gums and other products and contribute to soil conservation and improvement through nitrogen fixation (Devendra, 1993). Their particular value in arid zones lies in their extreme resistance to heat, drought, salinity and alkalinity, drifting sand, grazing and repeated cutting (Le Houerou, 1980). Consumption of pods considerably improves the quality of small ruminant diets as well as their growth rate (Uguru *et al.,* 2014). It is recommended to aware resource-poor pastoralists and agro-pastoralists, particularly in Africa, to use *Acacia* pods as a strategic dry season supplementary feed to improve the nutritional value of the inherently low-quality indigenous forages.

Mio district of southern Ethiopia where, the study was conducted have a large number of livestock and dominated by the pastoral production system. The district is dominated by different browse species, especially *Acacia* species. In spite of the availability and wide use of the indigenous *Acacia* species, studies have not yet been done with regard to the extent of its utilization. Hence, it is high time to consider detailed understanding on the utilization practices of *Acacia* Spp. and the pods in the southern part of Ethiopia where the information is still scanty. Addressing this research could help to sustain the productivity of livestock and improve the resilience capacity of pastoralists to feed shortage, particularly in the study area where the environment is fragile. Therefore, this study was initiated with the objective of assessing the existing management, utilization practices, importance and density of available *Acacia* species in Mio District, southern Ethiopia.

Materials and Methods

Description of the Study Area

The study was conducted in Mio district of Borana Zone, southern Ethiopia found at a distance of 725 km from the capital Addis Ababa (Fig. 1). The total population is estimated to be 79,068. Population density of the district is 17.5 people per km^2. The district is located between 4^0 01' N Latitude and 38 ^{0}15 'E Longitude. The district has bimodal rainfall pattern with average annual rainfall of 450-500 mm. The main rainy season of the district is March to May and short rainy season is September to November. The temperature ranges from 16

to 27˚C. The altitude of the district varies from 750 to 1350 m above sea level.

