

**CAMELS' HERDING IN RELATION TO RANGELANDS RESOURCES IN BUTANA AREA (CENTRAL SUDAN)**

By  
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**ABSTRACT**

This study is conducted in south Butana area, (Rawashda forest). This area is considered central for the nomads during their seasonal movement from the summer domains near Rahad River to north butana at the onset of the rainy season. Nomads use the area as a resting place during their movement.

The objective of the present study is to investigate the grazing and browsing resources in relation to herd and herding structures requirements, because information in this respect is limited. Socioeconomic survey that covered 55 nomads' families was done to complete the picture.

Sampling for herbaceous cover is based on four sampling plots, each of 200x200m, determined following the *Releve* method and minimal area. Four transects, 200m. long each is used for measurements in each plot. Browse assessment is done in two circular samples each of an area of 0.01/ha located in forested site. For the socioeconomic studies fifty five families were surveyed using a questionnaire.

The herbaceous assessments included cover, composition, density and biomass. The equipments used for data collection were Loop, 1m<sup>2</sup> quadrat, compass, and 100-m. tape.

Within the circular sample plots, tree density and available browse were determined using direct count method and twig weight at browsing point (dbp) to assess available browse.

The study has concluded that, camels herders in Butana are the majority (53%). Herding different types of livestock. all of them are regularly using north Butana as rainy season domain, while 73.3% of them use summer domains

The result has shown that, Rawashda forest constitutes an important source of feed for their livestock during the rainy season. The small number % of those do not use summer domains, stay around river Atbra or the villages around.

The dominant herbaceous species in the area are *Justica flava*, and *Chorchorus spp'* both are less preferred by animals, indicating intensive selective grazing and hence disturbance in grazing browsing ratio.

Distribution of the livestock grazing between the forest and range sites in Butana is not balanced, and may result in range land deterioration. The low availability of browse of *Acacia seyal* in south Butana compared with *Acacia mellifera* in its north for nearly the same density, indicates the need of more trees of *seyal* to yield the same browse as *A. tortilis*.

The low percentage of *Acacia seyal* browse ratio compared with graze is a fact of tree density and height. These variables should be incorporated in the management prescription of the rangelands in the area. Grazing browsing/ratio should also be looked at in relation to range quality and not only biomass productivity (quantity).

The percentage of camel herding in Butana required more work toward management of browsing resources in the area.

#### المخلص:

تم إجراء هذه الدراسة في جنوب منطقة البطانة (غابة الرواشدة)، حيث تختبر هذه المنطقة الموقع الأوسط لمرحال الرعاة من منطقة المصايف قرب نهر الرهد إلى منطقة شمال البطانة، كما و أنها منطقة استراحة خلال حركة الترحل. هدفت الدراسة إلى استقصاء الموارد الرعوية العشبية و الشجرية و ملائمتها لتركيب القطيع المستخدم لها و استدامة منظومة هذا الاستخدام من ناحية بيئية مع التركيز على الموارد الرعوية الشجرية و نمط استخدام الجمال لراعي البطانة و ذلك نسبة لقلة توفر المعلومات في هذا الإطار. كما تم تحليل نمط الاستخدام من خلال دراسة اجتماعية اقتصادية شملت 55 أسرة من الرعاة.

تم اخذ عينات إطارية بأبعاد 200 م X 200 م في كل من للرعى الشجري و الفتوح تم تحليل مساحتها حسب قاعدة الـ (Releve) ومساحة التمثيل الشامل الصغرى (minimum area theory). أما القياسات الشجرية تم أخذها داخل عينات دائرية مساحتها 0.01 هكتار.

شملت قياسات المراعي العشبية على الكثافة، التردد، الغطاء النباتي، السيادة النباتية باستخدام جهاز اللوب والشريط الطولي (100م). العلف الشجري للتاح تم تحديده بواسطة قطع الأفرع على مستوى القطر عند



نقطة القضم لعدد خمسة أفرع من كل شجرة لعدد 15 شجرة في كل عينة، ثم حساب العلف المتاح بضرب متوسط وزن الغصن في متوسط عدد الأفرع المتاحة للشجرة ثم حسابه للهكتار حسب كثافة الأشجار.

