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Social Characteristics of Camel Owners and Analysis on the Contributions and Constraints to Camel Milk Production in East and Central Sudan

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Abstract

This study was conducted in Red Sea, Kasala, Gedarif and Gezira states - in east and central Sudan to assess the aspects of camel raising and constraints to camel production. A total of 114 camel owners were investigated using questionnaire in addition to interviews. The results showed that the majority of the camel owners in the study area aged between 41-55 years (42.7%), all of them were married, more than half of them (52.3%) were sponsoring families ranging in size between 4 to 10 members and most of them were illiterate 57.7%. The study found that majority of the she camels (57.5%) in the study areas are conceived at the age of 4 - 5 years and the main source of the replacement bulls was the newly born camel calves (66.5%). The results showed that the highest daily amount of camel milk produced in all studied states about 1- 8 kg (69.4 %) with an average of 4.5 kg, throughout the lactation period of about 12 months (365 days). Poor pastures and forage resources, diseases and health problems, marketing camel and their products and shepherds availability were the main obstacles facing camel breeders, respectively.

Keywords: *Socio-economic, Camel, Milk, Production, Constraints, Sudan.*

Introduction

Globally, milk productivity of camels is five times lower than that of cattle. In arid zones where camels are reared, however, the milk yield in camels is higher than in cattle. In drought-stricken areas of the world (particularly Africa), where severe drought frequently decimates cattle, sheep and goat populations, only camels can survive and produce milk. Indeed, one of the most remarkable features of camels is their ability to continue lactation and production of highly diluted milk with over 90% water content even during periods of severe draught (Faye 2004). The estimation of milk yield potential of dairy camels in Sudan is very difficult because of the variety of techniques used in measuring the quantity suckled by the young camel. The FAO statistics give 3 types of data: the number of lactating camels, the yearly milk yield per lactating female and consequently the total amount of milk produced. The proportion of lactating animals accordingly is increasing regularly. That may be probably linked to the increasing interest in milk both for the producers and the consumers. This study was, therefore, designed to assess the contributions of and

constraints to camel milk production in states of eastern and central Sudan**.**

Material and Methods

***Description of the Study Area*:** this study was conducted at Red Sea, Kasala, Gedarif and Gezira states of the Sudan.Butana plain is a semiarid clay region, covers most of the present Kassala and Gedarif and Gezira 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 (Ali and Majid, 2006).

***Data collection*:** the study was based on well-designed questionnaire to obtain data on camel milk production using complete randomized design. A total of 114 questionnaires, in addition to interviews and group discussion with camel owners were used to collect data. Some of the data collected during interview probably supported by observations. Before initiating the survey, the questionnaires were designed and pre-tested. The filled questionnaires were reviewed in the field by the survey team before proceeding to data entry. The entered data were checked for errors and consistency before undertaking analysis

***Statistical analysis*:** The data were analyzed with SPPS version 21 software. Simple descriptive statistics such as mean, range and percentages were used.

Results

Social characteristics of camel owners:

***Age*:** The results showed that the camel owners in the study area aged between 41-55 years (42.7%) followed by those aged above 56 years (30.0%), then those between 25-40 years (26.4%) and those bellow 25 years of age (0.9%) (Table 1)

Table 1: The age groups of camel owners in the study area

Ages	State				
	Red Sea	**Kassala**	**Gedarif**	**Gezira**	**Total**
Less than 25 yrs	0%	0%	3.7%	0%	**0.9%**
25 – 40 yrs	16.7%	53.8%	22.2%	12.9%	**26.4%**
41 – 55 yrs	53.3%	42.3%	33.3%	41.9%	**42.7**
More than 56 yrs	30%	3.9%	40.8%	45.2%	**30%**
Total	100%	100%	100%	100%	**100%**

***Social status*:** The study revealed that all (100%) camel owners were married.

***Education*:** Table 2 show that more than half of the camel owners were illiterate 57.7% followed by those who completed primary school (37.0%) and secondary graduates were (5.3%).