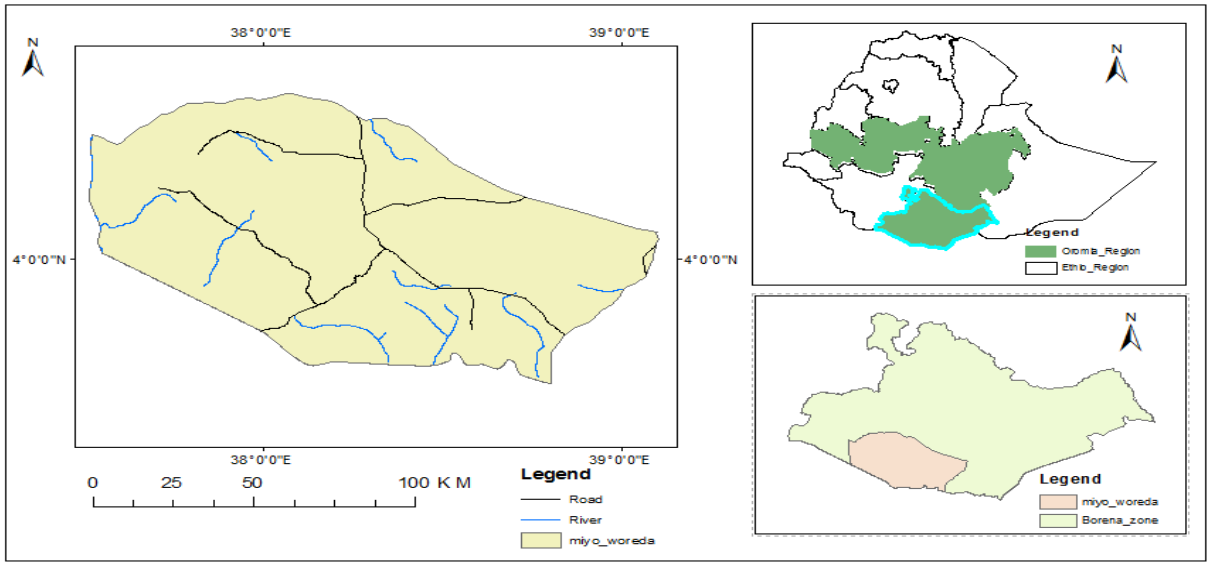

Fig. 1. Map of the study area

Study Site and Sampling Methods

To assess the utilization practices of *Acacia* pods, five representatives *Kebeles* (Ks) from 18 Ks of the district were purposely selected on the basis of *Acacia* potential and presence of major *Acacia* species using group discussion with pastoralists and in consultation with extension and development experts in the district. From each selected Ks 15 pastoralists were purposively selected with the assumptions that they have sufficient knowledge about the area and be able to provide enough information on *Acacia* species utilization trends and other related information. Accordingly, a total of 75 pastoralists was included in the study.

Semi-structured questionnaire was developed and pre-tested with few pastoralists and rearranged to help pastoralists respond without bias. During data collection process data, such as animal feed resource of the area, types of *Acacia* species, feeding practice of *Acacia* species, parts of *Acacia* species preferred, seasonal availability and conservation practices, ways of local pod treatment if any and other relevant information were collected. In addition, from each kebeles, 5 pastoralists (elders) and one Development Agent (DA) who did not involve in the household survey were used for focus group discussion and key informant interviews, respectively.

Acacia species density estimation

Knowledgeable elders were consulted to identify each woody *Acacia* species by local name (vernacular name). For identification purpose (Identification of its scientific name), representative plants with flowering head and other vegetative parts were collected, pressed and labelled. Later on, they were sent to Yabello research center and identified for their scientific name.

Based on pastoralist perception, collected samples of *Acacia* pods were classified according to their preference and palatability to livestock. After classification, the selected *Acacia* species were employed for density estimation by using plot-less (point-centered) quarter methods (Beasom and Haucke, 1975). From each 5 selected kebeles five 100 m long transact was laid out with shorter rope and within the interval of 4 km. The total data for density estimation were taken from 25 transact of 100 m long. The estimation of density, relative frequency, cover (dominance) and importance value of

Acacia species in the study area were determined by the following formula.

$$\text{Absolute density} = \lambda = \frac{1}{\bar{y}^2}$$

$$\bar{y} = \frac{\Sigma ni = 1\ \Sigma 4j = 1\ Rij}{4n}$$

$$\text{Absolute density of each species} = \lambda k = \frac{\text{Quarters with species k}}{m} x\ \lambda$$

$$\text{Relative density of each species k} = \frac{\lambda k}{\lambda} x\ 100$$

$$\text{Absolute frequency} = \frac{\text{No of sample point with species}}{\text{Total number of sample points}} \times 100$$

$$\text{Relative frequency} = \frac{\text{bsolute frequency of a species}}{\text{Total frequency of all species}} \times 100$$

$$\text{Relative cover} = \frac{\text{Total BA of species k along transect}}{\text{Total BA of all species along transact}} \times 100$$

Importance value = Relative density +Relative cover +Relative frequency.
n = the number of sample points along the transect.
4n=the number of samples or observations one for each quarter at each point
i = a particular transect point where i = 1…n
j = a quarter at a transect point, where j = 1…4
λ= absolute density
$\bar{y}$ = Mean distance
R_{ij}=the point-to- tree distance at point i in quarter $_j$
BA=Basal area

Statistical Analysis

Statistical Package for Social Sciences (SPSS, version 20) was used to summarize the survey data using descriptive statistics (i.e., mean, frequency and percentage). SAS (Statistical Analysis System version, 9.1.3) was used to analyze data on density estimation. Ducan's multiple range test was employed to separate means that are significantly different ($p<0.05$).

