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Assessment of Livestock Feed Resources in the Farming Systems of Mixed and Shifting Cultivation, Gambella Regional State, Southwestern Ethiopia

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I. Introduction

Ethiopia's livestock population is the largest in Africa. It is estimated to be about 56.71 million cattle, 29.33 million sheep, 29.11 million goats, 56.87 million poultry, 2.03 million horses, 7.43 million donkeys, 0.4 million mules, 1.16 million camels and 5.89 million beehives in the sedentary areas of the country (CSA, 2015).

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The Ethiopian livestock sector has considerable economic and social importance at household and national levels and provides significant export earnings. The sector contributes about 15 to 17% of gross domestic product (GDP) and 35 to 49% of agricultural GDP and 37 to 87% of the household incomes (Gebremariam *et al*., 2010; Behnke and Metaferia, 2011; ATA, 2012). Geographically, approximately 75% of the cattle and sheep, and 30% of the goat population are in the highlands in predominantly mixed crop livestock production system and densely populated environments, while the balance is in the lowlands in predominantly pastoral and agro pastoral production systems (MoARD, 2004). Among the diverse and numerous functions of livestock are food (meat, eggs, milk, and honey), cash income, draught power, manure and transport. Livestock production is an all year round activity compared to crop production and therefore, serves as a security against the risk of crop failure. However, productivity is low in comparison with the livestock population in the country due to a number of constraints (MoARD, 2004), such as poor genetic makeup, poor nutrition and poor veterinary service.

Under nutrition and malnutrition are major factors constraining animal production in Ethiopia. Nutritional stress causes low growth rates, poor fertility and high mortality, which is compounded by diseases. About 85% of feed intake is used to meet the animals' maintenance requirements and only 15% is utilized for production. Utilization of the feed resources is therefore highly inefficient (Alemayehu, 1985). Animals depend mainly on natural pastures for their feed requirements because they provide more than 90% of the livestock feed and yet the natural pastures are generally poorly managed due to over stocking resulting in sever land degradation, losses of valuable species and dominance by unpalatable species (Alemu, 1998).

Livestock feed resources are classified as natural pasture, crop residue, improved pasture and forage, agro-industrial by- products, other products like food and vegetable refusal, of which the first two contribute the largest feed type (Alemayehu and Sisay,2003). The area of improved pastures and fodder

crops is almost none and natural pastures are overgrazed causing invasion of inferior species. Seasonal feed deficiencies cause the loss of weight gains made during more favorable periods. Generally, all stocks graze together with no attempt to provide special treatment for different classes of livestock. Despite the fact that, the presence of potential livestock in the current study area, the presence, utilization and seasonal availability of livestock feeds in various farming systems has not been studied. Hence, farmers in the area are not benefiting from livestock products and by-products effectively. Generally, livestock feed resources in the region at large and in the study area specifically are inadequate in terms of quantity and quality throughout the year (GRS, 2003). There is little or no base line information about the livestock feed resource availability, type of forage species and general nutritional qualities. Availability of such information is of paramount importance in designing the development strategies, research plans and any intervention options for both livestock production and natural resource management. Therefore, this study was designed to generate base-line information with the objective of assessing the major livestock feed resources availability in the study area during wet and dry seasons.

II. Materials and Methods

a) Study area

The study was conducted in Gambella Regional State (GRS) which is located in the south-western part of Ethiopia and 766 km far away from the capital city, Addis Ababa specifically Abobo Woreda. Abobo has an estimated population density of 5.3 people per square kilometer, which is greater than the Zone average of 3.66. The region share borders with Oromiya regions to the North, the Southern Nations Nationalities and Peoples' Regional State (SNNPRS) and the Sudan Republic to the South, Oromiya and SNNPRS to the East and the Sudan Republic to the west (Kassahun and Asfaw, 2008). Abobo, is found in the lowland agro-ecological zone where there is crop production with gradual encroachment to rangelands showing the future expansion of crop cultivation. Farmers rear cattle, sheep, goats and chicken together with their crop cultivation practices. They produce cereal crops mainly maize, sorghum, millet, and rice. In Abobo woreda there are two major types of farming systems, these are mixed farming and shifting cultivation practiced by settlers and native local people of the area, respectively (GRS, 2003).

