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Environmental Impacts of pastoralists movement on the natural rangeland in Butana area, Sudan

Hala Ahmed [1], AbdelazizAbdelfattah Hashim[2], Babo Fadlalla[1], and Sahar Ezzat[1]
[1]Sudan University of Science and Technology, College of Forestry &Range Sciences, Department of RangeScience, Sudan, *(Corresponding author), Email:ahmedhala82@yahoo.com
[2]Agricultural Research Corporation (ARC), Agricultural Economics and Policy Research Center, Sudan.

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ABSTRACT

This study aimed to identify the environmental impact of pastoralist movement on the natural rangeland in Butana area of Sudan. For data collection, afield survey was started in the first of July and ended late September 2011. A random sample of 407 pastoralists' households in Butana area was chosen to collect primary data through a structured questionnaire. Descriptive statistics were used for data analysis. The data were coded, summarized, tabulated and processed. Analysis was conducted using (SPSS) computer program. The results were presented in the form of a frequency distribution. It was found that (80.1%) of pastoralists reported that rangeland situation was poor. The majority of pastoralists (79.1%) said that the current rangeland problem is soil degradation. Also, (88.2%) said that dry season / drought has the major effect on the rangeland. In addition, all respondent pastoralists reported that new plant species have invaded the area. About (77.1%) of respondents said expansion of rain-fed agriculture in the study area reduced the area of the natural rangeland and that there were conflicts between farmers and herders on rangeland. The study recommended that rangeland should be improved by government through availing animals' services, reseeding and proper distribution of water points.

INTRODUCTION

Arid and semi-arid rangelands are characterized by erratic rainfall and high rate of vegetation dynamics (Dahdough *et al,* 2002). Range condition and trend assessments over the years have often pointed at worsening productivity of natural pastures both in the arid and semi-arid areas of East Africa (McPeak,

2001). Livestock grazing is a major type of land use, providing livelihood for more than a billion people worldwide. Nevertheless, income from livestock grazing is associated with large uncertainties, as productivity of the pastures depends strongly on the low and highly variable precipitation (Behnke 1993, Sullivan and Rhode, 2002). According to Ministry of Information (2011), the area of the Sudan is about 1,882,000 km^2. The human population is 42.2 million (WPR, 2017). Livestock population is about 106 million heads (MARFR, 2015). Livestock enterprise of small-scale farmers is considered as a potential mechanism for generating income for many rural households, thereby alleviating poverty and improving livelihoods of the rural poor (Musemwa *et al*., 2007).

Rangelands dominate these areas, providing primary products of grasses, legumes and browse from shrubs and scattered trees associations in some depressed areas (Wright *et al*, 2003). The main livestock in Sudan are cattle, sheep, goats and, camels. Taha and Khidr (2011) pointed that in Africa, overgrazing has reduced range productivity virtually. Mobility of pastoralists, droughts and shortage of rainfall, misuse of land caused deterioration of natural rangeland in the study area. In addition, conflicts between agricultural and pastoral communities occur. Livestock production in pastoral areas is affected by numerous problems of which environmental degradation is prominent. In Sudan pastoral communities are under increasing pressure due to loss of pastoral land to agriculture, mining, oil explorations and more recently to South Sudan after its cessation from Sudan. The lack of understanding of the relationship between the environment and pastoralists and ignorance regarding the perceptions of the pastoralists and their outlook on life, may also contribute to the misunderstanding of the pastoral production system and the priorities and needs of the pastoralists (Amaha, 2003). The objective of this study was to identify the environmental impacts of pastoralist movement on the natural rangeland in Butana area of Sudan.