Result and Discussion

Household Characteristics

Household characteristic of the interviewed pastoralists in Mio District is presented in Fig. 2 and 3. Among the interviewed pastoralists 74.7% were male and 25.3% were female. The largest proportions of the interviewed pastoralists (34.7%) in the study area were within the age category of 41-50 years. However, only 1.3% of the respondents were within the age of >70. The majority of the respondents were illiterate (66.7%), while 20% respondents had acquired primary education and the rest 5.3%, 4%, and 4% had acquired diploma, religious basic education and first degree, respectively (Fig. 3). This result is not in agreement with Muleta *et al.* (2017) who reported that, most of the household heads (72.1%) were educated in western Hararghe Zone. Hence, this would suggest an impediment to technology transfer, intervention to be made and the need for introduction of pastoralists-based education.

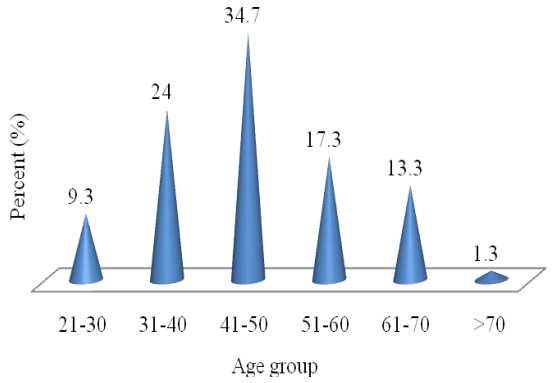

Fig. 2. Age groups of the households

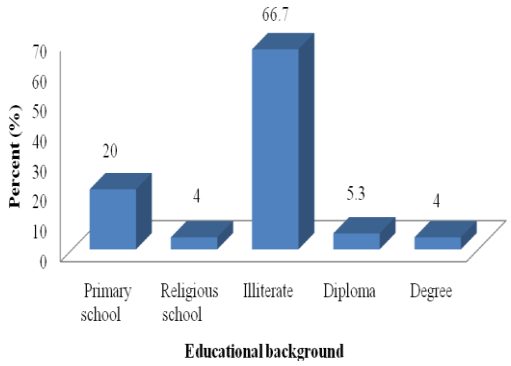

Fig. 3. Educational background of the respondants

Livestock Production

Herd Size and Composition of Livestock in the Study Area

The average number of livestock holding per household in the study area was 46.7 (Table 1). The herd size is mainly affected by shortage of feed, health and predators in the study area. This finding was higher than what has been reported by Solomon (2004) in Bale highlands and comparable with the one reported by Mizan (2010) in Yabelo district. Among the types of livestock owned by the pastoralists, cattle constituted the largest percentage (37.05%) followed by goats (33.85%), which is in agreement with Megersa *et al*. (2014). Livestock have been involved in governing the livelihood of the pastoralists either directly or indirectly. The respondents indicated that, livestock are considered as live insurance for safeguarding their livelihood in the study area.

Table 1. Average number of livestock per household in the study area

No	Types of livestock		livestock No. per household	Percent (%)
1	Cattle	Calves	3.56	7.63
		Heifers	3.17	6.79
		Bull	1.6	3.43
		Oxen	2.4	5.10
		Cows	6.58	14.1
		Sub total	**17.31**	**37.05**
2	Sheep		7.2	15.42
3	Goat		15.8	33.85
4	Camel		4.66	10
5	Donkey		1.7	3.64
	Sub total		29.36	62.91
	Grand total		46.67	100

All respondents indicated that keeping more than one livestock species were used for risk minimization as different species of animals have different physiological adaptation to recurrent drought and erratic rainfall. This is in agreement with the finding of Mizan (2010) and Teshome (2007) who reported that keeping diversified livestock species by the pastoralists in Ethiopia and East African countries act as means of securing livelihood. Moreover, Nigatu *et al*. (2004) indicated that keeping animals with different feeding habits in the rangeland is beneficial as it helps to make efficient utilization of available feed resources. The group discussion carried out in the study area revealed that, relatively higher proportions of female animals were kept by pastoralists than males. This is obviously due to the fact that female animals are used as replacement stock.

