

**Studies on some camel (*Camelus dromedarius*)  
production traits, health and constraints  
in Butana area, Sudan.**

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## Abstract

This field study was conducted in Butana area, northeastern Sudan to update previous data on dromedary herd population and production systems and to update the previous knowledge on the constraints affecting traditional camel management practices in Butana region.

In this study, the phenotypic features of the two main racing camel subtypes as well as the other baggage Sudanese camel subtypes in Butana area were described. Also the speed of the two most famous Sudanese racing breeds, *Annafi* and *Bishari*, were examined and compared. The study showed a continuous and persistent decline in the total number of camels in the study area which contradicts the common believe among the animal resources authorities who always assume a fixed positive growth factor of camel herd in Sudan. The study also showed a current significant change in the mode of camel husbandry in eastern Sudan characterized by decreasing percentage of camel herders practicing transhumance in contrast to an increasing percentage of sedentary camel herders indicating a change in the lifestyle of camel herders towards settlement and sedentary mode of camel production. The same constraints facing traditional camel husbandry in Butana were found persistent over two decades (1986 – 2006) which was considered a real indication of the negligence by the government and official authorities towards the traditional camel nomads in the Butana region.

Therefore, the manuscript proposed some recommendations in order to alleviate the constraints facing traditional camel husbandry in northeastern Sudan and to improve the livelihood of camel nomads in the study area.

## Introduction

Camels are the most capable animal species in utilizing marginal areas and in survival and production under harsh environmental conditions (Knoess, 1977; Gauthier-Pilters and Dagg, 1981; Hjort and Hussein, 1986; Abbas and Tilley, 1990, Schwartz, 1992). Many pastoral groups and communities in diverse eco-zones throughout the world are depending on camels for their livelihood. This dependence consists of utilization of camel meat, milk, leather and wool, exportation of live camels, uses as an important sport and tourism resource as in the Arabian Gulf countries and, lastly, the use of camels as animals for packing, transport and riding (Wilson, 1984; Abdurahman and Bornstein, 1991; Kohler-Rollefson, 1992; Snow *et al.*, 1992).

In eastern Sudan, camels (*Camelus dromedarius*) are raised mainly in Butana region and Red Sea coast. In the former, the camel population was estimated around 750.000 head representing 25% of total Sudan camel herd population (Darosa, 2005). The main camel keeping tribes in Butana region are the *Lahawiyin*, *Kawahla*, *Shukriya*, *Rashaida*, *Bija* and *Bawadra*.

Camel research in the Sudan has been focused mainly on functional anatomy, diseases and reproduction. However, research on husbandry and management systems, feeding and nutrition and production performance are scanty (Majid, 2000, Majid, 2006). In the last few years some new modes of camel husbandry practices were developed for the improvement of the traditional systems of camel keeping methods. This paper presents data on dromedary herd population and production systems in Butana region, northeastern Sudan, with regard to breeds and herd structure and with special emphasis on the impact of grazing systems on camel production in the study area. Moreover, the constraints affecting

traditional camel management practices in Butana region were emphasized and detailed.

### **Materials and Methods**

**Description of the study area:** Butana plain is a semiarid clay region, covers most of the present Kassala and Gedaref States in Eastern Sudan. It lies between Latitude 13°40' and 17° 50' North and Longitude 32°40' and 36° 00' East. It is bound by the Main River Nile on its northwestern border, the Blue Nile on its southwestern edge, the Atbara River in the northeast and by the railway connecting Kassala and Sennar in the south. The area is composed of mountainous ranges intersecting the plain to the western and southern borders. It is crossed by many seasonal rivers namely, Atbara, Seitite, Ba-Salam, Gash and Rahad Rivers. Small temporary seasonal valleys do run through these plains during the rainy season. The rocky basement complex forms the geological underlining of Butana plains with sandy and stony soils in the north, light non-cracking clay in the Central, Eastern and Western regions and dark cracking clay in the South. As a result of this and with the exception of small water catchments in the mountains mentioned before, very limited water resources are available. Seasonal shallow surface water wells are present as well as few very deep bore wells. However, the amount of water and the persistence of reserves during the summer dry season depend on the quantity of rainfall during the wet season. In the Butana, a tropical continental climate prevails ranging from a sub-equatorial condition with rain in the south to desert climate in the north. Most of the rains are in the form of showers or thunderstorms. The rainfall in Butana region is highly variable from one year to the other. It ranges between 600 mm/year in the southeast to less than 100 mm/year in the northwest. As always in the semiarid regions, rainfall is the most important climatic factor in Butana because people and their livestock depend on this factor which supports