b) Selection of the Study Area and Survey Procedures

Multi-stage sampling technique was employed for questionnaire survey of the study. In the first step, Abobo woreda was selected of all the woredas in the region purposively based on the representatives of mixed farming and shifting cultivation, feed resources availability and its accessibility for data collection. Six kebeles (3 from each farming systems) were also purposively selected out of the total 17 kebeles. Then, a random sampling technique was employed to select the respondents that have at least one livestock for the survey data collection. A total of 180 (30 per kebele) households were identified and interviewed. Also, observations, group discussions with Bureau of Agriculture and Rural Development (BoARD) Staffs and key informants were made to countercheck the individual farmer's responses. Secondary data were collected and reviewed from all possible relevant sources to consolidate the information.

c) Forage Species Identification

The commonly available feed resources were collected from each selected kebele together with livestock owners, from a total of 6 representative grazing sites of which 3 was selected from each farming system. Local name of each forage species was identified from the study area. To help in identifying the collected species, representative plants with flowering head, root, leaf and fine stems from each species were collected, coded, pressed, dried and then transported to Addis Ababa University National Herbarium.

d) Statistical Analysis

The collected data were organized, summarized and analyzed with the help of Statistical Package for the Social Sciences (SPSS, version 12). Descriptive statistics such as means, percentages, and standard error of the means were used.

III. Results and Discussion

a) Land holding

In the mixed farming system and shifting cultivation the average land holding of the respondents was 1.26 hectare (ha) and 1.42 ha, respectively which includes arable land and homestead. According to CSA (1998), the land holding of smallholder farmers are small and fragmented and at national level about 60% of the households have less than 2 ha and the result of this study is more or less comparable with 1.5 ha in North Shoa zone of Oromiya (OESPO, 2001). Majority (80%) reported that there was an increase in land holding since 1984 in both farming systems. The reasons for the change of land holdings in the two farming systems as indicated by 64.4%, 26.9% and 8.8% of the respondents were due to food security, availability of labor which implies that when there is enough labor in the households the size of land holding increased and vice versa, and availability of land, respectively. Availability of land is sufficient in the shifting cultivation relative to the mixed farming systems which resulted in increasing of land holding. This is probably due to less human population hence there will be enough land for crop production and grazing field.

Table 1 : Land allocated per household and their change in the two farming systems of Abobo woreda

Variables	Mixed farming (n=90)	Shifting cultivation (n=90)	Overall (n=180)
	Mean± (SE)	Mean± (SE)	Mean± (SE)
Land holding per household (ha)	**1.26± (0.11)**	**1.42± (0.07)**	**1.34± (0.06)**
Trend over time (% of respondents)			
Increasing	72.2	87.8	80.0
Decreasing	11.1	6.7	8.9
No change	16.7	5.6	11.1
Reason of change (% of respondents)			
Food security	66.7	62.4	64.4
Availability of labor	28.0	25.9	26.9
Availability of land	5.3	11.8	8.8

n= number of respondents

b) Livestock herd structure and herding practice

In the mixed farming system (MFS), cattle herd size was dominated by cows and followed by oxen. Similarly, in shifting cultivation the number of cows is also dominant (Table 2). This is consistent with the finding of Beyene *et al*. (2011). This showed that milk production is more important compared to meat and plowing purposes of cattle.

During group discussion, in the MFS, there is a practice of buying oxen during farming seasons and selling them when plowing period is over. For small ruminants, the flock was mainly dominated by female. It was observed that the number of females was greater than males since the males were the first to be slaughtered and sold. Females are kept for breeding purpose. Equines and camels are not reared in the study area due to adaptation problems to hot and humid conditions, problems of diseases and flies. The larger proportion of female stock observed in the current study is a typical characteristic of pastoralists living in other parts of Ethiopia (Coppock, 1994; Teshome, 2007). In the study woreda, chickens are reared traditionally in a scavenging system. Sometimes chickens are supplemented with sorghum, maize, and other kitchen leftovers. Chickens are mainly kept as immediate source of cash income for the family members and as a breeding stock. The livestock (cattle and goats) holding per household in this study is comparable with the figure reported for Assosa Zone by Beyene *et al*. (2011).