Purpose of keeping livestock in Mio District

In the study area, pastoralists keep livestock for various purposes (Table 2). The major purpose of keeping cattle was for milk production followed by income and meat, which was in agreement with Muleta *et al*. (2017) in western Hararghe Zone and Mizan (2010) in Borana pastoralists. The use of such animals as milk and meat sources led to growing consumption of livestock products that brought important nutritional benefits to large segments of the population of developing countries (Megersa *et al*., 2014; Birara and Zemen, 2016).

The major purpose of keeping sheep and goat was for meat, income generation and milk production, which was in agreement with the report of Muleta *et al*. (2017). Occasionally, pastoralists in the study area slaughter sheep/goats for home consumption and for inviting tribe leaders, religious celebration and for other purposes (Mizan, 2010). Small ruminants were also reared for prestige (besides their tremendous economic importance, which was in line with the report of Solomon (2004).

Table 2: Purpose of keeping livestock in study area

No	Types of animals	Purposes	Index	Rank
1	**Cattle**	Meat	0.207	3
		Milk	0.415	1
		Drought	0.082	4
		Income	0.276	2
		Social prestige	0.020	5
2	**Sheep and goat**	Meat	0.387	1
		Milk	0.235	3
		Income	0.340	2
		Social prestige	0.020	4
		Ceremony	0.018	5
3	**Equine**	Milk	0.003	5
		Income	0.351	2
		Social prestige	0.136	3
		Ceremony	0.050	4
		Transport	0.460	1
4	**Camel**	Meat	0.170	3
		Milk	0.461	1
		Drought	0.003	7
		Income	0.206	2
		Social prestige	0.026	5
		Ceremony	0.026	5
		Hide	0.010	6
		Transport	0.098	4

Notice: Index score = sum of (6 * percent of household ranked first +5 * percent of household ranked second + 4 * percent of household ranked third + 3 * percent of household ranked fourth + 2 * percent of household ranked fifth + 1* percent of household ranked six) given for each purpose divided by sum of (6 * percent of household ranked first + 5 * percent of household ranked second + 4 * percent of household ranked third + 3 * percent of household ranked fourth + 2 * percent of household ranked fifth + 1 * percent of household ranked six) for all purpose (S&P Dow Jones indices, 2021)

The major purposes of keeping equines were for transport followed by income (Table 2). Such findings agreed with other reports (Solomon, 2004). In this study pastoralists kept donkeys in all parts of the study area, while horses and mules are found rarely. The major purpose of keeping camel is for milk, income generation and meat. Camel population is being increasing in the study area. According to the perception of the community and group discussants, the attitudes of the pastoralists in rearing camels increased relative to what it was in the past. This could be related to the fact that camel is able to utilize the available browse and bush species that occurred as a result of lower rainfall distribution better than cattle and sheep. This showed that camel can be used as an adaptive strategy to drought and related shocks, especially in pastoral and agro-pastoral production systems where rainfall variability was more serious than crop-livestock production system (Ahmed *et al*., 2017). Megersa *et al* (2014) also reported that in Borana pastoral areas, cattle herd size declined due to mortality (26%) and forced off-take rate (19%) at household level during 2011 drought year and were forced to keep more goat and camel than cattle and sheep under increased rainfall variability (Megersa *et al.,* 2014).

Responsibility for livestock management

The study demonstrated that 90.7% and 65.3% of selling of livestock and milking activities, respectively, were done by husband, whereas 94.7% of churning of milk for butter making, 82.7% of barn cleaning and 93.3% of marketing of dairy product activities were handled by women (Table 3). The duties of herding and watering livestock were left for children and husband. All family members participated in feeding of livestock. This indicated that there is a division of labour among family members.

