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ASSESSMENT OF RANGELAND AT UM KASS RAINY SEASON CAMPING AREA IN NORTH KORDOFAN

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ABSTRACT

Rangelands are very important for feed livestock. Therefore, continuous monitoring and study is necessary to understand their existing situation for their improvement and management. Two sites were surveyed for vegetation measurements 50 kilometers from Elobeid where inventory was conducted on the rangelands. The two sites were selected according to soil type. Sampling for herbaceous cover was based on locating twenty transects 100 m. The assessment included cover, composition, density and biomass production. The tools used for data collection were Loop, 1 m2 quadrate, compass, and transect of 100m. The data was analyzed via analysis of variance. The results showed that overgrazing was considered as the major factor responsible for the low vegetation cover in the study area due to the concentration of high numbers of animals during the rainy season. The results indicated that negative impact on vegetation attributes replacement of palatable grasses by less palatable plant species and low carrying capacity. The most dominant herbaceous species in the study area were Abotilon figrianum and Cyprus rotundus both are less preferred by animals, indicating intensive selective grazing and hence disturbance in rangeland. Results indicated that there was variations in species density in two sites .pastoralist activities and heavy grazing are the main factors influencing the distribution of tree cover and can also affect the woody species density. The Boscia senegalensis and Acacia nubica were the most dominant tree species in the area and it was less preferred by animals. Sound management and suitable improvement techniques should be implemented for these rangelands.

Keywords: Rangelands, Biomass production, North Kordofan , Palatable Plant

1. INTRODUCTION

Rangelands are communally used in Sudan. The traditional herders, the main users of the resource, have little to do with management and proper use of range resource. Hence continuously grazed areas are subject to over grazing. The impact of this practice is needed being assessed seasonally to study the extent of damage caused and methods needed to renovate vegetation. Land use has strong impact on vegetation cover and diversity patterns of ecological communities in many parts of the world including Sudan. In semiarid and arid ecosystems, and specifically in savannas, unsustainable livestock farming is common. The impact misuse of rangeland differ from soil type to another that is why assess must take into consideration soil types on which range communities are surveyed. North Kordofan State is one of the main rainy

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season camping areas in the country. The traditional herders spend rainy seasons on low rainfall savanna on sand, clay and grdud soils. The conventional annual range inventory by the National Range and Pasture Administration do not take into account effects of seasonal grazing on rangelands in the State.

The aim of this study is to assessment of the impacts of the seasonal continuous grazing on main soil types in Kordofan state.

2. MATERIAL AND METHODS

2.1 Sampling procedure

A. Plant composition

Plant composition refers to the total plants observed from total number of hits; while the relative plants composition refer to the contribution of each individual plant species in the total plants percent (Parker, 1951). Parker loop method (Parker & Harris, 1959) was used. A total of 100 hits per transect were taken, then distribution of the species, litters, bare soil and rocks along each transect were identified. The total hits of each parameter were calculated. The following equations were used to calculate percent of certain parameters such as (Plants composition%, relative plants species composition%, litter%, bare soil% and rocks %) Parker, (1951).

$$\text{Trees density} = \frac{10000}{2(\text{Average distances in meter})^2} \quad \ldots\ldots\ldots\ldots\ldots (1)$$

$$\text{Relative trees density} = \frac{\text{Number of species encountred}}{\text{Number of all trees}} \text{ trees density} \quad \ldots\ldots\ldots\ldots\ldots (2)$$

(Barbour e t al.,1987).

$$\text{Percentage of each parameter} = \frac{\text{Total hits on each parameter}}{100} \times 100 \ldots (3)$$

Parameter = If it is present refer to litters or bare soil or rocks.

B. Frequency

Frequency is the quantization expression of the presence or absence of individual of species in population (SRM, 1989). Usually expressed as a percentage of the total number of samples collected (Elzinga et al.,1998).

Frequency is typically used to evaluate plant species distribution over an area and/or change in abundance of species over time due to management. Ten quadrats per transect at interval of 10 m that give (40) quadrat per block and (80) quadrat per site to estimate plant distribution at the study area.

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Plant frequency was calculated by counting species, which occur within each quadrat and recorded their names only not their number in form of frequency. The following equation was used to calculate frequency: (Daubenmire, 1968).

$$\text{Frequancy} = \frac{\text{Number of quadrats with plants species occurrence}}{\text{Total number of all quadrats}} \times 100 \ldots\ldots\ldots\ldots (4)$$

C. Plant cover percentages

Plant cover is defined as the area of ground that is occupied by the above-ground parts of each species when viewed from above (Kent and Coker, 1992). It was estimated as a visual percentage of the quadrat covered by plant material (Bonham, 1989). Plants rooted outside the quadrat are included in cover measurements to the extent that their canopy projects into the quadrat space (Barbour et al., 1987).

