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Distribution Rate and Economic Importance of Forage Trees in Three Woreda (Abay Choman, Jimma Geneti and Jimma Rare) of Horro Guduru Wollega Zone, Ethiopia

Firisa Woyessa
Departement of Animal Science, College of Agriculture, Wollega University, P. O. Box 395, Nekemte, Ethiopia

Abstract
The study was carried out in three woreda (Abay Choman, Jimma Geneti and Jimma Rare) of Horro Guduru Wollega Zone of the Oromiya National Regional State. With the objectives of assessing the role of forage trees in nutritional requirement of livestock and economic importance of Forage trees in land holding capacity. The condition rating used for the herbaceous vegetation assessment was based on the herbaceous layer (grasses, legumes and other herbaceous species). The data collected from three woredas was summarized and analyzed using the Statistical Package for the Social Sciences (SPSS, 1996). Very few peoples have given attention to livestock fattening, dairy or others specifically rather 88.6% of the respondents said the populations of livestock were decreasing due to Reduction in grazing land, Animal disease and Feed shortage with 49.6%, 19.5% and 12.2% respectively. Natural factors (92.7%) contributed significantly for progressive reduction of livestock productivity. The introduction and integration of ruminant livestock feed in the study area were natural pasture (45.5%), Natural pasture and Crop residues (28.5%). From this point of view the 95.9% of the respondents of the study area were facing difficult of feeding animal during summer" Ganna" and autumn" Bona" with 26.8% and (73.2%) when quality and quantity of feed is low. Respondents (71.5%) were not using improved forage due to Lack of seed, Lack of money, Lack of land and Lack of concern (14.6%) and lack of seed (11.4%). Forage availed in the study area were 36.6%, 35.0%, which distributed well in moderate and high altitude in the study area. Woody trees are primarily used for fuel and occupy (20.3%) of energy need.
Keywords: feed, forage, land, animal

INTRODUCTION

Among several factors, feed shortage both in terms of quantity and quality is a major problem hindering the development of livestock industry in Ethiopia. The most known feed sources are forage. Temporal distribution of forage production sets boundaries on the opportunities for directly or indirectly utilizing rangeland resources. A wide range of tree, shrubs and herb legumes have potential to forage development and conservation programs.
There are many species of multipurpose forage tree legumes in use throughout the tropical and subtropical regions of the world. (Brewbaker, 1986) listed about 80 species which are known to serve as animal fodder. One approach to developing new material is to encourage intensive activity with well known species as their genetic reservoirs of diversity have hardly been tapped. Another approach is to identify promising new species from other genera to increase the number of species in common use and broaden the genetic base (Brewbaker, 1986).

Environmental beautification is gaining attention in rural and urban centers of Nigeria, resulting to persistent planting of ornamental and herbal trees around the residential quarters as edge-rows. In order to prevent such trees and shrubs from growing wild, some branches are often selectively pruned down by the gardeners. Such pruned brush-woods are left under the tree or are allowed to dry and later set ablaze, thereby littering the compound and polluting the entire environment. The rising trend in tree planting can be mutual and beneficial to both small ruminants and the environment at large. Leaf of the trees can be used to feed goats and sheep as protein supplements all year round while the wastes accruing from the animals can as well be used as organic manure for the trees. Tropical trees are highly nutritive and rich sources of protein and minerals (Teferedegne, 2000; Babayemi *et.al*., 2004).

Legumes have been used in agriculture since ancient times. Legume seeds or pulses were among the first sources of human food and their domestication and cultivation in many areas occurred at the same time as that of the major cereals. Nutritionally they are 2-3 times richer in protein than cereal grains and many also contain oil. Leguminous mulches have always been used as a source of nutrient-rich organic matter and nitrogen for crops. In more recent times, legumes have become important as high quality forages for livestock both in cultivated pastures and in naturally occurring associations. Of all plants used by man, only the grasses are more important than the legumes but it is the legumes that show the most promise for future exploitation and development. The legumes are the third largest group of flowering plants comprising over 18,000 species in 650 genera which are well distributed in most environments throughout the world.

Tree-fodder is important feed resource in semi-arid regions to feed sheep round the year (Kumawat and Chaudhary 2004). Although protein content of some of the tree leaves is higher than grasses, their degradation is not complete due to binding with cell wall polysaccharides particularly with maturity (Karabulut *et. al.,* 2006).

