



## Original Article

# Impact of Continuous Grazing Around Rainy Season Camping Areas on Range Condition

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## ABSTRACT

This study was conducted in two open areas and a protected rangeland in North Kordofan, Sudan from March, 2010 to December, 2011. The objective of the study was to investigate the impact of continuous grazing of range resources on its attributes. Data was collected using range inventory by line transect method. The collected data was analysed using SPSS software version 16.0 and SAS software. Range inventory data in open areas indicated poor range attributes demonstrated by high percent unpalatable species, higher bare soil percentage, scanty ground cover and lower plant density and composition compared to protected area. Better carrying capacity estimates were recorded in protected areas (3.7 ha/tropical animal unit/8months) compared to 24.5 ha/tropical animal unit/8 months. The study concluded that continuous grazing around rainy season camping areas in the State has led to rangelands deterioration.

**Keywords:** Continuous Grazing, Rainy Season, Camping Areas, Range Condition.

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## INTRODUCTION

Sudan has a vast area of natural rangelands that amounts to almost 118 million hectares, and about 14% of total land area. Forage produced from those natural rangelands represents 86.6% of national herds feed requirement, and about 14% of the population is engaged in activities related to range utilization (MOA, 2003). Cattle herders use vegetation during rainy season leaving the area for camel and sheep producers during the dry season (Ali and Suleiman, 1988). It was estimated that this area which is intensively used was subjected to many ecological and human pressures. Traditional natural grazing is the main source of feed for the livestock species in Sudan (LADCO, 1999).

Natural rangelands in North Kordofan State constitute the main source of animal feed especially in pastoral autumn camping areas (*makharif*). They also provide feed for the

majority of livestock coming from other parts of the Sudan. So this trail was designed to study the effect of rainy season camping on range condition in North Kordofan State, Sudan.

## MATERIALS AND METHODS

### The Study Area

North Kordofan State lays between latitudes 11°:20' to 16°:36' N and longitudes 27°:13' to 32°:24' E and area occupies an amount to almost 25 million ha. Out of this area, 14.5 million hectares are rangeland (AFRICOVER, 2004). The state is considered among the leading regions of Sudan in terms of animal and range resources, where more than million heads of sheep, goats, camels and cattle are raised (RPA, 2005). Animal production in the state is mainly practiced under traditional extensive systems, depending on natural rangeland (Cook and Fadlalla, 1993). The average monthly temperature according to Nimer (2000) was 34.60 C, and the coldest months were December and January with mean temperatures of 14.10 C and 13.5 0C, respectively. The hottest months were April, May and June with an average mean temperature exceeding 40 C. The soil of the site lies within the sand dune area locally known as "Goz" soil, these soils are inherently poor, but their high permeability and easy penetration of roots, compensate for their inherent poverty.

### Range Inventory

Vegetation measurements around camping areas in unprotected areas (Mugshasha and Abuelgor about 60 and 30 km south and southeast Elobaied town) and protected area (Nabagaya about 45 km southwest of Elobied town) was done using the loop and transect methods according to Brown (1954); Rodoan and Fakhary (1976); Ali and Sulaiman (1988); Abuswar (2007) and Ahmed *et al.*, (2007). In this method, the measuring tape was stretched on the ground. Observational points were taken at one meter interval using the loop.

### Ground Vegetation Measurements

Vegetation measurements were done to collected data on range components and botanical composition: Plant %, Litter %, Bare soil %, Rock %, Plant density, Plant frequency, Vegetation Cover, Forage biomass productivity and Carrying Capacity.

### Statistical Analysis

The data were analysed using Statistical Package for Social Sciences (SPSS) v.14.0 software package (SPSS, 1996).

## RESULTS AND DISCUSSION

### Range Components Attributes as Affected by Grazing

Percentage plant, litter, rock and bare soil in the three sites surveyed are presented in table (1). Plant hit was (42.3 %) in Abuleghor, (67.9 %) in Mugshasha and Nabagaya (80.9 %). Litter percentage were (14.9%), (6.5%) and (1.5%) in the mentioned sites respectively. Rocks percentages were (0.8%), (0.7%) and (16.6%) in the mentioned sites respectively. Bare soil percentages were (42.0%), (0.7%) and (1.0%), in Abuleghor, Mugshasha and Nabagaya, respectively. Percentage of plant, litter, rock and bare soil in the three sites were affected by protection or continuous grazing. Abuelghor and Mugshasha were rainy season camping while Nabagaya is a protected area that can be seen as a control vs. continuous grazing. The better rangeland condition in the protected areas as opposed to the continuously grazed area could be attributed to overgrazing of the palatable species especially before seed setting. Those findings were in agreement with Ali and Suleiman (1988), Cossins and Gwynne (1977) who reported that Plant attributes on rangeland could improve upon protection or rangeland could be dominated with unpalatable flora when overgrazed.