شمل السح الاجتماعي الاقتصادي على استبيان اشتمل على تحديد نمط و آلية استخدام المرعى لعدد 55 أسرة من الرعاة.

أظهرت نتائج الدراسة ان جميع الرحل يذهبون إلى شمال البطانة كمنطقة مخارف كما ان غالبيتهم يقومون بتربية الجمال 53%. وجدت الدراسة ان النباتات السائدة في المرعى العلفي العشبي هي نباتات الفخة والخضرة حيث يعتبر هذا مؤشر لتدهور المرعى مما يؤدي إلى لجوء الرعاة لعقر الأشجار لتغطية فراغ العلف الشجري، كما نلاحظ ان هنالك كثافة عالية للمرعى في المناطق المفتوحة مما يؤدي إلى الزيد من التدهور و بالتالي اختلال نسبة العلف العشبي إلى الشجري.

تمت المقارنة مع الدراسة التي أجريت في شمال البطانة لتحديد العلف الشجري لأشجار الكثر والسيال (2003) نلاحظ ان إنتاجية العلف الشجري لشجرة الطلح في جنوب البطانة اقل بكثير مقارنة بشجرة السيال بالرغم من تشابه الكثافة الشجرية مما يستدعي مراعاة ذلك في إدارة المراعي في منطقة جنوب البطانة خصوصا ان نسبة العلف الشجري للعشبي وجدت قليلة حيث تساوي 1:9.

يجب النظر إلى نسبة العلف الشجري و العشبي ليس فقط من الناحية الكمية وإنما أيضا النوعية حيث تؤثر أفضلية الحيوان للنباتات على معدل استخدامه له. إن النسبة العالية لممارسة رعي الجمال بواسطة الرعاة تستدعي الاهتمام بمكون العلف الشجري في المرعى لضمان استدامة المحافظة على هذا الحيوان في هذه البيئة.

## INTRODUCTION

Butana area is one of the unique grazing lands in central Sudan that is used by large numbers and different mixtures of livestock. Since Butana is semi-arid area, camels are among the main livestock types using it. Camel herding requires rangeland that provides reasonable browse together with graze, in ratios that suit grazers and browsers requirements.

Rawashda forest, is located 45km north east of Gedarif town, along the main high way to Kassala. This forest has an area of 60,000ha, nearly 85% of

its cover is *Acacia seyal*. The forest constitutes the main resting place for nomads passing from the summer domain to north Butana. Results of this study were compared with another study covered north Butana, investigated the browse resources for *Acacia melliera* and *Acacia tortilis*.

Knowledge of browse assessment, utilization and related information under Sudan conditions is limited. Branes, (1982) indicated that, little is known about browse production in savanna in general and in semi arid areas in specific, where livestock raising is primary land use

The main objective of this study was to provide essential information about camels herding in relation to range resources in Butana of central Sudan.

### MATERIALS AND METHODS

The study was conducted in the central area of the transhumants route, about 45 Km north east of Gedarif town. Pattern of range resources utilization were assessed in an open and forested sites in Rawashda forest, late in the rainy season of October 2004. The assessment covered herbaceous cover and browse resources, in addition to socio-economic investigation that covered herders and herding patterns. Camels herding as practiced was matched and contrasted with the quantitative and qualitative range resources in the southern and northern parts of the Transhumant routes of the herders using Butana area.

**Sampling Procedure:** The sampling procedure for herbaceous cover was based on locating four square sampling plots, each with an area of two ha (200x200 m), the selection of plots, their location and size determined following the Releve method and the theory of minimal area (Michael *et al*, 1987). In each plot two perpendicular transects each of 200 m long crossed at the centre of the plot, were marked (figure1). For the browse assessment two circular samples each of an area of 0.01/ha were located in forested site (inside Rawashda forest), while the other sample was in the open. For the socioeconomic studies fifty five families were randomly selected and surveyed using a questionnaire.