Table 3: Responsibility for livestock management in % (n=75) in the study area

Category	Husband	Wife	Children	Labor	Undecided
Feeding	72	6.7	17.3	_	4
Herding	4	1.3	84	2.7	8
Milking	30.7	65.3	4	-	-
Barn cleaning	82.7	5.3	9.3	1.3	1.3
Making livestock product	-	94.7	5.3	-	--
Watering	85.3	4	8	-	2.7
Selling livestock	90.7	5.3	2.7	-	1.3
Selling livestock product	2.7	93.3	4	-	-

Constraints of Livestock Production

The major constraints of livestock production in the study area are shown in Table 4. The respondents mentioned that the constraints related to livestock production varied from species to species. Shortage of feed, shortage of grazing land, health problem, predator and labor scarcity were found to be the major constraints which limit livestock production in the study area (Table 4). For cattle production, feed shortage, followed by shortage of grazing land and

low productivity were priority challenges. This is in line with the report of Hungwe (2014), Muleta *et al.* (2017) who reported feed shortage to be the primary constraint for livestock in Western Hararghe Zone. Mizan (2010) also reported that decline in livestock productivity due to rangeland degradation causes shortage of feed, thereby hastened death of livestock and accelerated migration for searching of feeds. Moreover, health problem and predators were identified as the major constraints for small ruminants. Furthermore, health problem and labour scarcity were identified as the major problem for camels and equines respectively. This result was in agreement with the finding of Sisay (2006) who indicated that disease and parasite were the primary constraints of livestock production in Metema area. Therefore, balancing the existing grazing land and livestock number is mandatory through improving individual animal production.

Table 4: Constraints of livestock production in the study area

No	Types animal	Constraints	Index	Rank
1	Cattle	Shortage of feed	0.478	1
		Shortage of grazing land	0.338	2
		Low productivity	0.118	3
		Climate change	0.046	4
		Health problem	0.016	5
		Predator	0.002	6
		Marketing	0.002	6
		Total	1.00	
2	Sheep and goat	Health problem	0.35	1
		Predator	0.26	2
		Shortage of feed	0.198	3
		Shortage of grazing land	0.144	4
		Low productivity	0.02	5
		Climate change	0.02	5
		Water scarcity	0.004	7
		Marketing	0.004	7
		Total	1.00	
3	Camel	Health problem	0.393	1
		Shortage of grazing land	0.246	2
		Shortage of feed	0.187	3
		Gully erosion	0.137	4
		Climate change	0.012	5
		Low productivity	0.01	6
		Marketing	0.01	6
		Labor scarcity	0.006	8
		Total	1.00	
4	Equine	Labor scarcity	0.300	1
		Shortage of grazing land	0.191	2
		Health problem	0.156	3
		Shortage of feed	0.148	4
		Marketing	0.082	5
		Climate change	0.027	6
		Predator	0.049	6
		Illegal trade	0.025	8
		Low productivity	0.014	9
		Water scarcity	0.008	10
		Total	1.00	

Feed Resources and Feeding System

The types of feed resources commonly used for livestock in the study area are grazing land, browse species, crop residues, native hay, and agro-industrial by products. Among the different available feed resources, pastoralists ranked grazing lands as the first feed resource followed by browse species, crop residues and native hay (Fig. 4). This finding is in contrast with Muleta *et al*. (2017), who reported that, crop residues ranked first and followed by a folder tree in the Daro Labu district of the Western Hararghe Zone. This difference might be due to deference in agro-ecology and farming system across the study areas. On the other hand, natural pasture was the major feed resource, as has been outlined since long (Alemayehu, 2004). However, due to climate variability and continuous grazing of the natural pasture, the vegetation cover and its productivity have been decreasing (Ahmed *et al.*, 2010*;* Malede and Takele, 2014).

All respondents indicated that, the communal grazing land status was decreasing due to different factors. Among the factors, land degradation and increasing livestock number were reported as major ones (45.3%), which are in line with the reports of Aschalew (2014) and Mizan (2010). Moreover, shortage of rainfall was also reported as one of the factors by 20% of the respondents which occurred due to frequent drought. Accordingly, pastoralists applied different adaptation strategies to reduce the impact of drought. They tend to practice grouping their animals on their private grazing lands, feed conservation practice in the form of hay, and purchase of concentrate feed. Among the interviewed pastoralists, the majority of them (84%) had small private grazing land, and 69.8% of pastoralists also had the habit of grouping animal based on their age, sex and productivity on their grazing land.