the growth of the vegetation for their animals. The annual mean temperature ranges from 32°C during the day to 16°C at night in January (winter) and from 46°C during the day to 27°C at night in May-June (summer). Two vegetation zones are existing in the area, namely semi-desert *Acacia* shrub and short grasslands of the North Central Sudan and secondly, the low woodland savannah of central Sudan. The vegetation of Butana is constantly changing as a result of annual rainfall, accidental fire outbreaks and expansion of agriculture and grazing (Saint-Martin *et al.*, 1992).

The Butana area is inhabited by transhumant camel owning tribes in its northern part while its southern part is populated by agro-pastoralists who practice mainly mechanized rain-fed agricultural activities for production of sorghum and sesame grains besides considerable livestock raising activities.

### **Methods of data collection**

To achieve the objectives of the study a comprehensive questionnaire was designed and implemented covering all aspects of study parameters. The questionnaire was based on a model previously tested in Saudi Arabia, Niger and Butana area of Sudan (Abbas *et al.*, 1992). Little modification was made on the questionnaire to suit the conditions, local situations and requirements of the present study. The study aspects included in the questionnaire comprised of camel herd population, composition and structure, socioeconomic aspects of camel husbandry, production and reproduction systems and, finally, constraints hindering camel production in the region. Throughout the study period which was conducted in the rainy season of the years 2001, 2002 and 2003, the herders and households of 209 camel herds belonging to the major camel keeping tribes in Butana region were interviewed. The questionnaire was executed after a number of herders and local community leaders were

consulted to convey to the pastoralists the objectives of the study and to request their co-operation with the study team members to obtain reliable data. Small amounts of animal medicines were provided as incentive to cooperative herders.

All adequately completed questionnaire forms were statistically processed and analyzed using the suitable and appropriate statistical programmes.

## Results

In the study area, camels are found to be belonging to two main types, namely, the heavy, slow baggage *Arabi* type and the light fast riding or racing type. The former type includes the *Arabi* and *Rashidi* or *Diaili* subtypes while the latter type includes the *Annafi* and *Bishari* subtypes. The names of these subtypes are exclusively indicatives of the tribes owning these camel subtypes. The adult male *Rashidi* was found to have an average live body weight of  $521 \pm 28.3$  kg while the adult female was found to weigh  $564 \pm 20.6$  kg. The average live body weight of the male *Arabi* subtype was found to weigh  $684.1 \pm 58.5$  kg while the female was found to have an average live body weight of  $599.1 \pm 30$  kg.

The total number of camels of the respondent interviewees when compared in the years 1984, 1994 and 2003 was found to show significant decline (Table 1).

The number of camels as distributed according to the different camel keeping tribes in Butana region is shown in Table 2. There was a significant difference in the total number of camels belonging to the different tribes throughout the last twenty years except for the *Bawadra* tribe particularly during the last ten years (1994 – 2003). The study also revealed that the main source of replacement of camels in the studied herds was the newly born camel calves in contrast to the other sources

such as purchases, gifts or loans. On the other hand, the study revealed that the main reason for the decrease in number of camels in the studied herds was the death followed by sales then other reasons.

The increment in the total number of camel herd population was found positive increase (5.2%) in the sedentary herds compared to negative increment (-18.5%) in the camels managed in the open mobile grazing systems.

Table 3 shows the distribution of camels in the studied herds according to the sex and age structure. It was found that the male camels in the studied herds constituted a lesser percentage (25.6%) in the total herd composition compared to the females (74.4%).

The systems of camel husbandry in the study were found to be composed of pure nomadic or transhumant system, semi-nomadic system and sedentary systems based on the type of residence and seasonal movements practiced by the camel herders (Table 4). It was found that the semi-sedentary open grazing system of camel management in Butana region was practiced mainly by the *Bawadra* tribe while the open migratory grazing system was practiced by the *Kawahla*, *Rashaida*, *Lahawiyin*, *Diweihiyin* and *Bija* tribes.

The average daily milk yield of five lactating camels in the open grazing system throughout one year was found to be 4.24 kg while the average total milk yield of these camels per lactation was found to be 1654.4 kg. The average daily milk yield of three lactating camels in the sedentary system throughout one year was found to be 7.5 kg while the average total milk yield of these camels per lactation was found to be 2925 kg.