MATERIALS AND METHODS:

The Butana corresponds to a socio-ecological unit under 5 states and 9 locality divisions and it covers an area of 65 000 km2 (IFAD, 2009). In order to identify the environmental impact of pastoralists movement on natural rangeland in Butana area, afield survey was conducted and started in the first of July and ended late September 2011. In an empirical investigation it is impossible to collect information from the whole population. Therefore, researchers are often forced to make inferences based on information derived from a representative sample of the population. Sampling not only saves cost and time but can also give more accurate results than a census. Sampling theory provides an opportunity to minimize cost and to achieve acceptable results (Kinnear and Taylor, 1987,Casley and Kumar, 1988 and Barnett, 1991). Accidental sampling was used due to unavailability of records of producers, in addition to the difficulty to produce a list of all the diverse and considerably unsettled pastoralists in that area. The researcher employing this method interviewed any pastoralist met until the sample is completed. This procedure is characterized by saving in time and cost, and it has reasonable reliability when the

population is homogenous, (Faki, training note cited by EL Rasheed, (2005). Community is considered appropriate as (Hinton, 1995) reported that a minimum sample size of 25 is acceptable for social survey studies in homogenous communities.

A random sample of 407 pastoralists' households in Butana area was chosen to collect primary data through a structured questionnaire. Descriptive statistics were used for data analysis.

The data were coded, summarized, tabulated and processed. Analysis was conducted using (SPSS) computer program. The results were presented in the form of frequency distribution.

Results and discussion:

***Age groups*:** The result in Figure (1) shows that about (53%) of the respondents in the surveyed sample were within the age group of (21- 40), this indicates that the majority of those who look after animals are the young. This may be attributed to the fact that pastoralists send young men with herds for long distances to tend animals especially in the wet season. Pastoralists are characterized by cultural and economic orientation towards livestock and families dependon livestock for a significant part of their income and food (Wurzinger *et al*., 2008).

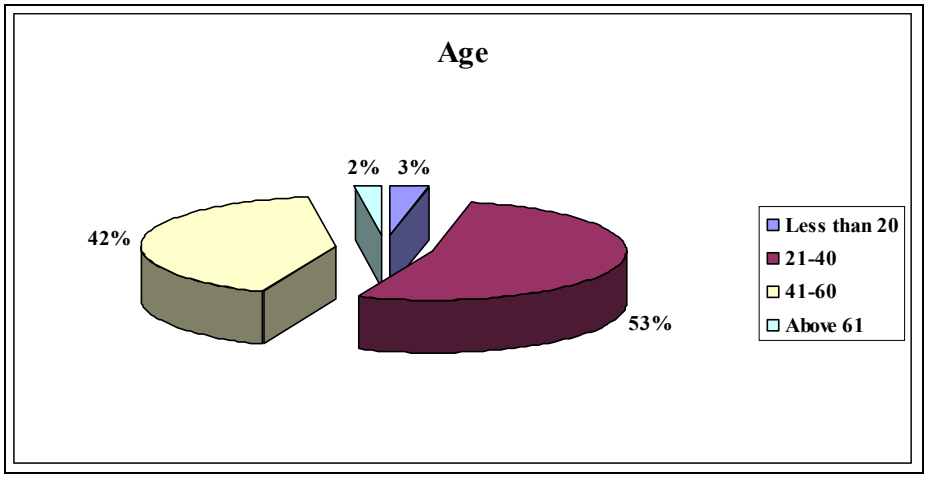

Figure 1: Distribution of respondents according to age groups

Education: Figure (2) shows that most pastoralists (61.4%) in the Butana are illiterate. This could be because nomads do not have permanent place, so it is difficult for them to send their children to school. They depend on them to look after the animals during the movement. Education is important because it provides an opportunity for pastoral households to diversify their livelihood portfolios, especially through employment as a source of wage and remittances (Wasonga, 2009).