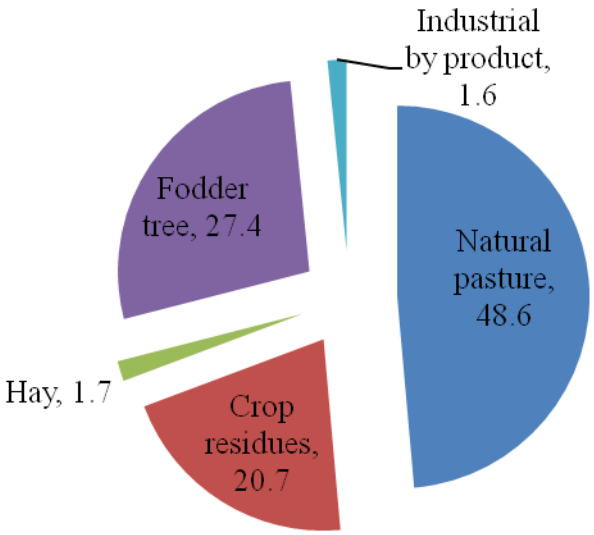

Fig. 4. Major feed resources in the study area as prioritized by pastoralists

Out of the total interviewed pastoralists, 97.3% indicated that hay making was one of the feed conservation strategies for dry season. This result agreed with Boru (2016), who reported 41.67% of pastoralist practiced hay making as local coping mechanism to protect their livestock from drought hazards in Yabelo district. According to the respondents' hay was commonly made during short rainy season from late November to December and long rainy season from June to July from their private grazing land, own farm, farm land boundaries and communal grazing lands. This is in line with the report of Aster *et al*. (2012). It was observed that mostly,

pastoralists store hay and crop residues by stacking in an open air around homesteads and in the ranch. Supplementation in the dry season was reported by the majority of the respondents (93.3 %) in the study area. The major supplementary feed identified was wheat bran. Supplementation of mineral (salt) was a common practice in the study area both in dry and wet season. All of the respondents provided salt to animals during the rainy season in order to increase the appetite, feed utilization efficiency, to make female animals in heat and to increase milk yield.

Feeding practices of *Acacia* Species

All respondents in the study area confirmed the availability of *Acacia* species that can be utilized as a source of feed for livestock (Table 5). In addition, parts of *Acacia* species were preferred by animals differently. 97.3% of the respondents indicated that, cattle consumed pods of *Acacia* than leaves and twigs due to its leave fineness and long height of *Acacia* plants. In case of small ruminants, 82.7% of the interviewed pastoralists mentioned that small ruminants consumed both leaves and pod parts. On the other hand, 95.8% of the interviewed pastoralists responded that camels consumed both leave and pod parts of the *Acacia* Spp. According to group discussion and key informants, pods from *Acacia* species were highly appreciated and regarded as valuable feed by pastoralist in the study area. This is in agreement with the report of Aster *et al*. (2012) who indicated that fruits from *A. tortilis* and *A. nilotica* were regarded as highly valuable feeds by Borana pastoralist but the leaves of these trees were not on top list. According to the interviewed pastoralists', pod from *Acacia tortilis, Acacia melifera*, *Acacia nilotica* and *Acacia Senegal* were the major species used for pods harvesting during dry season and used as a major livestock feed. Other species were also used as deciduous during dry season.

Animal preference of *Acacia* species

The interviewed pastoralists explained that goats are active and inquisitive in their foraging behavior. Although goats consume a wide diversity of foliage found in the area; they particularly prefer browsing than grazing and are attracted to trees and shrubs. Cattle were more selective in feeding on browse species than goat. According to the respondents' cattle didn't need thorny and rough browse species like *Acacia melifera* and *Acacia senegal* (JICA, 2015). They are not highly preferred by cattle, especially when there is adequate feed supply. But in critical times of the dry season all livestock kept in study area are fed on browse species, especially pod rather than leaves.