Table 2 : Number of livestock holdings (number of heads/household) in the two farming systems of Abobo woreda

Livestock species	Mixed farming (n=90)	Shifting cultivation (n=90)	Overall(n=180)
	Mean±(SE)	Mean±(SE)	Mean±(SE)
Cows	2.67±0.23 [a]	0.26±0.11 [b]	1.46±0.16
Oxen	2.03±0.15 [a]	0.06±0.03 [b]	1.04±0.11
Bulls	0.68±0.08	0.0	0.34±0.05
Heifers	1.11±0.13 [a]	0.03±0.03 [b]	0.57±0.08
Calves	1.51±15 [a]	0.16±0.06 [b]	0.83±0.1
Total cattle	**7.99±0.52 [a]**	**0.50±0.21 [b]**	**4.24±0.4**
Bucks	0.52±0.09 [b]	1.09±0.1 [a]	0.81±0.07
Does	1.76±0.18 [b]	3.22±0.22 [a]	2.49±0.15
Kids	1.96±0.21 [b]	4.39±0.26 [a]	3.17±0.19
Total goats	**4.27±0.41 [b]**	**9.03±0.45 [a]**	**6.65±0.35**
Rams	0.06±0.02	0.0	0.03±0.01
Ewes	0.19±0.05	0.0	0.09±0.03
Lambs	0.17±0.06	0.0	0.8±0.03
Total sheep	0.41±0.11	0.0	0.21±0.06
Chickens	12.76±1.53 [b]	27.34±1.62 [a]	20.05±0.24

n= number of respondents, SE= standard error. Means with different superscript letters within the row did significantly differ at P<0.05

As indicated in Table 3, in the shifting cultivation water is available close to the farms and the livestock owner do not trek their animals to distant areas. However, in the mixed farming system, about 11.1% of the respondents indicated that livestock traveled to get water to a distance of more than 10 km which reduce watering frequency and consumption. The effect of water stress can be simply stated in the energy loss during long distance walking in search of water and low nutrient intake. Therefore, trekking to a longer distance

could probably exacerbated weight loss of livestock. A similar report by Girma *et al*. (2009) indicated that animals consume less water if they have to travel further to the source.

Table 3 : The proportion (%) of respondents traveling with their livestock to watering points during the dry season in the two farming systems of Abobo woreda

Distance traveled	Mixed farming (n=90)	Shifting cultivation (n=90)	Overall (n=180)
Watered at home	4.4	6.7	5.6
≤ 5 km	44.4	75.6	60.0
6-10 km	40.0	17.8	28.9
>10 km	11.1	0.0	5.6

n= number of respondents

In the mixed farming system farmers mostly watered cattle once a day, whereas it was twice a day for shoats (Table 4). However, in the shifting cultivation 8.9 and 46.7% interviewed respondents' watered their cattle and shoats twice a day, respectively. About 7.2 and 20.0% of the respondents' in both farming systems described as water not to be a problem for cattle and shoats, respectively and animals have normally free access. In general, most of the farmers in the two farming systems watered their livestock once and twice a day and only very small number of them watered animals once in two days. The current finding is in line with the report of IPS (2000) in the lowlands of Somali region which indicated that the distance from residential areas to watering points varied from 2 to 70 km and this had significant influences on the frequency of watering.

Table 4 : Watering frequency for livestock species during the dry season in the two farming systems of Abobo woreda (% of respondents)

Livestock species	Watering frequency	Mixed farming (n=90)	Shifting cultivation (n=90)	Overall (n=180)
Cattle	Free access	11.1	3.3	7.2
	Twice a day	31.1	8.9	20.0
	Once a day	53.3	5.6	29.4
	Once in two days	4.4	0.0	2.2
Shoats	Free access	27.8	12.2	20.0
	Twice a day	34.4	46.7	40.6
	Once a day	30.0	35.6	32.8
	Once in two days	2.2	3.3	2.7
	Once in three days	5.6	2.2	3.9

n=number of respondents

The shortage of water supply is a very common and inescapable problem encountered by almost all livestock owners in the study area, especially during the dry season. The main livestock water-supplies are rivers and wells. The most usual practice during the dry season is to trek animals to the closest river and hand dug wells to water them. Sometimes these rivers are more than 10 km far. The distance to water-supplies normally gets far as the dry season progresses, indicating that some of the wet season sources cease to provide water in the dry season.