**Measurement:** Measurements were conducted by a team composed of the researchers and two assisting experienced workers.

**-Herbaceous cover:** To assess herbaceous cover, measurements taken included vegetation cover a composition, density and biomass. The equipments used were a Loop, 1m<sup>2</sup> quadrat, compass, scissors and a 100m tape.



Species composition is generally expressed in percent, so that all species components add up to 100%. The vegetation composition was measured along each 100m transect where plant species were recorded with 3/4-inch loop hits, resulting in 100hits in each transect. The readings were recorded in a sheet at 1m. intervals. Percentages of plants composition for species was obtained by dividing its total number of hits along the transects by 100 (the total number of hits).

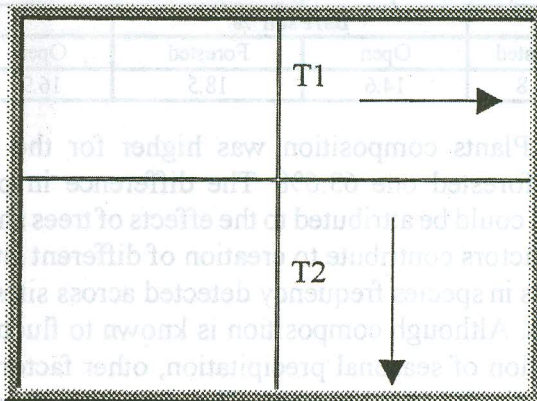
Density describes the number of individual plants in a given area. This was obtained for the key plant species, where the total number of plants were determined by counting them inside the one quadrat at 20m interval along the transect.

The vegetation cover, is the vertical projection of plant materials on the ground when viewed from above. It is usually expressed as a percentage value. It was determined by locating 1×1m quadrat along the transects and at 20m intervals.

To determine biomass, which refers to the weight of plant material within a given area, plants materials from each quadrat along the transects were harvested at a level of 2.5cm, then in labeled paper bags. Dry matter contents were determined by drying the sample in an oven, at (75°C, for 48hours). The dry weight obtained using a digital balance. Productivity was obtained for herbaceous cover.

**-Browse assessment:** Within the circular sample plots, trees density and availability of browse were determined using direct count methods. In each plot the number of trees was recorded, the diameter at browsing point (dbp) was determined for 5branches covering 15randomly selected trees in each plot. The assessment of available browse based on cutting the 5branches up to (dbp), drying them, then multiplying their average weight (gm) by the total estimated number of twigs/tree. .

**-Socioeconomic aspects:** Socioeconomic survey conducted using a questionnaire, which covered herders' families who are using range resources, and the herding pattern, herd types and structure, mobility, time and directions of movements. Chi square has been used to analyze the socioeconomic data.



**Fig. (1): layout of transects inside the sample plots**

**RESULTS AND DISCUSSIONS**

Rangelands resources in term of vegetation cover and water are the main factors dictating the pattern of livestock distribution and use. The suitability of range for certain animal types depends on how range characteristics fulfill the requirements of that class of livestock. Camels are mainly browsers and for this they suit rangelands that have reasonable availability browse. Herd mixture may imply existence of specific grazing browsing ratio that could suit the pattern of use imposed by such herd structure.

**Herbaceous Cover Assessment**

**Cover:** The results showed that, unlike bare soil and litter herbaceous cover percent was higher in the open range compared with the forested plots, 54% and 33.8% respectively (Table 1). This could be explained by the concept of trees grasses relationships. According to Wijngaarden, (1985), for each 10% increase in woody perennial cover, herbaceous cover declined by 7% reaching zero cover when the woody canopy reached 90%. On the other hand litter percent is higher under trees 22.8 compared with the open 16.9%. There is always a need to match herding structure with the available grazing and browsing resources, especially in the areas of intensive camels herding. Required cover percent is expected to ensure optimum browsing grazing ratio that expected to meet grazers and browsers requirements.



