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## Grazing patterns affecting browse availability and sustainable management

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### Abstract

Ecological biodiversity in Sudan needs a lot of focused work and research to enrich knowledge. Knowledge is of a vital importance for a better use of the vegetation cover to reach sustainable management systems. Browse systems in arid zones seek scientific management since it is strongly bound to activities practiced by people. This study was carried out in an arid area to serve as an example for other similar places. The objectives meant to be studied include the assessment of, first, the browse availability of the most dominant trees, second, to study the ground vegetation cover in terms of density, frequency, forage biomass cover and biodiversity and third, to study the socioeconomic aspects related to browse utilization.

Three sites were chosen randomly for the study. Samples of 250m x 250m were selected. Tree species in each sample were identified and tree density was determined by a direct count of the number of trees found. A major finding was the preference of *Acacia* trees as fodder trees. They provide both fodder for animals and used as a legume tree for soil fertility increase and soil conservation. Trees as legume plants also add nutrients which contribute to soil improvement. The tree density was found reasonable throughout the area whereas the natural regeneration found to be diminishing. *Acacia tortilis* was the most favorable fodder tree. Water source was the main factor that determines the utilization of browse resources during summertime. Tree density was decreasing due to over grazing, non-tree reseeding together with the drastic climate changes. The study recommended that conservation of plant cover is importantly needed through management and well-planned programs to keep the density of vegetation cover to be within the ecological sustainable balance. A well-designed extension messages were needed to serve maintaining the desired management. Soil conservation programs should be planned in close relation with income generating activities practiced by the poor people in the area. Different bodies that involved in the browse utilization must participate in the management process.

**Keywords:** browse, tree density, vegetation cover, sustainability, conservation

### Introduction

Sudan as a country of many different climatic zones needs lots of research work to enrich knowledge about its ecological biodiversity. The different zones known in Sudan are desert, semi-desert, low rain fall wood land savannah on clay soils, low rain fall wood land savannah on sandy soils, mountain region and the Red Sea climate on the eastern parts of the country. Natural resources namely the vegetation cover, all over the above-mentioned climatic zones in Sudan, excluding the protected areas, weren't run under sustainable management work plans, mainly forests, which cover 25% of the total area of the country. The other parts of forest reserve resources though protected by law they are subjected to heavy utilization pressure. Heavy continuous utilization of the natural resources results in and led to a remarkable deforestation and land degradation. Natural unreserved forests occupy a large land in Sudan, where they often take the form of state-owned unreserved forests or forest land managed on fewer basis than the registered forests according to the land acts. Arid and semiarid zones are the areas tolerate a heavy burden of community activities. Trees on arid places were known to play a remarkable role in reducing the negative effect of climate and soil aridity (Anderson, *et al.*, 2001) [2].

The rural communities benefit most directly from forests, since forests provide fuel wood needs and other products for sustainable use (Abdalla, 2008) [1]. Forests and range lands throughout the world provide a variety of important natural products. Most importantly the natural products are fodder, shade and minor forests products to local communities. Activities that are extremely vital for rural life are the provision of stable suitable ecosystem for agricultural and livestock rearing. Robson, 1989, stated that natural forests in Sudan need

to be managed under sustainable basis in order to satisfy the needs of the present and coming generation without depleting the resources. Trees and shrubs known to be the main source of browse provision for animals in the area for both domestic animals and wildlife. Worldwide it was noticed that open areas vegetation cover which is accessible to all local for grazing is decreasing rapidly specially in developing countries. There is an urgent need for enriching the knowledge and better use of vegetation potentialities concerning the natural resources. Presently the environmental degradation is affecting our planet (Fadleseed, *et al.*, 1999)<sup>[3]</sup>.

