

SHORT REPORT

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# The emergency of *Euphorbia tirucalli* as drought feeds for camels in northern Kenya

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## Abstract

This study took place in Isiolo County in northern Kenya among the Borana community, whose major economic activity is livestock production. The County is characterized by droughts which have increased in frequency and severity. This study sought to investigate the availability of camel drought feeds in the study site, guided by two specific objectives: to establish the existence of supplementary feeds used by the Borana community for camels during the drought periods and to establish the distribution of the supplementary feeds. Data was collected through secondary sources, semi-structured interviews, focus group discussions and direct observation. The study findings indicate that the Borana pastoralists use *Euphorbia tirucalli* to feed their camels during the drought periods. They also revealed that the plant was sparsely distributed in the study site and most of the feeds were purchased from neighbouring agro-pastoralists at affordable prices. *E. tirucalli* plays a very important role in saving the lives of camels during drought periods. Therefore, this study recommends that pastoralists in Isiolo County need to be encouraged to plant *E. tirucalli* in their farms. The Borana pastoralists need to be trained on appropriate methods of harvesting and propagating the plant.

**Keywords:** *Euphorbia tirucalli*; Camels; Borana; Droughts; Pastoralists

## Introduction

This study was conducted in Isiolo County, northern Kenya. The area lies in arid and semi-arid climatic zones, characterized by low and unreliable rainfall, and drought is a common phenomenon (GoK 2005). The inhabitants of these areas are mainly pastoral communities. Livestock production is their major economic activity; they rear cattle, camels, sheep, goats and donkeys (Kiruthu et al. 2003). However, drought has become very common in Kenya due to climatic changes. According to Kaitho et al. (2006), there has been a change in drought occurrence in Kenya as it used to occur in 10 years, but currently, it is occurring after three years and sometimes after one year. Orindi et al. (2008) report that Kenya pastoral communities have suffered from recent climate extremes.

Recurring droughts and extreme heat are causing livestock keepers to prefer rearing camels rather than other livestock species. Recently, some communities not known to keep camels have started rearing some to supplement

their cattle herds, especially during the dry period (Farm Africa 2002). Kagunyu and Wanjohi (2014) indicated that camel rearing is replacing cattle rearing among the Borana community of northern Kenya. Even some clans among the Borana pastoralists who viewed camel rearing and using camel products as a taboo have started adopting camel rearing. The increased camel production among the Borana, despite the increased severe and prolonged droughts, was the motivation for this study. The study was guided by these objectives: to establish the existence of supplementary feeds used by the Borana community for camels during drought periods and also to establish the distribution of the supplementary feeds.

## Study sites

The study took place in Isiolo County situated in northern Kenya. The study population consisted of Borana men and women household heads. The unit of analysis was the individual household.

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## Materials and methods

### Sample size and sampling procedure

This study applied both random and non-random sampling strategies. In selecting the study site, simple random sampling technique was applied whereby the names of the three Isiolo sub-counties were written on pieces of paper then folded several times and put in a container, which was shaken and the researcher picked one out. Three villages were selected purposively with the help of the local provincial administration who assisted the researcher.

To get a representative sample size, this study used a formula used by Mugenda and Mugenda (2003).

The sample size was determined as follows:  $n = z^2 pq/d^2$  where

$n$  = the desired sample size (if the target population is greater than 10,000)

$z$  = the standard normal deviate at the required confidence level

$p$  = the proportion in the target population estimated to have characteristics being measured

$$q = 1 - p$$

$d$  = the level of statistical significance set

Since the target population is less than 10,000, the final sample estimate (nf) was calculated as follows:

$$nf = n$$

$$1 + n/N$$

where

$nf$  = the desired sample size (when the population is less than 10,000)

$n$  = the desired sample size (when the population is more than 10,000)

$N$  = the estimate of the population size (Mugenda and Mugenda 2003)

When the population is more than 10,000 households, 384 of them are recommended as the desired sample size (Mugenda and Mugenda 2003: 43). The accessible population in this study was 4,000 households.

Mugenda and Mugenda recommend the formula

$$nf = \frac{n}{1 + \frac{n}{N}}$$

to be used to calculate the sample size.

According to the above formula,

$nf$  = the desired sample size when the population is less than 10,000

$n$  = the desired sample when the population is more than 10,000

$N$  = the estimate of the population size

Using the above formula, the sample size is

$$nf = \frac{384}{1 + \frac{384}{4,000}} = 350$$

To cater for those households that would decline to participate or dropped out during the process of investigation, the study proposed a sample size of 400.

A total of 400 households were interviewed. These consisted of 206 men and 194 women. The proportion of men was more than that of women because men were the ones who were readily available.

Systematic sampling was applied to select households for the interview.