In both farming systems, the major coping strategies (68.9%) to alleviate water shortage during the dry season were moving livestock in search of water (Table 5). The basic challenge for farmers is to maintain large number of animals under dry season conditions in order to make use of the extra supplies of both water and forage during the wet season. This is consistent with the findings of other study McCarthy *et al.* (2003), who indicated that pastoralists in south Ethiopia keep large herds consisting of different species to cope with the environmental variability.

Table 5 : Different coping strategies to alleviate water shortage in the two farming systems of Abobo woreda (% of the respondents)

Variables	Mixed farming (n=90)	Shifting cultivation (n=90)	Overall (n=180)
Moving with livestock in search of water	64.4	73.3	68.9
Using well	2.2	4.4	3.3
Reduce livestock number	4.4	0.0	2.2
Livestock mobility & Using well	20.0	18.9	19.4
Others	8.9	3.3	6.1

n=number of respondents, Others=loan (respondents send their animals to other areas where there is available water and feed sources, rear there and share the new born ones with the owners)

c) *Available feed resources in the two farming systems of Abobo woreda*

i. *Communal grazing/browsing land*

About 93% of the respondents reported that there is a declining trend of communal grazing land in the two farming systems while few respondents (6%) indicated neither declining nor increasing trend (Table 6). About 29.4% and 28.9% of the respondents reported that settlement and expansion of farm land as major reasons for declining condition of communal grazing lands, respectively. This is in agreement with Agajie *et al*. (2001) who reported that decline in grazing land has become one of the most important causes of feed shortage and drop in livestock productivity.

Table 6 : Trends on availability of grazing lands and the major reason in the two farming systems of Abobo woreda (% of respondents)

Trends	Mixed farming (n=90)	Shifting cultivation (n=90)	Overall (n=180)
Decreasing	93.3	92.2	92.8
Increasing	1.1	2.2	1.7
No change	5.6	5.6	5.6
Major reasons for decreasing of communal grazing/browsing land			
Rainfall variability	11.1	5.5	8.4
Over grazing and browsing	12.2	6.7	9.4
Expansion of farm land	47.8	10.0	28.9
Settlement	11.1	47.8	29.4
Expansion of farm land and Settlement	17.8	30.0	23.9

n= number of respondents

d) *Traditional grazing land utilization practices*

In both farming systems, based on focus group discussion the most accepted and widely applied traditional methods of grazing land management were communal grazing (47.9%), burning (39.6%) and seasonal mobility (12.5%) (Table 7). This is in agreement with the finding of other study (Oba, 2000), who reported that livestock mobility relieves areas of concentration and allows herds to exploit grazing resources that are unevenly distributed in time and space.

Table 7 : Traditional grazing land utilization in the two farming systems of Abobo woreda (% of respondents)

Management and utilization practices	Mixed farming (n=24)	Shifting cultivation (n=24)	Overall (n=48)
Communal grazing	54.1	41.7	47.9
Grassland burning	29.2	50.0	39.6
Seasonal mobility	16.7	8.3	12.5

n=number of respondents

e) *Natural pasture availability in the dry season*

In the two farming systems the availability of natural pasture during the dry seasons is summarized in Table 8. Seventy five percent of the respondents stated that no enough feed is available during the dry period. Browse species were the main source of feed for 75% of the respondents in the dry season. Moreover, most browse species have an advantage of maintaining their greenness and nutritive value throughout the dry season when grasses dry up and deteriorate both in quality and quantity. This is in agreement with the findings of other studies (Kadzere, 1995; Owen-Smith, 1997; Alonso-Diaz *et al*., 2010), who indicated that browse species are generally richer in protein and minerals. Another study by Salem *et al.* (2006), reported that browse species have the potential to be inexpensive, locally produced protein supplement that plays an important role in the nutrition of grazing animals.