**Problem Statement**

Semiarid zone comprises low rain fall wood land savannah on sandy soils and clay soils are the most favorite areas for rural communities. Due to the existence of the high population on such areas, difficulties and harsh conditions emerge and always exist for the two main activities that are essential for the people, which are, agriculture and animal rearing. The browse available to animals continues to decrease in arid and semi-arid zones as well as the low rain fall wood land areas. Forests also were drastically affected by the high pressure of human activities and animal stay in the area for a very long period of time especially in years of low quantities of rain fall. Tree growth, especially density and height which affect vegetation cover are the two variables that significantly affect the available browse productivity. These should be incorporated in the management prescriptions of the rangelands of this area (Gaiballa & Mohamed, 2006)<sup>[4]</sup>. The study meant to achieve the following objectives:

1. Assess the browse availability of trees.
2. Study the factors affecting the browse availability of the most dominant trees.
3. Study the ground vegetation cover in terms of density, frequency, forage biomass cover and biodiversity.
4. Socioeconomic aspects related to browse utilization.

**Materials and methods**

The study area chosen for this investigation namely Habiela within a vast area named Al-Baja 37 km west of the White Nile in the White Nile State. Many tribes from north Kurdofan visit this area practicing certain grazing patterns for decades. Different animals in quite big numbers were usually grown by the local people, mainly camels, cows and sheep. The area chosen for the study tolerates a heavy burden of human activities as well as grazing. A study is urgent to find and develop grazing systems to avoid land and vegetation cover degradation.

Herding practices and/or family and herd management was studied and investigated. A questionnaire was designed to highlight human practices for both farmers and herders. Pastoralist’s routing and movement through and across the study area was tackled in the questionnaire. A total number of 400-600 families were targeted for the questionnaire. Households included in the study were 62 families, chosen randomly for the investigation. The collected data was analyzed using SPSS program to get the desired results availed for the discussion.

**Results and Discussion**

**Assessment of Range Availability and Utilization**

Rural areas in Sudan are known to be the areas subjected to

very heavy activities by the dwellers. Mostly, agriculture and animal rearing are the major land use activities practiced by the local people. Due to this heavy burden semi desert zones should receive much more research work as it is usually done. A better management of range potentialities needs to know more about the range availabilities and utilization.

**Table 1:** Water sources in summer

Source of water	Frequency	Percentage %
Hafir	7	11.3
Well	6	9.7
Other	21	33.9
Hafirs & others	28	45.1

Mostly areas of Sudan enjoy a short rainy season, it continues for a period of time not more than three months maximum. Namely these are July, August and September. Water sources and availability where the main factors determine the utilization of browse potentialities during summer. Villagers use Hafiers and other water sources to offer water for all purposes. Water reservation in summer is the main difficulty, Haffirs traditionally were built and constructed with a very low capacity, could not keep supply of water to people for a long period of time. Pore wells also face a lot of problems like water salinity and inadequacy; therefore locals were compelled to fetch water from other areas far away in distance and that adds to life much more harshness and difficulties.

**Table 2:** Distance of Water Sources

Distance	Frequency	Percentage %
Short	4	6.5
Medium	50	80.6
Far	8	12.9

Animals in summer stay around the water sources whether it is a deep pore well or Hafier. Enormous numbers of animals use the same area with people. This of course increases the burden on soils and the browse in the area. The above table shows obviously that 80.6% of the respondents said it is a distance not too far but also not so close to the browse places. Which means the stay of animals in the same place takes longer time than it is supposed to be, then the effect increases negatively encouraging soil and browse deterioration.

**Table 3:** Tree Density

Density	Frequency	Percentage%
Increase	23	35.5
Decrease	38	62.9
Constant	1	1.6

This table shows that with no doubt 62.9% of the respondents agreed that the tree density decreases. A small number not more than 1.6% showed it is constant while 35.5% say the density increases. Tree density decrease is an alarm that deserves better consideration for search of better ways and mechanisms of management. Tree planting, tree seeds scatter and regeneration blots protection could serve as a sound measure for retaining and gaining tree density. This of course helps a lot in combating the harshness of life and the ecosystem.

