ISSN(Online): 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly Peer Reviewed Journal)

Vol. 5, Issue 2, February 2016

Determination of Range Plant Attributes in Kadugli Locality, South Kordofan State, Sudan

Mohammed Ibrahim Abdelsalam[1]*, Gamar-Eldin Abdelrahman Ibahim[1], Abdelbasate H Elmagbool[1], Glal Abas Fashir[1]

Department of Range Science, College of Forestry and Range Science, Sudan University of Science and Technology . Khartoum, Sudan[1]

ABSTRACT: This study was conducted in Kadugli locality, South Kordofan State, Sudan at the end of October 2010. The study focused on rangeland vegetation attributes to describe the current condition of this rangeland. The aim of the study was to determine the rangeland vegetation attributes to use for range management decisions. In this paper used transects, Parker loop and quadrate methods for vegetation attributes measurement. The study finding the most plant types grown in the study area were grasses, also found that *Schoenefoldia gracilis* was the dominant species in term of of species composition, density and frequency this species can be used as a key species when need to reseed and rehabilitate the degraded rangeland in this area.

KEY WORDS: Vegetation attributes, Frequency, Kadugli, Rangeland, Range management.

I. INTRODUCTION

The rangelands in Sudan vary from poor to rich according to ecological zones and climate factors, especially Kadugli locality. This situation needs to determine the vegetation attributes to lead the rangeland manager for making the sound decisions for each rangeland. Rangeland inventory has usually focused on describing attributes of the vegetation to describe the existing rangeland status or detect changes over time, [1]. Vegetation attributes are a quantitative feature of vegetation that describe how many, how much or what kind of plant species are present. The most commonly attributes are biomass, frequency, cover and species composition, [2]. There is a lack of information concerning the rangeland productivity and botanical composition in the study area, this study trying to fill this gap by providing information on plant attributes. The study aimed to determine the rangeland vegetation attributes such as biomass production, frequency, cover, density and species composition to help the rangeland managers in making the proper decisions and practices of range management.

II. MATERIALS AND METHODS

1. Study area: The area of the study was located in Kadugli locality, South Kordofan State, Sudan, in the area lies approximately between latitudes 9º 50" and 12º N and longitudes 27º 05" to 32ºE. It covers an area of about 135000km². The average altitude is 600m above sea level, [3].

2. SAMPLING PROCEDURE: Stratified sampling involves dividing the range site into sections that are more homogenous than the entire area. Stratification of the area makes sampling more efficient, because fewer samples are required for precise, [4]. The study area divided into four sites according to the soil types, such sandy soil, clay soil, rocky soil and *Gardoud* soil (hard clay soil mixed with sand). At each site five transects of 100m long distributed systematically and four quadrates of size 1X1m placed through each transect with interval 25m between them.

3. MEASUREING VEGETATION ATTRIBUTES: The Parker loop (¾″) was used to determine plant composition in the study area. At each one of the five transects, plant species, litter and bare soil were recorded at every 1-meter

ISSN(Online): 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly Peer Reviewed Journal)

Vol. 5, Issue 2, February 2016

interval. Data was recorded on a specified sheet and computed the average of species composition, litter and bare soil by using specific formulas. The quadrate of 1m² sizes was used in this study, to determine the most common vegetation attributes, such as frequency, density and biomass production.

4. SPECIES COMPOSITION: Species composition refers to the contribution of each plant species to the vegetation; it is generally expressed as a percent.The species composition of the area was recorded using line transect method. Five line transect was set, in any site to determine species composition frequencies, using loop Methods. Measured observation along the transect line will usually be three types of observation which are plant species (spp), dead plants or litter (L) and bare soil (Bs). The plant composition and other attributes will be calculated using the following formulas:

Species composition = $\frac{Total\ hits\ of\ each\ species}{Total\ hits\ of\ all\ species} \times 100$

Percent of bare soil = $\frac{Total\ hits\ on\ bale\ soil}{100} \times 100$

Percent of plant litter = $\frac{Total\ hits\ in\ plant\ litter}{100} \times 100$

5. PLANT COVER: Plant cover is the total area covered by the live plants, usually expressed by percentage. This attribute is determined by using Parker loop, and calculated using this formula: Plant cover = $\frac{Total\ hits\ of\ plant\ species}{total\ number\ of\ hits}\ X\ 100\%$.

6. FREQUENCY: Frequency is the percentage of total quadrates that contain at least one rooted individual of a given species. It determined by recorded the species names which appear in quadrates. The frequency calculated by using the following formula:

Frequency of the species = $\frac{Number\ of\ the\ occurrence\ of\ the\ species}{Total\ number\ of\ samples} \times 100$

7. DENSITY: Density is a number of individual plants per unit area expressed as (plant/unit). It determined by counting all plants rooted in quadrates.

8. BIOMASS PRODUCTION: Biomass data collected as a total weight for the vegetation present in the quadrate, all plant materials harvested above 3cm of the ground from the quadrate. The plant materials were collected in paper bags, oven dried at 104C^{o} and weighted. The productivity calculated using the following formula:

Biomass production = $\frac{\text{Average biomass gm/m}^2 * 10000 * 0.5}{1000000}$ = Ton/ha/year

0.5 = proper used factor. 10000 = hectare. 10000000 = convert to tone

III. RESULTS AND DISCUSSION

The result shown in table (1) explained the main plant types in the study area, the most of plant are grasses. The dominant plant in this area, according to the botanical composition was *Schoenefoldia gracilis* accounts for about 42% of all plant species in this area, followed by *Hyparrhenia confinis* and *Pennisetum ramosum* respectively. While only two species of the forbs appears such *Celosia argentea* and *Ipomoea sp.*

ISSN(Online): 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly Peer Reviewed Journal)

Vol. 5, Issue 2, February 2016

Table (1) Rangelands species composition (%).