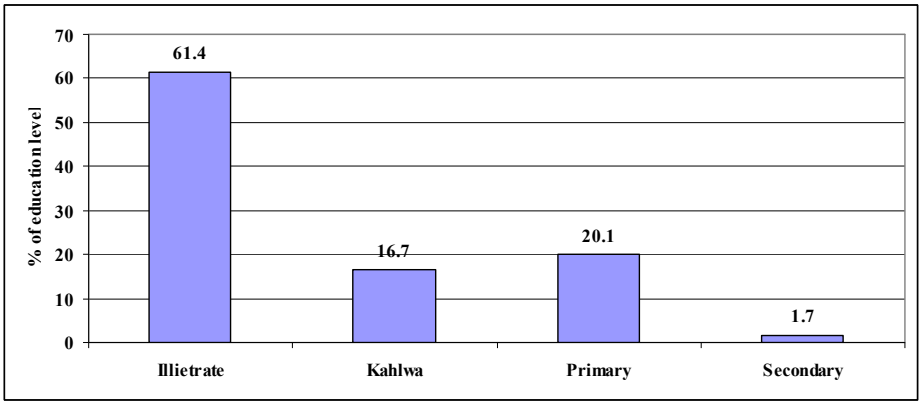

Figure 2: Distribution of pastoralists according to level of education

All of the respondents surveyed said livestock depends on natural range as essential source for feeding. This result agrees with (Hesse, 2006) who reported that pastoralists' livestock are dependent on natural pastures for their diets on the rangelands. Where the natural resources are managed through a mix of common property and private regimes, access to pasture and water are negotiated and are dependent on reciprocal arrangements. This is a coping mechanism; they have adapted and evolved to cope with constraints of climate, economic change and opportunities available to them. Some of the key livestock management strategies include herd mobility, raising several species of animals by a household and maintenance of a high proportion of female stock (Hesse, 2006).

The results in Table (1) show that (80.1%) of pastoralists stated that rangeland situation was poor.

Table 1: Rangeland situation

Rangeland situation	Frequency	Percent
Poor	326	80.1
Improved	81	19.9
Total	407	100.0

Moreover, the majority of pastoralists (79.1%), in Table (2) said that the current rangeland problem is soil degradation. Also, (88.2%) said dry season / drought has the major effect on the rangeland. This may be due to shortage of water with respect to forage growth and distribution. All the pastoralists reported that new plant species have invaded the area like *Cymbopogon spp*, this result agrees with (ELhag, 2006).

Table 2: The rangeland problem faced by the community within last (5) years

	Soil degradation			Dry season/ drought	
	Frequency	Percent		Frequency	Percent
Yes	322	79.1	Yes	359	88.2
No	85	20.9	No	48	11.8
Total 407		100.0	407		100.0

The Butana area with annually changing conditions of rainfall and pastures has always been a challenge for nomadic pastoralists. Table (3) shows that most of the households (82.6%) reported that basic water services are poor, and about,(13.5%) evaluated it to be average while (3.9%) stated that as good.

Table 3: Water services

Water services	Frequency	Percent
Good	16	3.9
Medium/ average	55	13.5
Poor	336	82.6
Total	407	100.0

The majority of the respondents (76.4%) in Table (4) mentioned that the main water points were *Hafirs* during the rainy season. *Hafirs* lead to deterioration of soil and vegetation cover due to overstocking in the small area surrounding the water points. When any *Hafir* is dry, most of the nomads move to a nearby one and this leads to a high concentration of animals. (*Hafirs* are machine-dug or hand-dug reservoirs on the clay soils, filled by rain or runoff water) (Elhag and Walker, 2009).

Table (4): Source of water

	Wells		Hafirs		Canals and river		Other	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Yes	278	68.3	311	76.4	214	52.6	157	38.6
No	129	31.7	96	23.6	193	47.4	250	61.4
Total	407	100.0	407	100.0	407	100.0	407	100.0

Plate (1) shows that *Hafir* provided the nomads with water during and after the rainy season. About (68.3%) of respondents indicated that their main source of water was wells and (52.6%) said that it was from canals and rivers. Shallow wells , hand pumps and natural depressions as well as Khors are also used by about (38.6%).This is in contrast with the case of Kordofan where shallow wells (35%) and hand pumps (26%) are the main source of water (Fadlalla, 2005).