The use of tree legumes in tropical farming systems dates back to the beginning of domestic agriculture. They were traditionally used for a variety of purposes, including food, fuel wood, construction and shade. In some areas, however, particularly in the arid and semi-arid zones of the world such as the Sahel and North Africa, tree legumes have always been primarily used for forage. In these dry regions, tree legumes principally *Acacia* spp. continue to provide a part of total herbage intake and most of the protein intake for livestock, especially during dry periods (Baumer, 1992). The introduction of tree and shrub legumes in agroforestry and livestock feeding systems offers promise for meeting the increasing demand for feed resources worldwide.

Forage trees are among the tree shrub which leaves are consumed by ruminants. This research focused on availability of indigenous multipurpose browse trees such can serve as an alternative protein supplement. Therefore, the objectives of this research was to assess the role of forage trees in supplementing nutritional requirement of livestock and to assess the economic importance of Forage trees in land holding capacity

2. MATERIALS AND METHODOLOGY

2.1. Description of the Study Area

The study was carried out in three woreda (Abay Choman, Jimma Geneti and Jimma Rare) of Horro Guduru Wollega Zone of the Oromiya National Regional State, located in the western part of Ethiopia.

2.2. Site selection

Before the actual field study, reconnaissance surveys was taken throughout the study Zone in order to have a general overview of the nature and distribution of the grazing lands and availability of herbaceous trees.
Based on agro-climatic zones classification, the study was in three districts of zone which can be divided into two broad climatic zones (high and mid altitude). 40 respondents were used from each district with a total of 120.

2.3. Sampling procedure and data collection

The condition rating used for the herbaceous vegetation assessment was based on the herbaceous layer (grasses, legumes and other herbaceous species). For identification purpose, representative plants vegetative parts from each species was collected, pressed and labeled for chemical analysis. In herbaceous trees condition assessment study, each composite sample of sample site was considered as an experimental unit for data analysis regarding herbaceous vegetation. Before the data was subjected to analysis of variance (ANOVA), the experimental unit (composite sample) was sorted by altitude.

2.4. Data Analysis and Interpretation

The data collected from different altitude was summarized and analyzed using the Statistical Package for the Social Sciences (SPSS, 1996). Statistical significance of the difference between means of altitude was tested using the Least Significant Difference (LSD). Descriptive statistics such as means, percentages, range and standard deviations was also used to show difference in topography of study area.

3. RESULT AND DISCUSSION

This section provides an overview of the socio-economic circumstances of forage producers in different three woreda of Horro guduru zone based on survey questionnaire. The questionnaire approach was contained many open-ended questions that allowed the respondents to express their opinions on issues. In this study the results are presented and discussed more specifically and entirely to the situation of sample households.

3.1. Socio-Economic Characteristics of the Households Surveyed

Almost all (93.9%) of the respondents in the study area were male, where as the remaining 6.1% female (4.9% divorced, 1.2% widows). However there is female contribution in forage production, but the female were those divorced and widows those have responsibility of family. The family sizes of the respondents were categorized in to three 1-5, 6-10 and 10-14 with 18.7%, 51.3%, and 26.8% in number of family respectively. The average mean and standard deviation of family size in the study area was 7.75$\pm$2.57 respectively.

The respondents in the study were categorized into 8 with the 6 interval of age group. Among this 62.0% of the family members in the study areas lie between 30 to 49 age categories that are thought to be productive in agricultural activities. The mean age of the respondents were 44.89 years with standard deviation of 12.07. The minimum and the maximum age of interviewed respondents were 23 and 73 years respectively. This survey result showed that people in the productive age are actively engaged in beekeeping activities.

Table 1. Age group of the respondent in study area

S/N	Age group	Frequency	Percent
1	23-29	5	4.0
2	30-36	32	26.0
3	37-42	26	21.3
4	43-49	18	14.7
5	50-56	15	12.1
6	57-62	10	7.2
7	63-69	9	7.2
8	70-76	5	4.0

In general the age, sex, marital status and family size of the respondents were listed below.

3.2. Land resources

To kwon the profile of the land in the study area, it is must to ask since when the respondents were living there in the study area. Concerning this most of the respondents was stayed there through their life and knows more about the area in detail. From this point of view, around 30.7% of the respondents were living there in the area starting from 1950, 37% of them from 1970 and 26.7 from 980. This variation was due to age group of the respondents, unless they know more about the area by asking their family and ancestors. Accordingly the respondents know profile of the land as, it was used for agricultural activities like ploughing, crop cultivation since early time.