Table 8 : Natural pasture availability during dry season and importance of browse species in the two farming systems of Abobo woreda (% of respondents)

Feed availability during the dry season	Mixed farming (n=90)	Shifting cultivation (n=90)	Overall (n=180)
Sufficient	41.1	8.9	25.0
Insufficient	58.9	91.1	75.0
Importance of browse species as feed			
During dry season	83.3	66.7	75.0
During wet season	11.1	6.7	8.9
During both in the dry and wet seasons	5.6	26.7	16.1

n= number of respondents

f) Most commonly available and palatable browse and grass forage species

Although there is difference in utilization of livestock feed resources across months of the year, communal grazing /browsing lands are utilized throughout the year. This is in agreement with the findings of other studies (Tsedeke, 2007; Tesfaye, 2008), that indicated browse forage to being the main feed resource for small ruminants and cattle in Ethiopia. The availability and nutrient quality of forages are not uniform all year round, as a result, for animals that are not supplemented; the body gains made during the wet season is remarkably lost in the dry season (Alemayehu, 2003). The utilization of indigenous browses species offer an opportunity for use as potential feed supplements by smallholder farmers in the tropics due to their high CP content and degradability so that they can keep animals in better body condition (Solomon *et al*., 2003).

According to Babayemi (2007) multipurpose trees and shrubs are feed resources that contribute to the nutrition of livestock in the tropics all year round. Their immense contribution is mostly felt during the lean period of the year where most available grasses are lignified. During the months from November to April indigenous browses are the main sources of feed in the study area, especially for goats, while hay and other supplementary feeds are almost not available completely. The utilization of indigenous browses by goats is also reported in Alaba district of southern Ethiopia (Yeshitila, 2007). According to the respondents in the two farming systems, most commonly available and palatable browse species were *F. virosa, L. fraxinifolius, S. kunthianum, V. amygdalina and A. seyal and the* grass species were *A. gayanus*, *O. abyssinica*, *C. dactylon*, and *H. rufa* (Table 9).

Table 9 : Most commonly available and palatable browse and grass forage species as livestock feed at Abobo woreda (% of respondents)

Browse species		Mixed farming (n=90)	Shifting cultivation (n=90)	Overall (n=180)
Local name	Scientific name			
Akano	*Flueggea virosa*	0.0	72.2	36.1
Sega	*Lecaniodiscus fraxinifolius*	33.3	0.0	16.7
Tishota	*Stereospermum kunthianum*	42.2	4.4	23.3
Girawa	*Vernonia amygdalina*	10.0	16.7	13.3
Odora (Girar)	*Acacia seyal*	14.4	6.7	10.5
Grass species				
Ageda	*Oxythanthera abyssinica*	21.1	36.7	28.9
Kolshoba	*Andropogon gayanus*	43.3	16.7	30.0
Serdo	*Cynodon dactylon*	18.9	23.3	21.1
Sembelet	*Hyparrhenia rufa*	5.6	11.1	8.3
Kilo	*Sorghum arundinaceum*	11.1	12.2	11.7

n= number of respondents

g) Crop residue utilization

In both farming systems, the largest proportion of crop residues was used for livestock feeding than for any other uses because of the critical shortage of livestock feed during the dry season. This type of benefit obtained from crop residues results in sustainable interaction between crop and livestock production systems. Crop residues are also used for construction and as fuel wood. Tesfaye (2007) reported that crop-residues are the main source of livestock feeds during the dry season next to natural pasture. Similar observations were reported earlier (Reed and Goe, 1989; Solomon, 2004).

h) Preference of crop residues as livestock feeds

Based on focus group discussion, in shifting cultivation maize stover was the most important livestock feed followed by sorghum stover and rice straw (Table 10). This is mainly due to high production of the farming system that provides stovers and straws for livestock. This is in agreement with the work of Jonah (2004), who reported that among crop residues, straws and stovers are the major feed resources in other developing world. Palatability, leafiness, pliability and stage of maturity of crop residues were the major criterions to select crop residues as livestock feed by

the respondents. In mixed farming system maize stover, sorghum stover, rice straw and finger millet were ranked in decreasing order of importance (Table 10). Farmers prefer maize and sorghum stovers to rice straw, finger millet straw and other stovers and straws due to high yield, quality and livestock preference in the studied area.