**Table (1): Cover, bare soil, and litter percentages for the open and forested rangeland sites**

Cover %		Bare soil %		Litter %	
Open	Forested	Open	Forested	Open	Forested
54	33.8	14.6	18.5	16.9	22.8

**-Plants Composition:** Plants composition was higher for the open site 93.6% compared with the forested one 63.6%. The difference in plant composition between the two sites could be attributed to the effects of trees shade, moisture and soil, since all these factors contribute to creation of different site characteristics.

The variations in species frequency detected across sites are due to factor of site characteristics. Although composition is known to fluctuate in relation to amount and distribution of seasonal precipitation, other factors such as grazing intensity, type (selectively) may interact. The dominant species in both sites was *Justica flava*, while *Corchorus spp.* ranked number two in term of frequency in the two sites. Dominance of *Justica flava*, and *Corchorus spp.* is an indication of intensive selective grazing, since the first species is less preferred by animals. In such situation nomads may lop trees to feed small stocks, which is an indication of disturbance in grazing browsing ratio. This ratio should also be looked at in relation to range quality as well as biomass productivity (quantity).

**Table (2): Percentages of species composition and frequency in the open and forested range sites**

Open Site			
Frequency		Composition	
Species	%	Species	%
<i>Justica flava</i>	97.5	<i>Justica flava</i>	51.38
<i>Corchorus spp</i>	62.5	<i>Chenopodium spp</i>	1.5
<i>Abutilon spp</i>	60	<i>Euphorbia spp</i>	0.5
<i>Indigofera spp</i>	45	<i>Solanum dubium</i>	0.12
<i>Euphorbia spp</i>	23.5	<i>Aristida spp</i>	0.63
<i>Cassia tora</i>	23.5	<i>Cassia tora</i>	1.25
Forested Site			
<i>Justica flava</i>	90	<i>Justica flava</i>	30.88
<i>Corchorus spp</i>	12.5	<i>Euphorbia spp</i>	12.75
<i>Leucas urticifolia</i>	10	<i>Aristida spp</i>	6.13
<i>Indigofera spp</i>	10	<i>Striga spp</i>	1.25
<i>Convolvulus spp</i>	5	<i>Sorghum halpense</i>	0.25

**Density:** According to (Table 3) plant density was higher in the forested site 37/m<sup>2</sup> compared with 24/m<sup>2</sup> in the open one. The variations in density between the different sites might reflect the different sites characteristics. According to (Guy, 2001), the relative abundance of different species is ultimately controlled by the different abilities of species to extract limited resources from below-ground (water, soil nutrients) or aboveground sources (light, carbon dioxide). Intensive grazing in open areas is another factor which may cause this difference.

**Biomass:** The results in (Table 3) show that, the biomass productivity was 0.73ton/ha in the open compared with 0.48ton/ha under trees. Rains and (Dassam, 1979) developed a non-linear relationship where at 20% woody cover total dry matter was reduced to 73% and to 17% when the ligneous stratum reached 60%. Grazing reduces standing biomass through forage consumption and associated trampling of vegetation. Trampling also accelerates litter decomposition (Hiernaux, 1989).

**Table (3): Plant density per /m<sup>2</sup> and productivity (ton/ ha) for open and forested sites**

Density		Productivity (ton/ ha)	
Open 24/m <sup>2</sup>	Forested 37/m <sup>2</sup>	Open 0.73	Forested 0.48