3.2.1. Livestock

Raring of livestock also takes place to increase productivity of the land concerning crop production. Rather very few peoples were give attention to live sock for fattening, dairy or others specifically. However the populations of livestock in the study area were decreasing from time to time. From this point 88.6% of the respondents said the populations of livestock were decreasing due to Reduction in grazing land, Animal disease and Feed shortage with 49.6%, 19.5% and 12.2% respectively.

Livestock were kept for several purposes according to the respondent in the study area 27.6% of the respondents were keeping cattle for Milk, manure, income, meat and Draft. They said that this products expected from animals have great role in feeding directly or indirectly, i.e., crop cultivation need manure as fertilizer, milk and meat are protein rich feed and live animal can be sold for income purpose. The others justified as because of shortage of feed or grazing land they can't keep large population of livestock, therefore keeping Draft (17.1%) ideal for crop cultivation and some respondents generally keep livestock including small ruminant for different incomes (13.9%).

The respondents' belief as rearing livestock is industry but several factors hider the activities, (33.3%) of the respondent were due to Shortage of grazing land which diminished due to crop cultivation, the others 36.0% of the respondent's beliam in addition to shortage of grazing land, Disease problem and unable to select the animal for breeding is the limiting factor.

Since the ancient time as they herd and know about the area, productivity of the land was decreasing from time to time. The causes of decreasing productivity of land were improper land use like over grazing (72.4%). These are over grazing because of shortage of grazing land they use communal grazing land that is seriously affected by erosion due to over stocking, while cultivating crops unable to use fertilizer or use in small amount which is not recommended rate is the major causes of low productivity of the land in the study area.

According to the respondents of study area natural factors (92.7%) contributed significantly for progressive reduction of the productivity of land. Among this factors land slid, wetness of land and termite infestation are predominant. But their rate of effect is varying land sliding and wetness of the land is the leading factors with (27.6%) each and termite infestation is the second with (14.6%) according to the respondents.

The cause for this natural factor was manmade factor which contribute more (87.8%) for progressive degradation of the land. But the degraded land will again rehabilitate by community of the area through participatory (69.9%) and by do it and by participatory (18.47%). This rehabilitation activity has advantages to the community in wood product, Grass for animals feed, Host of wild animals with different percentage. Most of the respondents (35.8%) said wood product, Grass for animals feed and Host of wild animals are advantage expected from the rehabilitated land. Around 20.3% of the respondent expect Grass for animals feed from rehabilitated area. The others 14.6 and 13% are expecting wood product, Grass for animal's feed and wood product respectively.

According to the respondent changes were observed in their environment after the rehabilitation activity done by the community. These are Water availability, Erosion, Crop production and Animal feed those listed change in the area. Their idea were analyzed as Water availability, Erosion, Crop production and Animal feed were 39.0%, erosion control and water availability were 12.2% each were the rate of change observed after

rehabilitation in the study area according to the respondents. Concerning using the resources after rehabilitation by memorizing the past history of the area society of the area used to rehabilitate resources wisely by using and replacing it.

3.3. Feed Resources in Annual Cropping Systems

Livestock production must be based on the utilization of existing crop residues, forages from non-cropped areas of the farm, re-growth of crops and weeds following crop harvest, and the supplementation of these feed resources by special-purpose forages where necessary (Devendra C.,1986).

The introduction and integration of ruminant livestock feed in Jimma Ganati 27.5% of the respondents use natural pasture with 65% of crop residues as animal feed. Whereas in Jimma Rare 17.5% of use natural pasture with 35% of crop residues. But 95% of Abay Choman woreda were used natural pasture as animal feed. Generally in the study area natural pasture (45.5%), Natural pasture and Crop residues (28.5%), Crop residues (11.4%). Therefore, natural pasture requires a major change in emphasis in livestock farming. It is difficult to quantify yields and nutritive value of these possible feed resources as they vary with variety, growth stage, soil and environmental conditions, and agronomic practices. The values subsequently quoted can only provide a guide to the quantity of forage that may be available and some indication of their feeding value and need for supplementation with other feed resources to provide a well-balanced diet (Devendra C., 1986). From this point of view 95.9% of the respondents in the study area were facing difficult of feeding animal. To full fill the need of animal in addition to natural pasture peoples use crop residues and forage predominantly.