When the speed, during racing, was compared between the *Annafi* and *Bishari* light breeds, the latter was found to be faster than the former

at the start of the race. However, the speed of the *Annafi* was found to be more persistent in the longer distances compared to the *Bishari* (Table 5).

The constraints affecting and limiting camel growth and development are arranged in descending order in Table 6. Some of these constraints are experienced throughout the year such as the duplication of taxes collected by the government personnel, high prevalence of diseases accompanied by lack of animal health services and, thirdly, lack of security. However, some of the constraints showed seasonal attitude such as lack of water and forage resources which are magnified during the summer dry season while some other constraints are experienced during the rainy season. The lack of migratory routes for the camels when crossing the expanded and encroached agricultural schemes as well as the difficulties in marketing the camels and camel products to meet the ever increasing life expenditure are examples of the constraints experienced during the rainy season.

The specific camel health and disease constraints are detailed in Table 7. These diseases included mange, trypanosomiasis, pneumonia, camel pox, *Ghodda* (septicaemia and abscessation), *Haboub* syndrome (muscular stiffness), helminths infection and anthrax.

## **Discussion**

Camel research in Sudan has been focused for a fairly long time on functional anatomy, physiology, reproduction and diseases (Malek, 1959; Karib, 1961; Agab, 1993). However, research and detailed information on camel breeds, husbandry, management systems and production performance are scanty. Moreover, the impact and influence of agricultural encroachment on the traditional camel natural range resources as well as the new factors of the occurring changes in camel nomadism are rarely, if ever, studied. Therefore, the results presented and

discussed in this manuscript were part of a pilot field study aimed to update the changes in camel herds and their structure, particularly camel population including breeds, herd structure and composition, production and productivity parameters and the socio-economics of camel rearing together with the current traditional practices and systems and constraints that hinder camel production in Butana region.

The dromedary camels of Butana are classified, according to body conformation, into two groups; the slow heavy pack or baggage type and the light fast riding or racing type. The former type is much heavily built, with balanced appearance of face and hindquarters. The shoulder and rump are relatively short and sloping steeply. The hair is often longer and coarse. The legs appear shorter and sturdier with large feet. The riding or racing type, on the other hand, is slender with a long and leveled shoulder, long legs and small feet. This classification and description largely agree with what has been previously mentioned by Gillispie (1962) and Schwartz and Dioli (1992). This description confirmed that Sudanese camels are multi-purpose animals and are true beasts of burden that can be used to perform a wide diversity of purposes (Burgemeister, 1975; Schwartz, 1986).

The pastoral camel herd population in the study area showed great variation and significant difference in number between years 1984, 1994 and 2003. It indicated a continuous and persistent decline in total number of camels in the study area as revealed by the samples investigated. This fact contradicts the common believe among the animal resources authorities, officials and policy makers who always assume and consider a fixed positive factor of camel herd growth in Sudan without considering the negative impact of many growth inhibiting factors. The Ministry of Animal Resources and Fisheries assumed an annual increase in camel population over a period of 10 years (1.5% increment per

annum) (MOARF, 2002). One of the causes of false camel population estimates is the migratory lifestyle practiced by the camel herders. Throughout the year, the pastoralists move between two or three States of Eastern Sudan. To avoid taxes duplication, camel pastoralists used to give false information about the real State to which their camel herd belong, which may lead to over estimation of camel population in the State and whole country.

The two most famous racing Sudanese camel breeds, *Annafi* and *Bishari*, are well-known in the Arabian Gulf countries for their high and fast speed (Ali and Tahhan, 2001). Being always the winners in camel racing championships in the Gulf, these subtypes were not allowed to compete with other local Gulf breeds and special racing championships were arranged for them.