Plate (1): Hafir with store of rainfall water during the field survey in Butana area

Type of livestock rearing and density: According to Tables (5.1) and (5.2) the dominant animal types in the study area are sheep (81.8%), cattle (77.6%), goats (74.2%) and camels (60.2%). Concerning animal densities the majority of the respondents (85.5%).

Table 5.1: Distribution of respondents according to type of livestock rearing (sheep and cattle)

	Sheep			Cattle	
	Frequency	**Percent**		**Frequency**	**Percent**
Yes	333	81.8	Yes	316	77.6
No	74	18.2	No	91	22.4
	407	100.0		407	100.0

Table 5.2: Distribution of respondents according to type of livestock rearing (goats and camels)

	Goats			Camels	
	Frequency	**Percent**		**Frequency**	**Percent**
Yes	302	74.2	Yes	245	60.2
No	105	25.8	No	162	39.8
Total	407	100.0		407	100.0

The results in Table (6) said animals density in the rangeland increased in wet season, which could be explained by the availability of forage and water in this period, this may lead to rangeland degradation, The accumulated pressure of grazing by livestock is one of the primary threats to rangeland biodiversity (Kassahun *et al*., 2008).

Table 6: Animals density in the Rangeland has

	Frequency	**Percent**
Increased	348	85.5
Remained the same	53	13.0
Decrease	6	1.5
Total	407	100.0

The result in Table (7) shows that about (61.9%) of respondents were semi-sedentary and (20.6%) were sedentary, while (17.4%) said that they move with the herds in search for forage and water. Mobility of pastoralists with their livestock in search of forage and water is the major characteristic of rangelands. The various distances travelled in search for forage and water in the study area.Variations may be attributed to season and type of animal etc. According to Ruckebush and Bueno (1978) distance livestock travelis infuenced by many factors including temperature, wind, stage ofgestation, and nutritional level.

Table 7: Pattern of rearing

Pattern of rearing	**Frequency**	**Percent**
Sedentary	84	20.6
Semi-sedentary	252	61.9

Nomadic	71	17.4
Total	407	100.0

Reasons for tribal conflicts: As illustrated in Table (8) about (77.1%) of respondents said expansion of rain-fed agriculture in the study area reduced the area of the natural rangeland. According to ELCI (2006) conflicts between agricultural and pastoral communities tend to occur, especially during drought periods.

In summary, the expansion of both mechanized and irrigated schemes under the pretext of "development" at the expense of pastoral rights has threatened the existence of pastoral economy and reinforced the feelings of neglect among pastoral communities (El Hadary, 2007).

Table 8: Reasons of tribal conflicts between pastorals and farmers during movement

Expansion of agriculture on rangeland	Frequency	Percent
Yes	314	77.1
No	93	22.9
Total	407	100.0

Activities by the Range and Pasture Administration (RPA): The result in Table (9) shows that more than half of households said there was a role of Range and Pasture Administration (RPA) in the study area. More than half of respondents (51.8%) said, opening fire lines were the main activity by RPA while (52.8%) said reseeding and about (52.3 %) excavation of *hafir* were the main activities. According to the interview held with RPA staff in New-Halfa they reported that all livestock depend on natural rangeland, and the rangeland is deteriorating in recent years due to the continued decrease in the amount of rainfall and poor access to funds.

Table 9: The most important activity by the (RPA)

	Open fire lines		Reseeding		Hafirs		Other	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Yes	211	51.8	215	52.8	213	52.3	31	7.6
No	196	48.2	192	47.2	194	47.7	376	92.4
Total	407	100.0	407	100.0	407	100.0	407	100.0

CONCLUSION:

Conflicts between agricultural and pastoral communities are a result of shrinkage of pastoral land due expansion of agriculture, increase intensity of animals and climate change which led to deterioration of natural rangeland in the study area. The study recommended rangeland should be improved by government through availing animals' services, reseeding and proper distribution of water points.

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