Teff straw was sown on a greater area than all other crops collectively, with noug, maize, and wheat being the second most important group of crops, although bees and peas were grown slightly with the great variation in the study area. Yields of all crops vary greatly between and within woredas, with the result that yields of crop residues available for ruminant feeding will also be highly variable.

In this study a given quantitative and qualitative values of the important natural pasture and annual crop residues available for animal feeding were limited in two seasons " Ganna" and " Bona". Most of the respondents (73.2%) were facing shortage of feed at "bona" due to drying periods. The remaining of the respondents 26.8% was facing feed shortage at "Ganna" due to crop encroachment of farm land and the communal grazing area occupied by swampy water.

Therefore the quantity and quality of feed availability in the study area were Declined or deteriorated from time to time according to the respondent (84.6%) and around 8.9% said now is better in feed quality due to the advice from development agent to use improved forage and saving crop residues. This amount and quality of animal feed were in worth from time to time in the study area due to Declined or deteriorated grazing land with 67.5, 92.5 and 98% at Jimma Genati, Jimma Rare and Abay Choman respectively which are highly significant among the woredas. ($P>0.001$).

To solve the limitation mentioned above 56.9% of the respondent need supplementary feed were as 39.8% not need supplementation in the study area. Anyhow Most of the respondents (87.18%) were in Jimma Ganeti and lower in Abay Choman with 35% were used supplement. The reason of low supplementation in Abay Choman was due to unavailability of supplementary feed around and even if its avail (40%) of society cannot afford with the cost

Those said no need supplementation were not due to sufficient feed but due to unavailable feed for supplementation and even availed unable to afford the price to use as animal feed. This is due to low income expectation from live animal or animal product. This indicate activity takes place concerning livestock in the study area were traditional. The general measure for feed shortage at both season were Feed conservation (kalo), ranting pasture and animal movement (daraba) with 34.1%, 25.2% and 13.0 % respectively which vary among the woredas. Use feed conserving (kalo) and animal movement (daraba) were in Jimma Rare and Abay Choman with 40% and 37.5 % respectively.

3.3.1. Forage Production

In recent years, there has been a growing awareness of the general multipurpose value of tree legumes and their specific multipurpose value in cropping-livestock systems. In the forage production there was major limiting factor. But the available forage herbaceous trees are difficult to consume directly by the animal because of its length and need cutting manually. So using improved forage to easily access by animal they were recommended. However respondents (71.5%) were not using improved forage due to Lack of seed, Lack of money, Lack of land and Lack of concern (14.6%) and lack of seed (11.4%). Improved forage was dominant in Jimma Rare and Abay choman with 30% and 42.5% respectively compared to Jimma Ganeti 7.5%. The reason in Jimma Ganati was lack of seed, Lack of money, Lack of land and Lack of concern with 10%.

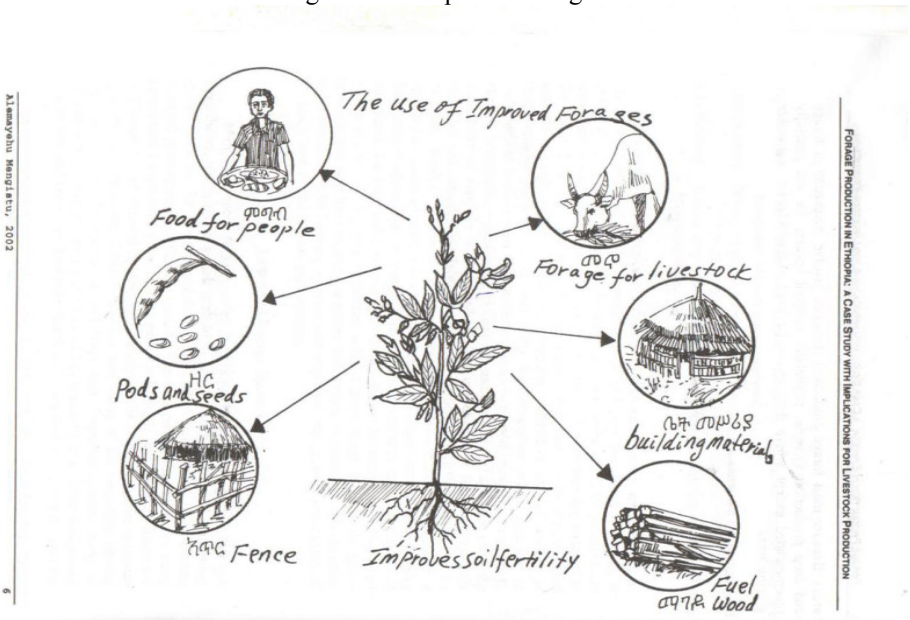
In addition to animal feed forage have several roles in agricultural activities like, Land holding capacity and Animal feed with (55.3%) and (22.8%) respectively according to the respondents idea. However improved forage distribution was low in Jimma Ganeti, but the respondent's belief as forage used in animal feed 55%. In addition to this it plays important role in land holding capacity with 32.5%. Unlike in Jimma Ganeti 80% Abay