**Tree density and available browse:** Results of the tree density and available browse for *Acacia seyal* are shown in (Table 4). The density of trees found to be 300tree/ha, with available browse of 0.07(ton/ha.). *Acacia seyal* is the dominant tree type in south Butana area, mainly the Rawashda forest which constitutes the main resting place for the nomads during their migration from the summer domains in the south to the rainy season domains in north Butana. These results were compared with those for *Acacia mellifera* and *Acacia tortilis* (Gaiballa *et. al.*, 2003) for a study conducted in forested sites in north Butana. The available browse for *A. tortilis* and *mellifera* were extremely higher compared with the results obtained in this study for *Acacia seyal* (Table 5). This came mainly as a result of variations in density, available browse at the browsing level and other morphological features. (Skerman, 1977) indicated that, it is unwise to encourage thicket-forming species, although they are usually the more suitable forage trees for each ecological niche. According to (Sauer *et. al.*, 1977) and



Cooper *et al.* (1980), those morphological features do not prevent animals from feeding but reduce bite size and biting rate. More tree density will be required for *Acacia seyal* to yield the same browse compared with the other tree under Butana conditions.

**Table (4): Tree density and available browse for *Acacia tortilis* and *Acacia mellifera* in southern Butana area**

Species	Average density tree/ha.	Browse (ton/ha)
<i>Acacia seyal</i>	300	0.07

**Table (5): Tree density and available browse for *Acacia tortilis* and *Acacia mellifera* in northern Butana area.**

Species	Average density/ha	browse (ton/ha)
<i>Acacia tortilis</i>	278	1.251
<i>Acacia mellifera</i>	69	0.572

Source: Gaiballa *et al.* 2003

**Grazing Browsing Ratio:** The grazing browsing ratio is a good indicator for the balance between the tree and herbaceous covers and hence between browse and graze resources. Although in many cases there is a reciprocal relation between these components, but in some conditions and due to special considerations, this may not be the case as with *Fedherbia albida* (haraz tree). Grazing browsing ratio may not only indicate the production balance of two layers, but also it tells the usable amount from both layers. According to (Table 6) the browsing grazing ratio in the study area was 1: 9 (0.07: 0.6ton/ha). The low percentage of the browse ratio compared with graze is a fact of tree growth especially density and height. These are the two variables that significantly affect available browse productivity and should be incorporated in the management prescriptions of the rangelands of this area.

**Table (5): Browsing Grazing ratio**

Browse	Graze	ratio
0.07 ton/ha	0.6 ton/ha	1: 9

**Socioeconomic Aspects of Livestock Herders:**

**Main Activities:** Table (7) shows that, there was high significant difference at P (.000) among the nomads according to the diversification of income sources, 96.7% of them depend on herding and only 3.34% on other activities. Exclusive



pastoralists are livestock raisers who grow no crops and simply depend on the sale or exchange of animals and their products to obtain foodstuff. Such producers are most likely related to nomads (Blench, 2001).

**Table (7): Percentages of nomads and settled groups according to diversification of income sources**

Economic activities	%
Herding	96.66
Herding /Other	3.34
Df	1
Sig	***

**Preferred Grazing Sites:** Table (8) shows that, there were significant differences at P (.001) among the nomads according to preferred grazing sites, 80% of them preferred using an open site followed by 20% preferred grazing in forested area. This may be attributed to the reason that, the forage productivity was higher in an open compared with the forested area. On the other hand grazing under trees as required by camels, is considered better in many ways, but this is not absolutely the fact because during the rainy season, there is no need for shade, since it is normally cloudy and humid. Uneven distribution of the livestock grazing between the forest and range sites, may lead to concentration of animals in certain parts in the rangeland while other parts are left underused, which may cause rangelands deterioration including tree lopping. Mixtures of livestock (grazers and browsers) are more friendly users of varied range resources. According to (Adams, *et al.* 2004), poor livestock distribution is one of the major causes of unhealthy rangelands and may also reduce the production potential.