Plant cover percentage usually estimated by looking at the quadrat from the above and estimate approximately the part covered by plants. Plant cover percent was estimated for each quadrat and recorded in form of plant cover%. The total cover for all quadrats determined total cover for each block, which is divided by the number of quadrats taken in each block to obtain one average. The following equation was used to calculate plants cover%.

$$\text{Plants cover percentage} = \frac{\text{Total estimations}}{\text{Total number of quadrats}} \times 100 \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

D. Biomass production

Biomass is the weight of vegetation at a point in time (Holecheck et al., 1989). It was determined by direct harvesting of vegetation from the square meter quadrat (Bonham, 1989).

Equipments were included Quadrat (1m x1m), Scissors, Paper bags, Sensitive balance and Form for biomass.The plant species in each quadrat were clipped at 3cm above the ground level, as this represent grazing level using scissors .The harvested plant materials were placed in paper bags, dried partially under the sun light to reduce the moisture contents of plants and to protect them from decaying. The plant materials were oven dried at 105^{o}C for 17 hours. The oven dried materials were weighed. The dry matter per quadrats was obtained by dividing the total weight of all quadrats by their number to obtain one average of weight (gram/m^2). Then the dry matter (ton per hectare) was used following formulas.

$$\text{Biomass production gm/m}^2 = \frac{\text{Total weight of dry matter of plants}}{\text{Total number of Quadrats}} \ldots\ldots\ldots\ldots\ldots (6)$$

$$\text{Biomass production ton/ha} = \frac{\text{Biomass gm/m}^2 \times 10000}{1000 \times 1000\text{gm}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

(Gaiballa, 2014)

Available forage production = Biomass production ton/ha × 0.5

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0.5 = Proper Use Factor

E. Carrying Capacity

The carrying capacity was calculated on basis of total biomass production and amount of the feed requirements per animal unit. Carrying capacity is usually determined using proper use factor (PUF), of 50% in which only half biomass produced is considered available for grazing, livestock requires daily dry matter (DM) intake equivalent to 2.5 – 3% of their body weight.

Thus Tropical Livestock Unit (TLU) of 250 Kg body weight consumes 2.5 – 3% of their body weight the daily Animal Unit (AU) requirements is equivalent to 6.25 – 7.5Kg dry matter per day (Darag & Suliman ,1988). The following equations were used to calculate Carrying Capacity.

Requirements of AU/day = 3× 250 ÷ 100 = 7.5 kg

Requirements of AU/month = 7.5 × 30 = 225 kg

Requirements of AU/year = 7.5 × 30 ×12 = 2700 kg

$$Carrying\ Capacity = \frac{Available\ forage\ production}{Total\ animal\ unit\ consumption\ (AU/Year)} \quad \text{..... (8)}$$

(Gaiballa , 2014).

Where: Available forage production is the biomass production at the study area in ton/hectare.

AU: Animal Unit.

F.Trees and shrubs density

Density in vegetation measurement refers to the number of individuals per unit area. Density for trees and shrubs was determined by using the Nearest Individual Method (Barbour e t al., 1987) in which 60 points were taken at each block (120 point at each site), at each point the distance to the nearest individual tree of any species (shrub or tree) was measured; the species were identified and recorded. Only one measurement from each point was taken. All distances for all species were summed and divided by their numbers to yield one average distance to calculate density per hectare (10000m^2) for all trees. The following equations were used to calculate trees density and relative trees density.

$$\text{Trees density} = \frac{10000}{2(\text{Average distances in meter})^2} \quad \text{.....(1)}$$

$$\text{Relative trees density} = \frac{\text{Number of species encountred}}{\text{Number of all trees}} \text{ trees density} \quad \text{.....(2)}$$

(Barbour e t al., 1987).

3. RESULTS AND DISCUSSION

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Table (1):) 1 Average plant composition, cover, bare soil, and litter percentages for the two different range sites (Sand soil/ Grdud soil),

Parameter measured (%)	Range site	
	Sandy soil	Gardud soil
Plant composition	48	46.75
Bare soil (B.S)	38.25	34.25
Litter (L)	13	15
Rock(R)	0.75	4
Total	100	100
Carrying capacity ton/Ha	10.3	9
Vegetation cover%	27.5(25)	33.7(50)

In this study found that Plant composition at the two sites. Sandy site scored the highest plant composition compared to the grdud site in Fig(1) that was 48% and 46% respectively, it same line with Ytes,etal,200 who stated that the low plant composition due to variable of soil properties and grazing intensity . The plant palatability of the dominant species at the sandy site explains this result (table 1) according with Herlocker, (1999).

