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Assessment of Vegetation Change on Semi-Arid Zone of the Sudan, Case Study; Alfashir Locality

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ABSTRACT

The study was conducted at Alfashir, North Darfur State, Sudan, for two consecutive years 2016 and 2017 during flowering and seed setting stages. The objectives of this study were to evaluate range condition and trend by monitoring vegetation changes overtime. Vegetation Measurements were done to collect data on the following: range composition, species composition, plant density, ground cover and dry matter yield.

The result showed highly %plant and lower litter and bare soil at first period; also first period had higher ground cover, plant density and productivity than second period. The study showed that some species were disappear at the second period like; Corchorus olitorius, Requenia obcordata and Zornia sp. While the species of Eragrostis sp was appear at second season.

The study concluded that some species were not found at the second period, the reason may be high competition between species and variation of rainfall. Further research works is needed to monitoring vegetation change and assess the rangelands across different ecological zones in North Darfur State.

KEYWORDS: *Plant density, Ground cover, Productivity, Litter, Bare soil*

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INTRODUCTION:

Natural range supports and provides feed for large number of livestock, which plays a vital role in national economy through provision of animal product for local consumption and foreign exchange

Rangeland supports different vegetation types including shrub lands such as deserts, steppes, temporarily treeless areas in forests, and whatever grows on land today, sandy, rocky, saline, or wet soils, and steep topography for commercial farm and timber crops [1]. Rangeland vegetation may be naturally stable or temporarily derived from other types of vegetation, especially following fire, timber harvest, brush clearing, or abandonment from cultivation [2] and it managed, typically, for livestock production [3]. In the developing countries, there at least 40 million pastoralists who depend on natural grazing for their livelihood, most are subsistence herders [4].

The Greater Darfur region occupies approximately an area of 500,000 km2. It lies in the north western part of the Sudan and mainly consists of four main climatic zones. Firstly, the rich savannah in the south with an average rainfall between 400 to 800 mm per year. Secondly, the poor savannah in the middle of the region with an average annual rainfall that ranges between 200 to 400 mm. thirdly, is the arid zone which occupies the middle of northern parts of the region, the rainfall ranges from 100 to 300 mm. The fourth zone is the desert zone and it is characterized by lack of rainfall and high temperatures during the summer [5].

The study area

The study was carried out at Alfashir, North Darfur State, Sudan (Figure 1). The state lies between latitudes 12° 30' and21° 55' N and longitudes 24° 00' and27° 30' E within the arid and semi-arid zones. Based on average annual rainfall amounts and soil types the state can be divided into two main geographical zones: Desert and semi-desert, and area amounts to about 296,400 km2; about 60% of it is rangelands. The total population of North Darfur State is estimated at 2.1 million. The rural, urban and nomadic population constitutes 64%, 16.8% and 19.2% respectively [6].

Figure (1): Map of the Sudan, Location of North Darfur State and study area

Source: Adam, 2013

Materials and methods

The field work was carried out at the rainy season (Flowering stage) and the end of rainy season (Seed setting) (late August and late October) for two consecutive years (2016 and 2017). Ten transects 100m long were taken and two quadrates in each transect were chosen. The measurement tools consisted of measuring tape (100 meter), loop (3/4 diameter), quadrate (1x1m^2) and recording sheet.

The samples were taken from two sites, open and protected area (one hectare in each site) to evaluate range condition and trend by monitoring changes vegetation overtime.

Vegetation Measurements were done to collect data on the following: Range composition, species composition, plant density, ground cover and dry matter yield.

Information used in the attainment of this study included both primary and secondary data. Primary data were vegetation measurements collected from open and protected area, sources of secondary data were published and unpublished reports and studies covering variety of related topic to the study area. Three variables were measured. These are: the number of live plants, the litter quantity and the area of bare soil. When the skinned process had happened, they were transformed in percentage. Excel software program was used to organize and tabulate the collected data. Rangeland standard assessment equations were used.

Results and discussion

Table (2) shows the range composition during both periods (2016 and 2017), first period during flowering stage had highest %plant and lowest %litter and %bare soil, while second period during seed stage had lowest %plant and highest %litter and %bare soil. This variation may be due to the amount of rainfall. Harrison and Jackson 1958 stated that range components are influenced by amount of annual rainfall.

The percentage of plant species composition are showed in the table (3), in the second period at seed stage *Blepharis linarifolia* records highest percent about 40.18%, this study observed that some species had disappears at second season, this result may be due to the high competition between plants and some species had highest roots to get water from underground.

Range attributes were show in the table (4), first period had higher plant density, cover and productivity, and this may be due to the management systems. The results support the finding of WSARP (1985) [7] that herbaceous productivity was generally higher inside protected range than outside, this is because the protected range was not subjected to removal of plants by animals or damage by humans, while the difference within the same area from year to year is attributed to differences in annual rainfall amount.

Table (1): Annual rainfall at Alfashir locality at seasons 2016 and 2017

Season	May	June	July	August	September	October	Total
2016	24	27	99	186.4	21.1	3.1	360.6
2017	--	16	136.9	91.3	14	--	258.2

Source: [8]

Table (2): Range composition in the study area at seasons 2016 and 2017

Season	Stage	Plant	Litter	Bare soil
2016	Flowering stage	90	2	8
	Seed stage	76	7	17
2017	Flowering stage	81	6	13
	Seed stage	66	12	22

Table (3): Percent of plant species composition at seasons 2016 and 2017

	2016			2017		
Species	Flowering stage	Seed stage	Aver	Flowering stage	Seed stage	Aver
Aristida sp.	13.35	26.77	20.06	18.64	23.28	20.95
Blepharis linarifolia	19.23	18.70	18.95	38.34	40.18	39.26
Cenchrus biflorus	10.41	10.34	10.37	07.37	07.01	07.19
Chloris prieurii	05.07	03.54	04.31	06.01	12.88	09.45
Corchorus olitorius	00.67	01.98	01.33	00.00	00.00	00.00
Dactyloctenium aegyptium	18.56	15.44	17.00	06.77	06.26	06.52
Eragrostis sp.	00.00	00.00	00.00	02.26	00.00	01.13
Ipomoea sp.	06.81	05.24	06.03	10.68	02.75	06.72
Requenia obcordata	05.07	03.68	04.38	00.00	00.00	00.00
Tribulus terrestris	08.28	03.54	05.91	03.61	03.38	03.49
Zalya pentandra	06.94	04.68	05.81	06.32	04.26	05.29
Zornia sp.	05.61	06.09	05.85	00.00	00.00	00.00
Total	100.00	100.00	100.00	100.00	100.00	100.00

Table (4): Range attributes in the study area at seasons 2016 and 2017

Season	Density (plant/m^2)	Cover%	Productivity (ton/ha)
2016	58	64	1.593
2017	43	49	1.409

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