The drop in birth rate among the migratory herds in contrast to the sedentary herds as well as the increased mortality rates among the migratory herds compared to the sedentary ones agreed with the conclusions of Wilson (1984) and further proved the drawbacks of the migratory lifestyle of camel nomads. These facts in addition to the prolonged inter-calving interval of camels, the absence of twinning in this species and the high rate of off-take of camels due to increased selling rate, particularly among the females, explain the decreasing number of dromedary camels recorded in Butana region. However, camel off-take rate in Sudan was estimated by the official authorities to range between 6% and 12% whereas off-take rate of 3% – 5 % was considered as a stress on camel population and would lead to decrease in camel herd population (Schwartz and Dioli, 1992). It is interesting to note that this study showed a current significant change in the mode of camel husbandry in eastern Sudan when it recorded a percentage of 22% of camel herders as transhumant nomads in contrast to 40.7% as sedentary

camel herders. These findings were in line with the results of Abbas (1997) and Jasra and Isani (2000) who claimed a global change in the lifestyle of camel herders towards settlement and sedentary mode of camel production. This new shift in the mode of camel husbandry in Butana indicates that the classical lifestyle is now giving the way to new emerging production systems. This is accompanied with increased and encouraged rain-fed and irrigated crop production activities which may result in pushing the remaining camel nomads southward to un-hospitable eco-climate for camels due to the soil nature and high prevalence of diseases such as trypanosomiasis which may lead to further deterioration in the situation of traditional camel pastoralism. All the above mentioned limiting and hindering factors resulted into the remarkable drop in camel milk production and negative growth rate recorded in this study. Moreover, these factors together with the appearance of new and easy money-earning activities as well as the lack of some essential services needed by the young herders, such as education and health services, discouraged the young camel herders to practice this "profession". Therefore, for better development perspectives, elimination of migration and reduction of extensive rearing method of camel husbandry could improve many issues directly related to them such as poor nutrition and higher disease morbidity which were always associated with migrating herds (Agab and Abbas, 1999). Some workers in other camel rearing countries, such as India, considered the encroachment of irrigated and rain-fed cultivated crop schemes on pasture land areas as a good reason to investigate into alternate methods of large scale rearing of camels (Laval *et al.*, 1998). It worths mentioning that the illegal "robbed" pasture land used for crop production in Butana region has jumped from 120,000 feddan in the year 1945 to 3 million feddan in the year 2005 (Darosa, 2005). Previously, land allocation for pastoralists utilization in the form

of small irrigated plots (hectare/family) to be developed as “nomadist refugees” in the face of drought recurrence has been suggested in Sudan (Abbas *et al.*, 1992). It is a fact that there is no contradiction between the traditional camel herding and crop production activity, but nevertheless, these can be highly integrated activities for the welfare and benefit of the camel agropastoralist. This agropastoralist can utilize the crop for his family and feed the crop by-products to his animals leading to more and better productivity for his camel herd as clearly shown in this study by the *Bawadra* tribe which was the only ethnic group that showed less expenditure than the income among all camel keeping tribes in the study area.

The different constraints of camel production system reported in this study were in line with the constraints reported before by other workers in the study area (Abbas and Musa, 1986; Agab, 1993; Abbas *et al.*, 1992; Abbas *et al.*, 1993; Ali and Majid, 2006). Among the little studied camel constraints in Butana area, one can mention the problem of camel routes and pathways during migration through the crop farms. The width of these routes had been officially reduced over the last five decades from 10,000 meters to only 150 meter which subjected the camel herders to serious conflicts with the crop farmers (Darosa, 2005). These conflicts obliged the camel herders to use the high ways as migratory routes which also resulted into several traffic accidents leading to losses among both human and camel population. The persistence of the same constraints over two decades (1986 – 2006) is a real indication of the negligence by the government and official authorities towards the traditional camel nomads in the Butana region. However, Jasra and Isani (2000) studied the camel pastoral communities in Pakistan and mentioned that pastoralism in any form has never attracted the policy makers to invite large scale modern development interventions. Moreover, Gillispie (1962) quoted

that "In short, a degree of normal settlement is taking place. Grazing land is being lost to agriculture".

Therefore, it could be possible to recommend the following in attempts to improve the livelihood of traditional camel production herders in Butana area of Sudan:

- 1- Camel herd population and structure and the practiced production system should be under focus for keen and close monitoring and evaluation.
- 2- Clearance of camel herds from classical diseases and health ailments (e.g. trypanosomiasis and internal parasitism) using the proper curative and prophylactic regimes are needed.
- 3- Applicable intensive research projects on camel reproductive constraints should be implemented.
- 4- Interventions by the relevant and decision making governmental authorities are needed to stop man-made hindering factors and to assist the herders to tolerate the drought hardship.
- 5- Adoption of sedentary production system based on land owning policy needs to be generalized since it proved its efficiency as a better and more suitable alternative for the current classical migratory nomadic lifestyle.