Vegetation cover showed were high in grdud site whearest were low in sandy site as same line with (Abdelsalam etal.,2012) who stated that vegetation cover is poor in sandy soil also Abdalla etal.,2013 mentioned that rangelands of soil sand are detected by windy erosion .

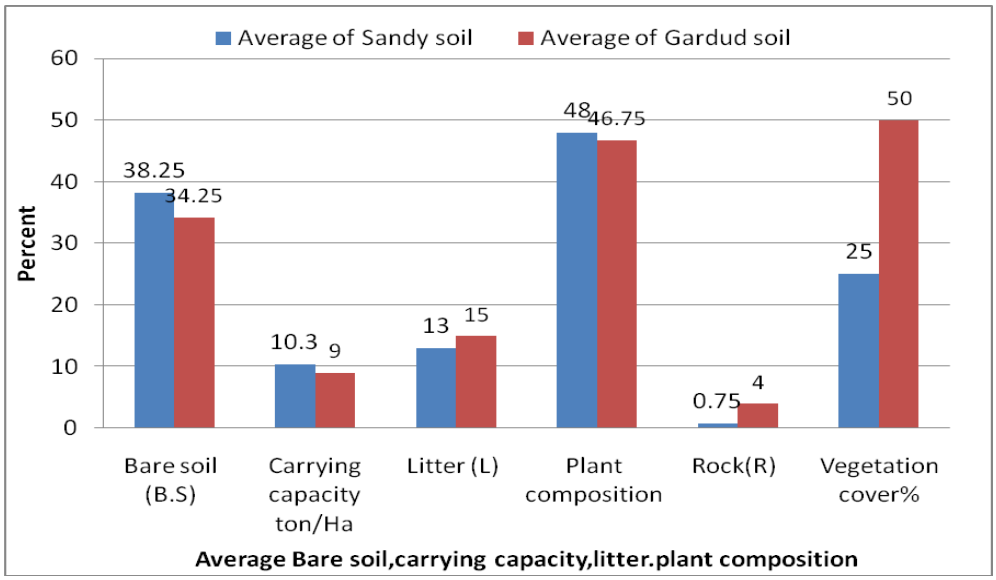

Fig (1) Plant composition%, litters% and bare soil% at the study area

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Carrying capacity showed in table (1). Highest in sand soil whereas in grdud soil was low this result with line (Abdelrahim & Abdalla, 2015) they reported that biomass productivity was nearly the same in both periods 2008 and 2012 (1.5 ton/ha and 1.3 ton/ha respectively due to variation in biomass productivity between two periods may be resulted from the variable and fluctuated rainfall characterizing also due to positive impact of grazing .

Table (2) Percentage of species composition in Study area

Species	**Site** sandy %	**Relative density**	**Site** grdoud %	**Relative density**
1.Abotilon figrianum	**75**	**23.3**	**138**	**41.6**
2.Faristia longisliqua	**7**	**2.1**	**9**	**2.7**
3.Eragrostis termula	**12**	**3.7**	**28**	**8.4**
4.Fimbristilis dichotma	**6**	**1.8**	**4**	**1.2**
5.Heliotropuim supinum	**1**	**0.3**	**7**	**2.1**
Acanthus sp.	**15**	**4.6**	**54**	**16.3**
7.Zornia glochidiata	**10**	**3.1**	**27**	**8.1**
8.Seteria verticillata	**2**	**0.6**	**0**	**0.0**
9.Casia sena	**2**	**0.6**	**4**	**1.2**
10.Triblus tresters	**5**	**1.5**	**6**	**1.8**
11.Cenchrus biflorus	**6**	**1.8**	**7**	**2.1**
12.Solanum dobium	**41**	**12.7**	**27**	**8.1**
13.Amaranthus vridis	**27**	**8.4**	**0**	**0.0**
14.Chorcrus olitorius	**1**	**0.3**	**2**	**0.6**
15.Datura stramonium	**1**	**0.3**	**0**	**0.0**
16.Zaleya pentandra	**2**	**0.6**	**4**	**1.2**
17.Euphorbia aegyptiaca	**1**	**0.3**	**0**	**0.0**
18.Schenfeldia gracilis	**9**	**2.8**	**0**	**0.0**
19Cassia tora	**1**	**0.3**	**0**	**0.0**