**Table (8): Percentages of nomads and settled groups according to preferred grazing sites**

Selection grazing site	%
Grazing in open site	80
Grazing in forested	20
Df	1
Sig	**

**Herds Structure:** Table (9) shows that, there were high significant differences among the nomads according to type of herd structure, 20% herding sheep, 3.33% goats, 16.66% cattle, 53.33% camel, 3.33% cattle, goats and sheep and 3.33% sheep, camel , goats and Cattle. It observed that camels herders are the



majority (53%). Herding different types of livestock may be attributed to the need of coping with different conditions. Camels and sheep are more tolerant to mobile life and harsh environment, while cattle are less tolerant. Nomads like to keep large number of camel and sheep because they are easy to be managed and watered, in addition to that, sheep are more marketable and help to earn money compared with goats. In a general sense, the entire concept of nomadic life may be considered as a mean of coping with and exploiting highly variable resources. This is made possible through the ability of nomads to maintain several species of diverse herds of livestock camels, cattle, sheep and goats and by their geographical mobility. The use of different livestock species has ecological and economic implications (Niamir, 1991).

These variations in herd structure may be attributed to the reasons that, all the users had different numbers and types of livestock and during the grazing period, livestock select between the plant species and use different type of range. Cattle and sheep rely in large part on grass (but also some forbs and browse especially in the dry season), while camels and goats rely mainly on browse. According to (Le Houerou, 1980) different animal species fill different ecological niches and therefore may be more efficient than a single species.

**Table (9): Livestock structure among the nomads using Butana area**

Category	%
Sheep	20.00
Goat	3.33
Cattle	16.66
Camel	53.33
All types including camels	3.33
All types without camels	3.33
Df	5.00
Sig	***

**Regularity of Using Rainy and Dry Season Domains:** The results show that, all nomads were regularly using rainy season domain while 73.3 of them use summer domains. The forest constituted an important source of feed for their livestock in the rainy season. This may be attributed to the reason that, during the rainy season nomads, have to move north from the summer domain because of clay and flies, and they may stay for a while in the forest because this is the only available area grazing, while most other areas usually covered with the

rain fed agricultural crops. The small percent of those do not use summer domains, are those who stay around river Atbra or the villages around.

**Table (10): Percentages of nomads' regularity in using rainy season and Summer domains**

Regularity	Domain	
	Summer	Rainy Season
Regular	73.33	100
Not regular	26.67	0
Df	1	-
Sig	**	-

### CONCLUSIONS

Camels herding is an important practice among nomads in Butana area. It requires rangeland that provides reasonable browse resources. Studies in this aspect is rather limited. Investigation by this study revealed the following conclusions:

- It is found that camels herders in Butana are the majority (53%). Herding of different types of livestock is attributed to the need for coping with different conditions. Camels and sheep are more tolerant to mobile life and harsh environment, while cattle are less tolerant
- The result showed that, all nomads were regularly using north Butana as rainy season domain, while 73.3% of them go to summer domains. Rawashda forest constituted an important source of feed for their livestock during the rainy season. The small percent of those who do not use summer domains, are those who stay around river Atbra or the villages around.
- The dominant herbaceous species in open and forested range sites in south Butana was *Justica flava*, while *Chorchorus spp* ranked number two in terms of frequency in the two sites. Dominance of *Justica flava*, and *Corchorus spp*, which are less preferred by animals, is an indication of intensive selective grazing and hence disturbance in grazing browsing ratio. This situation in many circumstances make nomads lop trees to feed small stocks.
- Uneven distribution of the livestock grazing between the forest and range sites in Butana, lead to concentration of animals in certain parts of the rangeland, while other parts are left underused. This may cause rangelands



deterioration including tree lopping. Mixtures of livestock (grazers and browsers) are more friendly users of varied range resources.

- Due to low availability of browse of *Acacia seyal* compared with *Acacia mellifera* for nearly the same density, more trees will be required for *Acacia seyal* to yield the same browse compared with the other tree.
- Grazing browsing ratio should also be looked at in relation to range quality and not only biomass productivity (quantity).
- low percentage of browse ratio compared with graze is a fact of tree growth especially density and height. These are the two variables that significantly affect productivity of available browse and should be incorporated in the management prescription of the rangelands of Butana area.

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