Table 2: Educational levels of camel owners in the study area

Education Level	State				
	Red Sea	**Kassala**	**Gedarif**	**Gezira**	**Total**
Illiterate	50%	42.3%	74.1%	64.5%	**57.7%**
Primary	43.4%	53.8%	18.5%	32.3%	**37%**
Secondary	6.6%	3.9%	7.4%	3.2%	**5.3%**
Total	100%	100%	100%	100%	**100%**

***Family size*:** More than half of the studied breeders (52.3%) sponsoring families with size ranging between 4 to 10 members, followed by the camel owners sponsoring

more than 10 members per family (34.1%). Small percentage of breeders (10%) sponsor families ranging in number between one and three individuals, while, the size of targeted families without individual was 3.6% (Table 3)

Table 3: Family size of camel owners in the study area

Family size	State				
	Red Sea	**Kassala**	**Gedarif**	**Gezira**	**Total**
Without	0%	7.7%	3.7%	3.2%	**3.6%**
1 – 3 persons	13.3%	26.9%	0%	0%	**10%**
4 – 10 persons	80%	50%	37%	41.9%	**52.3**
Above 10 persons	6.7%	15.4%	59.3%	54.9%	**34.1%**
Total	100%	100%	100%	100%	**100%**

Productive and reproductive performance

Reproductive performance

***Age at first conception*:** the study found that (57.5%) of she camels in the study areas were conceived at the age of 4 - 5 years, followed by (29.4%) conceived at age less than 4 years, while small proportion distributed to those are conceived when they attained above 5 years, (5.6%) conceived at about 5 years old and (7.5%) conceived when they were less than three years of age (Table 4).

Table 4: Age of she camels at first conception

Age at first Conception	State				
	Red Sea	**Kassala**	**Gedarif**	**Gezira**	**Total**
Less than 3 yrs	0%	15.4%	14.8%	0%	**7.5%**
Less than 4 yrs	46.7%	15.4%	55.6%	0%	**29.4%**
4 – 5 yrs	46.7%	53.8%	29.6%	100%	**57.5%**
Above 5 yrs	6.6%	15.4%	0%	0%	**5.6%**
Total	100%	100%	100%	100%	**100%**

***Sources of bull used in insemination process*:** The study found that the sources of males used for inseminating the female camels were either born in the herds (66.5%) or purchased (6.2%) or borrowed 27.3% (Table 5).

Table 5: Bull camels used in insemination process

Source	State				
	Red Sea	**Kassala**	**Gedarif**	**Gezira**	**Total**
From the herd	40%	76.9%	81.5%	67.7%	**66.5%**
By procurement	3.3%	3.8%	11.1%	6.5%	**6.2%**
By expatiation	56.7%	19.3%	7.4%	25.8%	**27.3%**
Total	100%	100%	100%	100%	**100%**

***Delivered she-camel during the study period*:** From table 6, the ratio of (58.7%) of females whose age was between 1 – 5 years delivered during the study period (Table 6).

Table 6: she camels Delivered during the study period

Delivered females	State				
	Red Sea	**Kassala**	**Gedarif**	**Gezira**	**Total**
1 – 5	76.7%	50%	37%	71%	**58.7%**
6 – 10	13.3%	19.2%	25.9%	25.8%	**21%**
11 – 20	3.3%	23.1%	33.3%	0%	**14.9%**
Above 21	6.7%	7.7%	3.8%	3.2%	**5.4%**
Total	100%	100%	100%	100%	**100%**

Productive performance

***Lactating she-camels during the study period*:** According to the Table 7, the ratio of females which were lactating during the study period were between 1 – 5 she camels (58.7%).

Table 7: Lactating she-camels during the study period

Lactating females	State				
	Red Sea	**Kassala**	**Gedarif**	**Gezira**	**Total**
1 – 5	46.7%	57.7%	25.9%	67.7%	**49.5%**
6 – 10	20%	15.4%	29.6%	25.8%	**22.7%**
11 – 20	26.7%	15.4%	37%	3.2%	**20.6%**
Above 21	6.6%	11.5%	7.5%	3.3%	**7.2%**

***Lactation Length of the she-camel*:** Camel owners (60.3%) reported that the length of the lactating period was 12 months, 25.3 % reported 9 months and 6% reported 6 months. Small proportion of the camel owners confirmed that it was15 months (5.1%), while, (3.3%) of the surveyed owners stated that it was 18 months (Table 8).

Table 8: Lactation Length of the she-camel during the study period

Months	State				
	Red Sea	**Kassala**	**Gedarif**	**Gezira**	**Total**
6	0%	3.8%	7.4%	12.9%	**6%**
9	10%	7.7%	22.2%	61.3%	**25.3%**
12	66.7%	84.6%	70.4%	19.4%	**60.3%**
15	13.3%	3.9%	0%	3.2%	**5.1%**
18	10%	0%	0%	3.2%	**3.3%**
Total	100%	100%	100%	100%	**100%**

***Daily milk yield (kg) of lactating she-camel during the study period*:** the results showed that the high daily yield of camel milk produced in studied states were about 1- 8 kg (69.4 %) according to the category of camel milk production which was stated in the questionnaire (Table 9).