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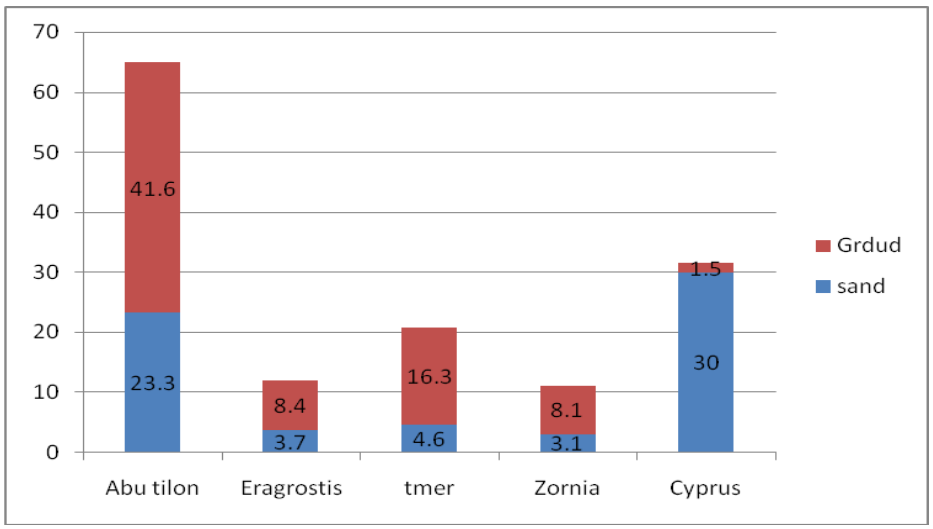
20.Cypprus rotundus	**97**	**30.2**	**5**	**1.5**
21.Alyscarpus monilifera	**1**	**0.3**	**1**	**0.3**
22.Aristida funiculata	**0**	**0.0**	**3**	**0.9**
23.Sesbania sesban	**0**	**0.0**	**1**	**0.3**
24.Cleome monophylla	**0**	**0.0**	**1**	**0.3**
25.Ipomea kordofana	**0**	**0.0**	**2**	**0.2**
Total	**21**	**321**	**19**	**331**

The study showed that species of Abutilon recorded high density in the two sites this result stated from (Abdalla et al., 2013) who stated that species is adopted in sand soil and grdud soil. Showed in Fig (1).



Fig(2) Most Plant species densities at study area.

The study showed that the relative density of trees in sandy soil was 72 trees /Ha. Whereas in grdud soil was18 trees/Ha.The results indicated that the two sites dominated by different woody species. Sandy dominated with *Boscia senegalensis* (40 shrub/ha) while the grdud site was dominated by *Acacia nilotica* (6 shrub/ha) (Table 3). This variation of trees density at the two sites may be due to rainfall and soil texture . The species *Boscia senegalensis* consider dominant species in the sand but does not prefer by most animals particularly for this reason animals avoid to eat it.

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Table (3) Tree density of woody tree species Trees/Ha in Study area

Scientific name	Range site	
	Sandy soil	Grdud soil
1.Acacia nilotica	**5**	6
2.Boscia senegalensis	**39.4**	5.2
3.Ziziphus spina christi	**10.5**	1.7
4.Acacia nubica	**18.4**	3.5
5.Caltropis procera	**0.0**	3.5
Total	72	18

4. CONCLUSION

The study concluded there are some plants species adopted with type of soil also study found more species of plant disappeared due to overgrazing on the other hand the existence of conflicts among the herders and farmer in rainy season domain "Makhraf" and most of them mentioned reasons of conflicts in separately ways such as blocking routes of livestock by farms on livestock's routes and damaging of farms by livestock belong to mobile pastoralists. The conflicts were taking place around farms and increase when the nomad center the rainy season and through practice grazing.

Therefore the rangelands should consider utilization of rangelands and conditions when applying different rangelands management approaches. Nevertheless seed broadcasting of more palatable species, should be done in the sandy site with proper measure to control the unpalatable species invasion. The plant cover in the sand site should be increased and gardud site needs soil erosion measure particularly water erosion. Hence to reverse the trend of degradation there is a need to improve the awareness of the local herders and convince them about the importance of their fragile ecosystem as well as grazing management should take into account vegetation physiological stage and avoid early grazing and overgrazing.

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