**Assessment of browse Sustainable Management**

Animal rearing as a major activity practiced in the area together with agriculture should be tackled closely and carefully to focus on reasons that affect animal feeding in the arid zones. Definitely there might be shortages of animal feed from now and then in periods of drought. This

encourages the local people to fetch other sources for fodder provision. Income for sure affects the availability of fodder and the power to purchase additional amounts from the market. Source of income within the dwellers was investigated to discuss this issue for more highlight.

**Table 4:** Source of income

Source	Frequency	Percentage %
Farming	10	16.1
Livestock Razing	5	8.1
Farming & Livestock Razing	36	58.1
Others	2	3.2
Trade	7	11.3

The income activities that prevail in the area were shown in table (4) as farming and livestock rearing. Other activities represented in a very low percent (3.2) only. The two main activities within the area were found to be practiced together in a high percentage (58.1)%. This is very clear shows the animals owned by the community were closely tied to

farming for providing fodder. Then the vegetation cover, especially tree regeneration as a result will suffer from heavy grazing practices traditionally practiced. As a measure for combating deterioration and to keep browse sustainable well designed grazing systems must be developed in the area.

**Table 5:** Tree Density and Natural Regeneration

Species	Sites						Average	
	1		2		3		Tree	Reg.
	Tree	Reg.	Tree	Reg.	Tree	Reg.		
<i>Acacia tortilis</i>	33	10	20	10	47	7	33.3	9
<i>Ziziphus spina christi</i>	3	20	7	7	23.3	3.3	11.1	10
<i>B. aegyptiaca</i>	3	13	10	3.3	13.3	3.3	8.8	6
<i>Acacia seyal</i>	-	-	3.3	-	-	-	1.1	-
Total	39	43	40.3	20.3	33.6	13.6	54.3	25

Table (5) showed that the density of trees is different in the three sites investigated. Three tree species were shown, *Acaciatortilis* tree was found to be high while its regeneration is low. Compared to the other two species *Ziziphus spina christi* and *Balanites aegyptiaca* old mature trees were found to occur in a low density while their regeneration was found to be higher comparatively. It is known generally that regeneration of trees in arid areas is difficult due to the aridity of the area and low rain fall in

addition to the heavy grazing practices dominate in the area. This comes to strengthen (Nancy, 2008), state; (little number of seeds germinates in addition to that tender seedlings are trampled or browsed by animals. *Acacia seyal* regeneration was completely disappeared from the area. Very strongly it is obvious that grazing is heavy on the trees during the dry period. This call, without any doubt, to invent and adopt new systems for sustainable browse practices in the area.

**Table 6:** Best Tree Fodder

Species	Frequency	Percentage %
<i>Acacia tortilis</i>	35	69
Other	1	1.7
<i>A. tortilis &amp; B. aegyptiaca</i>	15	25.4

Table (6) showed that the preference for fodder goes for *Acacia tortilis*, other species were found to be of low preference 1.7% only. This again calls for strong extension program that enrich knowledge about trees in general and specially species suitable for grazing.

**Conclusions and Recommendations**

The study ended to concrete findings from which some recommendations thus derived thought to be of a value to conclude the study.

- *Acacia tortilis* is the dominant tree that was preferred for browsing in the area as a legume tree for animal's nutrition characteristics in present.
- *Acacia tortilis* tree was found to be higher in density than its natural regeneration, which means this tree may

face a decrease in future if no measures were taken to enrich its existence.

- The study revealed that herbaceous vegetation cover under tree was dominated by *Aristida* species which showed a high frequency and composition and characterized by acceptable degree of preference.
- Summer known to be the period preferred as a season for browsing, while the fodder trees are available mainly for villagers and *Acacia tortilis* one of the best species for this purpose.

**Recommendations**

- Extensive directed and focused extension work is required with involvement of the different concerned partners in the communities to promote browse

conversation with sustainable range management process.

- Social fencing and control is still effective as related to natural vegetation resources protection.
- More work towards management of browsing resources in the area is highly recommended.
- Range management should keep balance between tree density and the natural regeneration of trees to ensure sustainable tree cover for maintaining availability of browse for the livestock.

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