chomman used forage as animal feed.

The leaves of tree legumes can be used as a high-quality supplement to crop residues for small ruminants. Many feeding experiments have shown higher live weight gains by sheep and goats from the inclusion of a proportion (up to 20-25%) of tree legume leaves with crop residues or grasses (Armiadi Semali and Mathius 1984).

Major limitation of forage feed were shade effect on cereal crop production. So good site for forage development on the bounder of the cereal crop, it affects negatively cereals 56.9% of the respondents. This is due to majority of herbaceous trees are woody tree. Herbaceous trees can be woody tree, clamping tree, forage with 58.5%, and 10.6% and 9.8 % respectively with different rate of availability. However woody tree and forage are same what found in different agro ecology. Among forage used as animal feed 56.9% were found in low rate and 29.3% not as much availed everywhere. So conservation is mandatory to maintain the availed one and to continuous their existence for futures.

Fig.1 use of improved forage



Source: Alemayehu Mengistu, 2002

Rate of availability was affected by altitude and environmental temperatures. There is forage adapted to different altitude like High altitude, low altitude, moderately. According to the respondents idea among those forage availed in the study area 36.6%, 35.0%, were distributed well in moderate and high altitude in the study area. Almost all (97.6%) of the respondents use leaf part of the forage as animal feed. This due to leaf part is easily consumed and digestible by ruminants. The way of offering to the animal is vary from place to place in the study area. However by cutting the branches of the tree animal can consume directly. There are also those add to forage mineral as palatability increment to increase rate of feed intake. Through cut and carry system and direct by animal with 87.0 and 10.6% respectively.

Woody trees are not primarily used for animal feed but for fuel. The electric source for the country side of the study area were covered by dry woody tree (20.3%), Fuel Wood and Cow Dung cover 53.7% and Fuel Wood and Petroleum 13.8%. this indicate the role of woody tree in electric sources in addition to forage for animal. The sources for woody tree whether for animal feed or electric source were 54.5 in the forest and 43.1 on the farm land. Thus we can imagine that how much the farmers now understand the use of forage tree in the local circumstance. The woody tree used at live time as well after dry, i.e., 32.5% of dry woody tree and 65.0% of dry and fresh tree can be used for electric sources.

3.3.2. Natural resources

In general point forage tree/ tree legumes have great contribution in the natural resources in solving household income problem. In the study area it is used for Charcoal /Firewood, Water conservation most probable around the area affected by erosion and as pasture for farm animal. From this 54.5% of the respondents were used as pasture animal feed and 18.7% of the respondents were used as animal feed those fresh one and as charcoal those dried. These serve during critical period of feed shortage 92.7% of the respondents. But the time of critical feed shortage vary according to the respondents 64.2% of them face critical feed shortage during winter season and around 33.3% during wet season.

To resist the feed shortage during this season 86.2% of the respondents give supplement to their animals. The supplementation were vary from area to area because of cost of supplementation were high and all

respondents or community may not afford to use. So peoples of the area separate their animals according to their use in the farm herd. Most 68.3% of the respondents give priority to lactating cows following calves 10.6%. This is depending on the season and condition of the animal, i.e., if the cow was on early lactation stage priority given to them or if oxen on the season of ploughing the land.

Conservation of feed for the season of feed shortage is practiced in the study area. 95.9% of the respondents were practice this conservation according the feed availability. Majority (62.6%) of the respondents conserve crop residues i.e, because after crop harvest residues are aftermath so it is less value in the community (animal feed, house construction, selling in small amount especially teff straw) and the others conserve hay and teff straw with 15.4% according to its availability.