Table 10 : Preference index value of major crop residues as livestock feed in the two farming systems of Abobo woreda

Variables	Rank				
	1st	2nd	3rd	4th	Index
Shifting cultivation (n=24)					
Maize stover	*14*	7	2	*1*	0.39
Sorghum stover	10	9	3	2	0.35
Rice straw	5	4	8	7	0.26
Mixed farming (n=24)					
Maize stover	16	4	3	*1*	0.27
Sorghum stover	12	10	1	1	0.26
Rice straw	9	8	5	2	0.23
Finger millet straw	8	10	3	3	0.23

*n= number of respondents, Index: sum of single crop residue preference ranked (4*first ranked crop residue preference) + (3*second ranked crop residue preference) + (2*third ranked crop residue preference) + (1*forth ranked crop residue preference)/Sum of all weighted crop residue preference mentioned by the respondents*

i) Storage of crop residues

Storage of crop residues is important to utilize the available residue efficiently during the time of feed shortage. However, not all farmers store the residue and thus increased feed shortage. In both farming systems the storage practice of crop residues is under taken either stacked in the open air near the homestead or under the shade. It was found that the majority of the sampled households (86.7% and 54.4% in the mixed farming and shifting cultivation, respectively) stored maize and sorghum stovers while the rest did not as storage needs transportation of the residues from the field to the storage sites (Table 11). This is consistent with the findings of previous study (Tesfaye and Musimba, 1999). The criteria for crop residue preference as livestock feed were palatability (30%), palatability and leafiness (40%) and palatability, leafiness and stage of harvesting (20%) in both farming systems.

Table 11 : Crop residue storage practices and farmers major selection when used as feed for livestock in the two farming systems of Abobo woreda (% of respondents)

Variables	Mixed farming (n=90)	Shifting cultivation (n=90)	Overall (n=180)
Storage means of crop residue			
Stacked under the shade	6.7	0.0	3.3
Stacked in open air	80.0	54.4	67.2
Did not stack	13.3	45.6	29.4
Criteria for crop residue preference			
Palatability	44.4	15.6	30.0
Leafiness	1.1	0.0	0.6
Stage of harvesting	13.3	5.6	9.4
Palatability and leafiness	28.9	51.1	40.0
Palatability, leafiness and Stage of harvesting	12.2	27.8	20.0

n= number of respondent

j) Improved forage cultivation

About 95% of farmers did not grow improved forages while the rest (5%) planted few forage species such as *Sesbania sesban* and *Moringa olifera* for feeding of livestock in both farming systems (Table 12). Lack of awareness and unavailability of forage seed were the major reasons hindering improved forage utilization in the two farming systems. Similarly, Abate *et al*. (1993) indicated that no special effort is made to grow feed for farm animals in subsistence-oriented smallholder production system in the Ethiopian highlands. Thus, all ruminants depend on two major feed resources, namely natural pasture and crop residues.

Table 12 : Status of improved forage cultivation and major limiting conditions in the two farming systems of Abobo woreda (% of respondents)

Variables	Mixed farming (n=90)	Shifting cultivation (n=90)	Overall (n=180)
Improved forage crop cultivation			
Have some experience of forage production	5.6	4.4	5.0
No any experience	94.4	95.6	95.0
Reasons for lack of forage production			
Lack of awareness	31.8	62.8	47.4
Unavailability of seed	68.2	37.2	52.6

n= number of respondent

k) Major forage species available during dry and wet season in the study area

Natural pastures are composed of grasses (Poaceae), legumes (Fabaceae), sedges (Cyperaceae), and other heterogenous plants in various families, which could be herbaceous or woody forms (McIllroy, 1972).

About 38 specimens of forage species were identified in the study area which is used as livestock feed. Those species were identified based on primary information from livestock owner of the key informants (Table 13).