Table 9: Daily milk yield (kg) of lactating she-camel during the study period

Milk yield	State				
	Red Sea	**Kassala**	**Gedarif**	**Gezira**	**Total**
1 – 2	13.3%	30.8%	3.7%	0%	**11.9%**
3 – 4	16.7%	11.5%	3.7%	38.7%	**17.6%**
5 – 6	23.3%	11.5%	18.5%	29%	**20.6**
7 – 8	43.4%	3.8%	7.4%	22.6%	**19.3%**
9 – 10	0%	7.7%	7.4%	0%	**3.8%**
11 – 13	3.3%	3.8%	7.4%	3.2%	**4.4%**
14 – 16	0%	7.9%	37%	6.5%	**12.8%**
17 – 18	0%	15.4%	3.7%	0%	**4.8%**
19 – 20	0%	3.8%	3.7%	0%	**1.9%**
More than 21	0%	3.8%	7.4%	0%	**2.9%**
Total	100%	100%	100%	100%	**100%**

***Constraints to Camel breeding*:** Almost of herders surveyed (92.9%) stated that the poor of pasture and scarce forage resources were one of the major obstacles facing camel breeders in the study, other obstacles include health problems and diseases of camels (40.25%), in addition to the problems of camel and the marketing of their products and shepherds insurance (15.4% and 14.55%, respectively) (Table 10).

Table 10: Constraints to Camel breeding

Constraints		State				
		Red Sea	**Kassala**	**Gedarif**	**Gezira**	**Total**
Poor pastures	Yes	93.3%	88.5%	96.3%	93.5%	**92.9%**
	No	6.7%	11.5%	3.7%	6.5%	7.1%
Feeding	Yes	50%	23.1%	96.3%	87.1%	**64.1%**
	No	50%	76.9%	3.7%	12.9%	35.9%
Health care	Yes	46.7%	23.1%	81.5%	9.7%	**40.25%**
	No	53.3%	76.9%	18.5%	90.3%	59.75%
Marketing	Yes	6.7%	7.7%	14.8%	32.3%	**15.4%**
	No	93.3%	92.3%	85.2%	67.7%	84.6%
Herders	Yes	3.3%	0%	25.9%	29%	**14.55%**
	No	96.7%	100%	74.1%	71%	85.45%

Discussion

Most of the camel owners (72.7%) were aged over 41 years, which reflected that their age exceeded the age of youth segment. The herds ownership confined in only responsible men, if we consider being married was the sign of responsibility. The owners are almost linked to illiteracy, which was very common in the pastoral society. The study found that majority of the female camels in the study areas (57.5%) are conceived at the age of 4 - 5 years. This result resemble work of (Singh, 1966; Khetami, 1970) who stated that full reproductive capacity of the female camel is reached at 6 years, but it can be bred at 3-5 years of age (Matharu, 1966; Williamson and Payne, 1978). Finding results in (Table 5) was similar to that of (Darosa, 2005) who stated that the main source of replacement of camels was the newly born camel calves. The average daily milk yield per camel observed

in this study (4.5 kg) was somewhat similar to the mean daily production of 4.14 kg per camel reported by Bekele et al. (2002). In Butana area the average daily milk yield of lactating camels in the open grazing system throughout one season was found to be 4.24 kg, while the average daily milk yield of lactating camels in the sedentary system throughout one year was found to be 7.5 kg (Drosa, 2005). In Sudan, El-Amin (1979) revealed that average milk production was 5-10 kg per day, on the other hand; Bakheit(1999) mentioned that the she-camel, in Western Sudan reared under nomadic management produced 2.36 liters of milk per day. Salman (2002) studied camel milk yield in Butana area and found that, camel's milk yield could reach 8 liters per day in the rainy season and good conditions, but at the end of summer, the amount of milk decreases to 1.38 liters/day. Gihad (1995) postulated that, it was difficult to estimate the milk yield of the dromedary under pastoralist conditions, the dam maintained on irrigated pastures could produce 5-35 Kg per day, while it can yield only 3-5 Kg per day on poor desert range. The milk yield obtained from pastorally managed camels in the study area indicated the role of camels as dairy animals and their value to the pastoral community. Since the quantity of milk produced by camels depended mainly on environmental factors such as a mound and quality of feed and water available, the climate and the level of management. There was a possibility to increase camel milk production in the study areas by improving the environmental factors. The average lactation length of camels observed in the present study is higher than the values reported by Bekele et al. (2002) (353 days). Feeding plays an important role on the lactation length and yield. In good feeding conditions, the length of the lactation period may change from 8-12 months up to 16-18 months. Anyway, the differences between breeds could be attributed sometimes to differences in feeding conditions rather than strictly genetic factors. The duration of the lactation season was dependant on the gestation status of the dam. First, the lactation could inhibit the ovarian activity and then delays the reproduction time. Second, the end of gestation may lead to a milking refusal for the dam. Generally, the lactation length increases with the calving interval. However, lactation and gestation are not incompatible. Lactation length depends on availability of feed and stage of pregnancy, during which camels stop giving milk. If not pregnant, the lactation length can be extended up to 2 years. Camel calves were not weaned until the end of lactation. 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 (Drosa, 2005, Abbas and Musa, 1986; Agab, 1993; Abbas *et al.*, 1992; Ali and Majid, 2006). Gillispie (1962) quoted that "In short, a degree of normal settlement is taking place. Grazing land is being lost to agriculture". The major constraint that hinders camel production in the study areas was feed shortage. Lack of grazing land and bush encroachment of the rangelands further compound the problem of feed shortage in the area. Increasing trend of sedenterization and introduction of crop farming in the area has been causing shrinkage of grazing lands of the nomadic herds. Besides, the majority of the rangelands in the area are being invaded by poisonous and unpalatable plant species (Agab, 1993). Appropriate management of the rangelands, introduction of improved feeding systems such as provision of good quality supplementary feeds to camels, and introduction of drought resistant, palatable and nutritious shrub species as feed for camels may help to solve the problem of feed shortage in the area. Disease prevalence is the second most important problem that limits the productivity of camels in the study area.