Other uses of Available *Acacia* Species Grown in the Study Area

As presented in Table 5, all *Acacia* species had diversified uses in addition to livestock feed. The interviewed respondents` mentioned that *Acacia nilotica, Acacia bussei, Acacia brevespica* were 100% and *Acacia etabacia* 98.7% used for construction and farm utility. Most of these species were used for bee keeping and some of the *Acacia* species were also used as traditional medicine. Among the selected *Acacia* species, *Acacia brevespica* were mentioned as traditional medicine by all respondents. But, none of the *Acacia* species were mentioned as edible fruit rather than used as livestock feed. The uses of available *Acacia* species observed in this finding were in agreement with the finding of Lock (1989) except edible fruit included in his finding. The other *Acacia* species, *Acacia melifera* were used as incense tree which was reported by 97.3% of the respondents. Furthermore, pastoralists reported that even though, communal lands are decreasing overtime due to many factors such as

increasing number of livestock, frequently occurred drought, expansion of farmland and land degradation, *Acacia* species were able to grow around homesteads, farm land boundaries and in the rangeland. The advantage of fodder tree (especially *Acacia*) in this study area was that they can be grown as fodder hedges around homesteads and in poor managed rangeland.

According to the respondents, they didn't involve much in planting and growing *Acacia* trees. They were only exploiting naturally grown and regenerating *Acacia* trees in the area. Preserving *Acacia* species vary within species. Mostly preserved *Acacia* in the study area was *Acacia tortilis* while the others were less preserved. Plant species which are mostly used as animal feed were preserved and managed both by the community and government organizations.

Table 5. Major uses and livestock feeding practice of different *Acacia* species in Mio District (n=75)

Acacia species	Local name	Feeding practice (%)						Feeding practice (%)				
		Fuel wood	Construction	Traditional medicine	Farm utility	Beekeeping	Incense tree	Browsing	Cut & carry	Deciduous parts	Mix of other feeds, hay/ crop residues	Shaking down pods
A. tortilis	Dhadacha	36	_	_	_	97	_	98.7	_	98.7	14.7	98.7
A. nilotica	Sapansa guracha	100	100	_	100	100	_	92	_	100	20	100
A. melifera	Burquqe	100	1.3	14.7	8	9.3	97.3	92	_	100	_	96
A. Senegal	Sapansa dima	89.3	1.3	4	_	53.3	_	100	_	100	_	96
A. etabacia	Alqabesa	100	98.7	_	100	100	_	100	_	100	_	_
A. berivespica	Hammaresa	100	100	100	100	_	_	100	98.7	100	_	1.3
A. bussei	Allo	100	100	_	100	100	_	100	_	100	_	1.3

Utilization methods of *Acacia* species

The interviewed pastoralists reported that *Acacia* species used as animal feed in both dry and wet season whenever *Acacia* trees have foliage to be used as forage. Some *Acacia* such as *Acacia brevespica* is used by cut and carry system for sick animals, kids, lambs and weak animals, which were kept around the homesteads (Table 5). This report is comparable with the findings of Muleta *et al*. (2017). Furthermore, pastoralists collect pods of *Acacia* tree and keep them at their homes for the purpose of feeding calves, kids and sick animals which cannot walk long distances in search of feed and water during dry season. Mature pods of trees and shrubs naturally fallen under trees were normally consumed by animals. *Acacia* species pods like *Acacia nilotica* and *Acacia tortilis* pods were used by wilting to minimize water content in it.