Scientific name	Type of plan	Percent
Schoenefoldia gracilis	Grass	41.83
Hyparrhenia confinis	Grass	15.24
Pennisetum ramosum.	Grass	14.02
Sorghum vercicolor	Grass	2.23
Celosia argentea	Forbs	2.04
Ipomoea sp.	Forbs	1.66
Chloris gayana	Grass	1.17

Through the result shown in table (2) found that the plant cover reached more than 74% of the ground cover while bare soil accounted only 14.15%, this result explain the ability of these rangelands to protect the soil against direct raindrop and water erosion as well as protect the soil from the direct impact of the wind erosion. The high grass canopy and basal cover and small gaps between plants should reduce raindrop impact, providing increased time for infiltration, [5]. The other component of ground cover is litter, found about 11.55%, this result makes clear that rangeland was not used intensively by grazing animal.

Table (2) Rangelands ground cover.

Attributes	Percent
Plant cover	74.3
Bare soil	14.15
Litter	11.55

Density can give valuable indicators in an inventory and monitoring program to determine range condition and range trend because it remains quite steady from year to year. Through result presented in table (3) found that *Schoenefoldia gracilis* was a high species density reached to 40 plant/m², followed by *Sorghum vercicolor* and *Hyparrhenia cofinis.* All these plant species in the top rank of the species density are grasses except one species ranked the fourth species as a forb is *Celosia argentea* its density was 12 plant/m². This result explained the dominant of grasses in the area.

ISSN(Online): 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly Peer Reviewed Journal)

Vol. 5, Issue 2, February 2016

Table (3) Plant density (plant/m²).

Scientific name	Type of plant	Plant density
Schoenefoldia gracilis	Grass	40
Sorghum vercicolor	Grass	19
Hyparrhenia confinis	Grass	18
Celosia argentea	Forbs	12
Echinocloa colonum	Grass	4
Pennisetum ramosum.	Grass	3
Chloris gayana	Grass	1

The result of plant frequency shown in table (4) explained the good distribution of *Schoenefoldia gracils* on the range site which was 59% frequent in this area compared with the other species appeared on this table. This result indicated that *Schoenefoldia gracils* had a good adaptation in all range sites, which can be concern as a key species in this rangeland.

Table (4) Plant frequency (%).

Scientific name	Type of plant	Percent
Schoenefoldia gracils	Grass	59
Celosia argentea	Forbs	28
Zornia diphylla	Forbs	16
Sorghum vercicolor	Grass	23
Cymbopogon nervatus	Grass	6
Hyparrhenia confinis	Grass	16
Pennisetum sp.	Grass	11

ISSN(Online): 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly Peer Reviewed Journal)

Vol. 5, Issue 2, February 2016

Biomass is a commonly measured vegetation attributes that refers to the weight of plant material within a given area. The average of biomass productivity of the study area was found 221.1gm/m² of all plant materials in finding the quadrate. According to this average and by using the proper used factor, take half and leave half (0.5) [6], the rangeland productivity was found 1.11 Ton/ha/year. Biomass estimation is useful to determine rangeland carrying capacity, rangeland ecological condition, range trend, watershed, health and wildlife habitat quality [1]. This result, it may reflect the ecological potential these rangeland and its also a good indicator for range condition.

IV. CONCLUSION

The vegetation attributes are useful and important consideration for range management planning. The species *Schoenefoldia gracils*, will consider as a key species to use in range improvement programs, especially in this area and other similar rangeland in the region.

V. RECOMMEDATION

Based on what has been reached and discussed in the study, it can lead to the following recommendation:

1. The need of identifying vegetation attributes periodically, because of their benefit in knowing the impacts of management practices, it is also a good indicator to determine the rangeland trend and condition beside the determination of carrying capacity.
2. The use of species *Schoenefoldia gracils* in the reseeding and rehabilitation of degraded rangeland, because of its ability to adapt in such environments.
3. The need for monitoring change in vegetation cover and composition through inventory and monitoring programs, and linked to environmental variables in order to find the most successful ways for climate change adaptation.

REFERENCES

[1] Holechek, J. L. Pieper. R. D. and Herbal, C. H. Range Management, Principles and Practices. Upper Saddle River, New Jersey, 7th Ed. 2010.

[2] Bureau of Land Management. Sampling vegetation attributes. Interagency Technical Reference, BLM/RS/ST-96/002+1730. Pp 2. 1996.

[3] Anon, Application of Remote Sensing Techniques for the Assessment of Pastoral Resources in Puntland, Somalia Somalia Water and Land Information Management Ngecha Road, Lake View. P.O Box 30470-00100, Nairobi, Kenya 2007.

[4] Jalonen. J. Vanha-Majamaa. I. and Tonteri. T. Optimal Toner and plot size for inventory of field and ground layer vegetation in mature Myrtles boreal spruce forest. Ann. Boot. Fennec 35:191-196 ISSN 0003-33847. Finnish Zoological and Botanical Publishing Board, Helsinki. . 1998.

[5] David. A. B, Jefferye. H, Patrick. S and Mike, Rangeland Health Attributes and Indicators for Qualitative Assessment. J. Range Manage. 55:584-577, November, 2002.

[6] Stoddard, L.A, Smithland and Box, T.W. Range management, 2nd Ed. New York. Mc GrGrewill, USA. 1975.