In the study area, camels are affected by outbreaks of various contagious and parasitic diseases. This situation is worsened due to lack of sufficient and appropriate veterinary services in the area. When camels get sick, pastoralists use various traditional medicines to treat their camels; however, if this doesn't work the destiny of the sick camel is eventually death. If the livelihood of the pastoralists is to improve, their livestock are to survive and to help them become self-sufficient in food production, appropriate veterinary services and improved animal health care need to be provided to the pastoralists in the area by the government or non-governmental organizations involved in livestock development.

Conclusion

The camel is an important factor for the survival of nomadic pastoralists in the study areas. Camel production in this region is constrained by a number of factors of which feed shortage and prevalence of disease are the most important ones. Camels in the study area feed exclusively on unimproved perennial natural vegetation of low nutritive value and they are not given supplementary feed. In order to improve the productivity of dromedary camels in the study area, development interventions should take into consideration the socio-economic contributions of camels and the prevailing problems in the area.

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الصفات الاجتماعية لمربي الإبل وتحليل إسهامات ومعوقات إنتاج ألبان الإبل في شرق ووسط السودان

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المستخلص:

أجريت هذه الدراسة في ولايات البحر الأحمر، القضارف ، كسلا والجزيرة (شرق ووسط السودان) لتحديد إسهامات ومعوقات نتاج ألبان الإبل واضعين في الاعتبار الخصائص الاجتماعية والاقتصادية لمربى الإبل في الولايات محل الدراسة. أستخدم عدد 376 من الاستبيانات في هذه الدراسة بالإضافة إلى المقابلات الشخصية واللقاءات مع ملاك الإبل وتم اجراء تحليل وصفى للبيانات من خلال الحزمة الإحصا ية للعلوم الاجتماعية (إصدار 1!). أشارت الدراسة إلى أن أغلبية ملاك الإبل (2.7، %) تتراوح أعمارهم ما بين 41 – 55 عام وان جميعهم متزوجين و أن أكثر من نصفهم (2.3 %) يكفلون عائلات تتراوح في أعدادهم ما بين 4 – 10 فرد وأن معظم المربين (7.7، %) أميين. أوجدت الدراسة أن معظم إناث الإبل في مناطق الدراسة (7.5 %) حملت في عمر يتراوح ما بين 4 – 5 سنوات وأن المصدر الرئيسي لإحلال الفحول هو المواليد الذكور النامية من نفس القطيع بنسبة بلغت (6.5، %). أوضحت الدراسة أن كمية ألبان الإبل المنتجة يوميا فى كل الولايات المعنية بالدراسة حوالي 1 – 8 كجم و ذلك بنسبة (9.4، %) من المربين المستجوبين بمتوسط 4.5 كجم يوميا خلال موسم الإدرار الذي يقدر ب 12 شهرا (365 يوم). أفادت الدراسة أن 2.9، % من ملاك الإبل أقروا بأن فقر المرعى وقلة مصادر الأعلاف هو العائق الكبير الذي يواجه مربى الإبل في مناطق الد راسة يتبع بالمشاكل الصحية (0.3، %) بالإضافة إلى مشاكل المتعلقة بالتسويق وتأمين الرعاة بنسبة (15.4% و 4.6 %) على التوالي.