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**Table 1.** Total number of camels in 209 herds in 1984, 1994 and 2003.

<b>Year</b>	<b>No. of camels</b>
1984	22793
1994	19692
2003	15026
<b>Total</b>	<b>57511</b>

**Table 2.** The owning tribes and total number of camels in the studied herds throughout the period 1984, 1994 and 2003 in Butana region, Sudan.

<b>Tribe</b>	<b>Year</b>		
	<b>1984</b>	<b>1994</b>	<b>2003</b>
<i>Kawahla</i>	6890	5625	3056
<i>Bawadra</i>	3494	3325	4251
<i>Rashaida</i>	3403	3262	2364
<i>Bija</i>	1770	1368	1330
<i>Dowehiyin</i>	4659	3847	2692
<i>Lahawiyin</i>	2577	2265	1333
<b>Total</b>	<b>22793</b>	<b>19692</b>	<b>15026</b>

**Table 3.** Distribution of camels in the studied herds according to age and sex composition.

Age group	Sex		Total
	Males	Females	
Less than one year	890 (6.0%)	1236 (8.4%)	2126
1 – 4 years	1166 (7.9%)	2366 (16.0%)	3532
4 – 14 years	1079 (7.3%)	6139(41.6%)	7218
More than 14 years	643 (4.4%)	1249 (8.5%)	1892
<b>Total</b>	<b>3778 (25.6%)</b>	<b>10990 (74.4%)</b>	<b>14768</b>

**Table 4.** Classification of camel management systems in Butana region, Sudan.

Type of management system	No. of respondents	%	Type of residence	Degree and type of seasonal migration
Nomadic	46	22.0	Tents.	Seasonally and yearly with families.
Semi-nomadic	75	35.9	Tents, huts and simple muddy temporary houses.	Limited only to rainy years with families.
Sedentary	85	40.7	Muddy or brick-made houses + tents.	Limited distance, migration for herds only without families.
None	3	1.4	-	-
Total	209	100	-	-

**Table 5.** Camel speed of the two breeds (*Annafi* and *Bishari*).

Camel breed	3 km	6 km	8 km	10 km
<i>Bishari</i>	4.55 min.	9.55 min.	14.0 min.	18.30
<i>Annafi</i>	4.55 min.	10.30 min	13.50 min.	17.30

**Table 6.** Ranking of camel growth and development constraints.

Season of severity	Constraints	Respondent ranking	%
<b>All year</b>	Duplication of taxes	1 <sup>st</sup>	98.1
	Lack of veterinary services	2 <sup>nd</sup>	96.7
	Drought	3 <sup>rd</sup>	87.6
	Camel diseases	4 <sup>th</sup>	65.9
	Lack of security	5 <sup>th</sup>	51.7
	Shortage of labour	6 <sup>th</sup>	18.0
<b>Summer</b>	Lack of water resources	1 <sup>st</sup>	97.6
	Lack of forage resources	2 <sup>nd</sup>	94.7
	High calf mortality	3 <sup>rd</sup>	74.2
<b>Autumn</b>	Lack of migratory routes	1 <sup>st</sup>	85.2
	Encroachment of agricultural schemes	2 <sup>nd</sup>	85.0
	Marketing of camels and camel products	3 <sup>rd</sup>	75.0
	Disappearance of some palatable forage plants	4 <sup>th</sup>	68.0

**Table 7.** Diseases affected camels in Butana region during the study period.

<b>Disease</b>	<b>Local name</b>	<b>No. of infected camels</b>	<b>Mean No. infected per herd</b>	<b>Percentage of total herd infection</b>
Mange	<i>Djarab</i>	1928	9.2	29.3
Trypanosomiasis	<i>Gufar</i>	1538	7.4	23.3
Pneumonia	<i>Nihas</i>	818	3.9	12.4
Camel pox	<i>Djedari</i>	533	2.6	8.1
Septicaemia and abscessation	<i>Ghodda</i>	511	2.4	7.8
<i>Haboub</i> syndrome	<i>Haboub</i>	266	1.3	4
Helminthiasis	<i>Doud</i>	217	1.0	3.3
Anthrax	<i>Abu Dam</i>	187	0.9	2.8
Calf diarrhoea	<i>Khorag</i>	50	0.2	0.8
Ringworm	<i>Goub</i>	44	0.2	0.7
Wry-neck	<i>Kassara</i>	11	0.05	0.2