3.4. Indigenous grazing land management

Majority (92.7%) of the respondents were practice traditional grazing land management. This indicates that capacity building is required for the community how to use modern way of feeding and conservation methods. Among the traditional methods most known practice were, Enclosing of grazing area (*Kaloo*), Feed conservation (Hay and others) and Migration to nearby areas (daraba) which occupy 17.1% of the respondents followed by Enclosing of grazing area (*Kaloo)* and Rotational grazing which consist 11.4% according to their availability.

In this traditional grazing management the only things applied were those mentioned above unlike other manure application. In this study are manure application were majorly (78.0%) done for Crop land fertilization followed by 8.1% done for Grassland fertilization and Crop land. These practices done starting from the previous time and still practiced know a day. From this point we can summarize that how much the activities were traditional.

Grass has several advantages in addition to feed for animals, like wise thatching and sale for income. About 39.0% of the respondent's sale and use as income generator, and 17.9% of the respondents use as thatching and for sale income. This is due to reduction of communal grazing land size because of expansion of agricultural land to sustain increasing human Population. So cereal encroachment done for feeding to human need satisfactory. This can be shown in percent as increasing human population, increasing human population and due to cereal encroachment with 52.0%, 27.6% and 6.5% respectively. Among those listed factors one is cause for the other and vise versa.

This limitation leads to ranking animal according to their use as the respondents said. 92.7% of the respondents ranking animal accordingly. Priority of ranking given to Weak animal and Lactating cows with 16.3%, followed by Oxen, Lactating cows and weak animal with 14.6% and Calves, weak animals and Lactating cows with 13.0%.

To improve feed availability the indigenous measurable indicator for assessing grazing land condition based on Plant growth, Current grazing pressure, Accessibility to water, Availability of forage, Topography suitability and Soil condition. From this point Plant growth, Topography suitability was the dominant factors with 17.1%, 13.8%, 7.3% respectively. The availability and quality of grazing grass where evaluated with the rate excellent, good and poor grazing condition. The good quality grass can have different palatable grass species, free from bush encroachment, Grazing land near to settlement, Availability of water near to pasture and Good soil condition. Based on this criteria Presence of different palatable grass species dominantly focused by the respondents followed by Presence of different palatable grass species, Free from bush encroachment and Availability of water near to pasture with the 20.3% and 12.25 respectively in the study area. This type of grass can be crop type, grass and tree forages. This can be indicate majorly (83.7%) in the area.

4. CONCLUSION

In this study the respondents know profile of the land since early time, it was used for agricultural activities like ploughing, crop cultivation. No scientific attention given to livestock for fattening, dairy or others specifically. Rather cattle's kept for crop cultivation. Because of population increment for the expansion of cultivation land for crop little attention given to animals. Majority (92.7%) of the respondents were practice traditional grazing land management so capacity building is required for the community, how to use modern way of feeding and conservation methods.

Even if forage have several roles in agricultural activities like animal feed, Land holding capacity and Animal feed with (55.3%) and (22.8%) respectively the respondents face Lack of seed, Lack of money, Lack of land and Lack of concern (14.6%) and lack of seed (11.4%) to have improved forage. Rate of availability was affected by altitude and environmental temperatures. Forage availed in the study area 36.6%, 35.0%, were distributed well in moderate and high altitude in the study area. Woody trees are not primarily used for animal feed but for fuel and occupy (20.3%) of energy need. In general point forage tree/ tree legumes have great contribution in the natural resources in solving household income problem.

Supplementations for animals were during feed scarcity by ranking their animal according to their use in the farm herd. This is depending on the season and condition of the animal, i.e., if the cow was on early

lactation stage priority given to them or if oxen on the season of ploughing the land. Conservation of feed for the season of feed shortage is practiced in the study area. Majority (62.6%) of the respondents conserve crop residues for several purpose, animal feed, house construction, selling in small amount especially teff straw and the others conserve hay.

To improve feed availability the indigenous measurable indicator for assessing grazing land condition based on Plant growth, Current grazing pressure, Accessibility to water, Availability of forage, Topography suitability and Soil condition were assessed. The availability and quality of grazing grass where evaluated with the rate excellent, good and poor grazing condition. The good quality grass can have different palatable grass species, free from bush encroachment, Grazing land near to settlement, Availability of water near to pasture and Good soil condition.

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