**Table 1: Range component at two rainy season camping areas and protected area in the late rainy season (2010).**

Site	Plant %	Litter %	Rock %	Bare soil %
Abuleghor (camp)	42.3	14.9	0.8	42.0
Mugshasha (camp)	67.9	6.5	0.7	24.9
Nabagaya (prot.)	80.9	1.5	1.0	16.6

### Impact of Continuous Grazing on Rangelands Frequency

In Nabagaya, plant species with highest frequency were *Eragrostis termula* (20.5%), *Zornia glochidiata* (18.5%) and *Cenchrus biflorus* (12.2%). In Abuelghor *Chloris pilosa* (26.7%), *Eragrostis termula* (16%) and *Aristida pallida* (8%) recorded the highest frequency. In Mugshasha, *Chloris pilosa* (13.9%), *Indigofera spp* (11.3%) and *Eragrostis termula* (10.9%) recorded the highest frequency. Vegetation cover was higher (60.5%) in the protected area followed by Mugshasha and then Abuelghor area where their values were 20.2% and 13.7% respectively. Dry matter (98.6 g/m<sup>2</sup>) in Nabagaya, (15.3 g/m<sup>2</sup>) in Abuelghor and (14.7g/m<sup>2</sup>) in Mugshasha. While protected areas indicated a carrying capacity of (3.7 ha/TLU/8 month) tropical Livestock unit during the dry season (8 months), the continuously grazed areas had 23.5 and 24.5 ha/TLU/8months (Table 2). Effect of continuous grazing on rangelands around rainy season camping places has resulted in significant decline of range biomass production. Dry matter (g/ m<sup>2</sup>) was higher in Nabagaya, and almost similar in Abuelghor and Mugshasha. While protected areas indicated a better carrying capacity per Tropical livestock unit during the dry season (8 months), the continuously grazed two areas had greater number of hectares needed for one tropical livestock unit for the 8 months' dry season. The biomass production on which those values were based has also shown differences. Galallyn (2007) also reported similar values for continuously grazed areas. Lanzenby and Swain (1979) and Strang (1980) also showed similar trends on surveying rangelands that were protected vs. open grazed areas. For there more, Lazim (2009) reported that protected plots had higher forage biomass productivity and carrying capacity than open plots.

**Table (2): Range attributes at two rainy season camping areas and protected area in the late rainy season (2010).**

Site	Cover %	Density (plant/m <sup>2</sup> )	Production (g)	Carrying capacity (ha/TLU/8month)
Abuleghor (camp)	13.7	20.5	15.3	23.5
Mugshasha (camp)	20.2	30.1	14.7	24.5
Nabagaya (prot.)	60.5	116.4	98.6	3.7

\*TLU = Tropical Livestock Unit

Plant density or number of plant species count per m<sup>2</sup> on the protected area where a quadrat of 1m<sup>2</sup> was used has shown that grasses and herbs of good palatability were dominant on the rangeland of *Nabagaya* (Table 3). The most dominant species were *Eragrostis tremula* (38 plant/m<sup>2</sup>), *Zornia glochiata* (34 plant/m<sup>2</sup>), *Cenchrus biflorus* (9.2 plant/m<sup>2</sup>) and *Aristida pallida* (6.2 plant/m<sup>2</sup>). On the rainy season camping places *chloris pilosa* (11 plant/m<sup>2</sup>) and *Cassia tora* (5.3 plant/m<sup>2</sup>) were dominant in Mugshasha (Table 4). In Abuelghor, *Chloris pilosa* (13 plant/m<sup>2</sup>), *Eragrostis tremula* (3 plant/m<sup>2</sup>), and *Aristida pallida* ( 2 plant/m<sup>2</sup>) were dominance (Table 5). RPA (1993) reports indicated that continuous grazing was the cause of plant composition, density and frequency of species change in semi arid and arid zones of the Sudan.

### CONCLUSION

The study concluded that continuous grazing around rainy season camping areas in the State has led to rangelands deterioration. Rehabilitation and management was not defined.

Conflicts over utilization were common. It was recommended that rangelands be demarcated and grazing system and beneficiaries be defined to ensure proper use of the resource.

**Table 3: Frequency and density of importance range species at Nabagaya area in the late rainy season (2010)**

Plant		Frequency %	Density (Plant/m <sup>2</sup> )
Latin name	Local name		
<i>Eragrostis termula</i>	Benu	20.5	37
<i>Zornia glochidiata</i>	Sheleeni	18.5	34
<i>Cenchrus biflorus</i>	Haskaneet kh	12.2	9.2
<i>Aristida pallida</i>	Gaw	10.2	6.2
<i>Indigofera diphylla</i>	Engaratelwaral	6.1	2.3
<i>Aristida adscensionis</i>	Humra	4.1	2
<i>Dactyloctenium aegyptium</i>	Abuasabia	4.1	1.3

**Table 4: Frequency and density of importance range species at Mugshasha area in the late rainy season (2010)**

Plant		Frequency %	Density (Plant/m <sup>2</sup> )
Latin name	Local name		
<i>Chloris pilosa</i>	Afan khadim	13.9	11
<i>Cassia tora</i>	Kawal	8.7	5.3
<i>Chloris prieurii</i>	Abumaleh	10.4	3
<i>Indigofera spp</i>	Tamor far	7.8	1.3
<i>Zornia glochidiata</i>	Sheleeni	5.2	1.2
<i>Indigofera spp</i>	Herasha	11.3	1
<i>Tribulus terrestris</i>	Derasa	7.8	1

**Table 5: Frequency and density of importance range species at Abuelghor area in the late rainy season (2010).**

Plant		Frequency %	Density (Plant/m <sup>2</sup> )
Latin name	Local name		
<i>Chloris pilosa</i>	Afan khadim	26.7	13
<i>Eragrostis termula</i>	Benu	16	3
<i>Aristida pallida</i>	Gaw	8	2
<i>Dactyloctenium aegyptium</i>	Abuasabia	6.7	1
<i>Cenchrus biflorus</i>	Haskaneetkhishen	6.7	1
<i>Aristida hordeacea</i>	Danab Naga	6.7	0.6
<i>Cassia tora</i>	Kawal	6.7	0.4

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