According to the interviewed pastoralists all *Acacia* species were utilized as animal feed by browsing. But the browsing degree differed among *Acacia* species. The leave of *Acacia berivespica*, *Acacia bussei* and *Acacia nilotica* were mentioned as highly browsed by camel and goat while leaves of *Acacia melifera* and *Acacia etabacia* were mentioned less browsed. This could be due to less palatability, leave fineness and thorny characteristics of *Acacia melifera*. Respondents reported that *Acacia melifera* were difficult to browse rather animals consume deciduous parts of it in the dry season, since all wet season unconsumed leaves and pods of *Acacia melifera* were

failed down in dry season (Lemma *et al.*. 2015).

Estimated density and growing niche of Acacia species in the study area

A total of 8 pod yielder *Acacia* species were selected and recorded (Table 6). Those *Acacia* species grown under this study area were found in different density ($p<0.05$). *Acacia tortilis* was high in relative density, relative cover, relative frequency and importance value when compared to other species. This finding is not in agreement with the finding of Yamene (2009) who reported high relative density, relative frequency and important value of *A. Senegal* in Awash national park. The result is also not comparable with the report of Teshome *et al.* (2012) who reported high relative density, relative frequency and importance value of *A. melifera* in Boke salt valley landscape found in Borana zone. *A. nilotica* was high in relative cover next to *A. tortilis* and this result is comparable with report of Yamene (2009). The higher importance value (IV) were recorded for *A. tortilis* (100), followed by *A. senegal* (47.2) and *A. nilotica* (42.1).

Table 6. Percentage of absolute density, absolute frequency, relative density, relative frequency, relative cover and importance value of *Acacia* species

Acacia species	Absolute density	Absolute frequency	Relative density	Relative frequency	Relative cover	Important value
A. tortilis	24.9^{a}	77.0^{a}	30.0^{a}	26.7^{a}	43.3^{a}	100^{a}
A. mellifera	10.58^{c}	39.0^{c}	12.8^{b}	13.5^{b}	8.44^{d}	34.7^{c}
A. nilotica	10.99^{c}	36.0^{cd}	13.3^{b}	12.5^{c}	16.3^{b}	42.1^{b}
A. Senegal	14.73^{b}	50.0^{b}	17.8^{b}	17.4^{b}	12.1^{c}	47.2^{b}
A. bussei	9.34^{c}	33.0^{cde}	11.3^{c}	11.5^{c}	12.2^{c}	34.9^{c}
A. berivespica	6.85^{d}	27.0^{de}	8.25^{d}	9.38^{d}	2.44^{e}	20.1^{d}
A. etabacia	5.60^{d}	26.0e	6.75^{d}	9.03^{d}	5.29^{d}	21.1^{d}
SEM	0.98	3.82	2.95	2.32	5.14	10.2
P-value	0.01	0.0	0.03	0.01	0.01	0.02

$^{a-e}$ mean values along the same column with different superscripts are significantly different ($P<0.05$)

The respondents reported that the niches of *Acacia* species were different in the farming system. Most of the *Acacia* species were found in the grazing lands and around farm land boundaries. Certain *Acacia* species were also available in the farmlands and around the homesteads. Pastoralist manage, browse species through controlling field fire and keeping of them from livestock damage, especially for those browse species which were found around the residential areas. The management of *Acacia* species by pastoralists may not start from establishment but after grown naturally.

Conclusions

Shortage of feed, livestock disease and shortage of grazing land were the major constraints which limits livestock production in Ethiopia. Traditional livestock production in the study area was predominantly based on natural pasture and browse followed by crop residues. Especially, in the long dry season, pods from different plant species were the main feed sources. Nearly all livestock species in the study area consume pods of *Acacia* depending on availability and preference of the animal. In addition to livestock feed, *Acacia* species were used for fuel wood, construction, bee forage, fencing and traditional medicine. *A. tortilis* had the highest in absolute density, absolute frequency, relative density, relative frequency, relative cover and important value followed by *A. Senegal* for the variable absolute density. *Acacia* species pods can be used as supplements to low quality livestock feeds to correct nutrient deficiencies such as

crop residues and natural pasture hay, if they are harvested at the right season. It is therefore, recommended to develop local conservation practices to reduce deforestation and fire hazards in the study area for optimum utilization.

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