Table 13 : Forage species identified in Abobo woreda

Forages species available during dry and wet seasons			
Sr. No.	Family	Scientific name	Local name
1	FABACEAE	*Acacia seyal*	Odora (Kembatigna), Girar (Amharic)
2	FABACEAE	*Acacia sp*	Odora (Kembatigna), Girar (Amharic)
3	FABACEAE	*Acacia sp*	Alawa (Agnuakigna)
4	POACEAE	*Andropogon gayanus*	Kolshoba (Kembatigna)
5	EUPHORBIACEAE	*Baphia abyssinica*	Adidagoyi (Agnuakigna)
6	CAPPARIDACEAE	*Caparies erythrocarpos*	Ognunno (Agnuakigna)
7	CARICACEAE	*Carica papaya*	Papaya (Amharic), Olilu (Agnuakigna)
8	POACEAE	*Cynodon dactylon*	Serdo (Amharic), Korto (Kembatigna)
9	POACEAE	*Dectyloctenium aegypticum*	Adititi (Agnuakigna)
10	EUPHORBIACEAE	*Flueggea virosa*	Akano (Agnuakigna)
11	POACEAE	*Hyparrhenia rufa*	Tile (Agnuakigna),Sembelete (Amharic)
12	ANACARDIACEAE	*Lannea fruticosa*	Dote (Agnuakigna)
13	SAPINDACEAE	*Lecaniodiscus fraxinifolius*	Sega (Kembatigna)
14	ANACARDIACEAE	*Magnifera indica*	Mango (Amharic)
15	MORINGACEAE	*Moringa oleifera*	Shiferaw (Amharic)
16	POACEAE	*Oxythanthera abyssinica*	Ageda (Agnuakigna)
17	POACEAE	*Panicum maximum*	Shanko (Kembatigna)
18	POACEAE	*Panicum porphyrrhizos*	Nechi sar (Amharic)
19	EUPHORBIACEAE	*Ricinus communis*	Gulo (Amharic)
20	POACEAE	*Sorghum arundinaceum*	Kilo (Kembatigna), Abaro (Agnuakigna)
21	BIGONIACEACE	*Stereospermum kunthianum*	Tishota (Kembatigna)
22	FABACEAE	*Tamarindus indica*	Roka (Amharic)
23	ASTERACEAE	*Vernonia amygdalina*	Eba (Kembatigna) ,Girawa (Amharic)
24	RHAMNACEAE	*Ziziphus mauritiana*	Kurkura (Oromiffa)
Forages available during wet season only			
1	POACEAE	*Andropogon chinensis*	Acili (Agnuakigna)
2	COMMELINACEAE	*Commelina benghalensis*	Wofeankure (Amharic)
3	CYPERACEAE	*Cyperus seculantus*	Engicha (Amharic)
4	RHAMNACEAE	*Helinus myslacinus*	Melessa (Kembatigna)
5	ACANTHACEAE	*Justicia landinoides*	Telenji (Amharic)
6	POACEAE	*Leptochloa fusca*	Juech (Agnuakigna)
7	POACEAE	*Pennisetum macrourum*	Pado (Agnuakigna)
8	POACEAE	*Pennisetum nubicum*	Muja (Amharic), (Oromiffa)

9	ASCLEPIADACEAE	*Pergularia daemia*	Yeayeti hareg (Amharic)
10	POLYGONACEAE	*Rumex abyssinicus*	Tuda (Kembatigna)
11	POACEAE	*Sporobolus pramidalis*	Gichole (Kembatigna)
12	POACEAE	*Sporobolus helvolus*	Usupa (Kembatigna)
13	POACEAE	*Tetrapogon cenchriformis*	NA
14	ASTERACEAE	*Vernonia sp*	Mulukiya (Kembatigna)

NA= Not available (Vernacular name)

IV. Conclusion and Recommendations

The availability of grazing land is decreasing from year to year due to expansion of farm land and settlement and most households depend on communal grazing land in the area. It is known that grazing land which is communally owned is poor in quality due to its effect on the re-growth of the grasses. This leads to the insufficiency of feed available from such sources. In addition to grazing, utilization of crop residues mainly maize and sorghum is common in the area. However, if not treated such feed sources even do not fulfill the maintenance requirement of ruminants. If animals are dependent on grazing and crop residue there is a need to supplement with browse legume available in the area. Further study is suggested as recommendations to some improvement measures such as more efficient utilization of the available feed resources such as crop residue treatment should be in place in the future and efforts need to be done to supply more watering points for livestock watering to reduce the distance traveled from both farming systems.

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