The sampling interval was determined by the equation given below.

$$\text{Sampling interval} = \frac{n}{N}$$

where

$n$  = the required sample size

$N$  = the population size

$n = 400$

$N = 4,000$

$$\begin{aligned} \text{Sampling interval} &= \frac{400}{4,000} \\ &= \frac{1}{10} \text{ (i.e. 1 in 10)} \end{aligned}$$

Microsoft Excel FUNCTION = RANDBETWEEN (1, 10) was used to select a random starting number for the first household to be included in the sample, which happened to be number 8.

The eighth household was from village 1 since the households were assigned numbers starting from village 1, 2 and then 3.

### Data collection methods

This study was cross-sectional in nature, and both qualitative and quantitative methods were employed. Secondary data was collected through a literature review, while primary data was gathered in household interviews, in focus group discussions and from key informants.

Qualitative data were analysed according to the themes in the research objectives. Quantitative data were analysed using the SPSS software.

## Research findings and discussion

### Camel feeds gathered during drought seasons

This study indicated that in the study area of Isiolo County, an extensive system of camel production is the most common. Due to erratic rains and frequent droughts attributed to climate change, this study revealed that there is a marked fluctuation in feed availability for camels and other livestock in the range lands. This was evidenced by the distance travelled by

pastoralists in search of green pastures for their livestock. As a result, the Borana pastoralists gather leaves, plants, tubers and pods as emergency feeds for their camels during the drought periods. They used to do this for all livestock species of all ages. More than half (60 %) of the respondents indicated that they collected *anno* (*Euphorbia tirucalli*) for their camels, while 23 % stated that they gathered acacia pods and remains of fruits and vegetables. On the other hand, 10 % of the respondents indicated that they gave crop residues to their camels. The crop residues included stalks of maize and beans from their small-scale farms. Another 7 % said they gave hay and relief feeds to their home-based livestock to sustain them during difficult times (Figure 1).

**Depleted forages**

On whether climate change has affected the availability of gathered forages, 88.2 % of the respondents affirmed this, while 11.8 % did not agree. According to those in the affirmative, severe and prolonged droughts have led to the disappearance of valued perennial camel forages such as *geddi* (*Echinochloa haploclada*), *kumude* (*Lannea alata*), *sigirso* (*Acacia reficiens*), *hido* (*Cynodon* sp.) and *urbu* (*Acacia tortilis*). Acacia pods have become fewer as trees were cut down and used for building and for fuel. The study revealed that the increased frequency of droughts has impacted negatively on the gathering of leaves, seeds, barks and tubers which used to supplement the livestock diet, particularly during times of forage deprivation. Focus group discussants reported that over the years, the availability and quality of pasture has deteriorated. According to them, the encroachment of unwanted plant species such as *Acacia drepanolobium* and *Prosopis juliflora* has resulted in a deterioration of the rangelands, since besides reducing the size of the rangelands, their thorns are harmful to humans and livestock.

**Camel forages which have appeared**

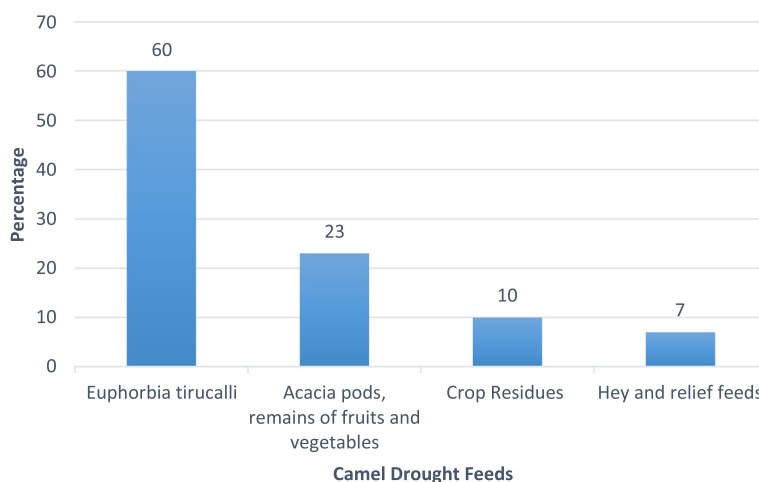
On whether there were camel forages which had appeared due to climate variability, a majority (63 %) of the respondents stated that there were, while 37 % said that there were none. Those in the majority stated that the following had emerged as a result of climate variability: *anno* (*E. tirucalli*); biscuit *Mjinga* (*Prosopis juliflora*), commonly known as *Mathenge*; *gurbi* (*Acalypha* sp.); *Leucaena leucocephala* and *Calliandra calothyrsus*. Focus group discussants indicated that they had negative attitudes towards the utilization of *P. juliflora*, saying that they had heard that the plant was harmful to livestock and human beings (Figure 1).

***E. tirucalli* as the most preferred forage for camels**

The Borana pastoral communities have discovered that camels can also feed on *anno* (*E. tirucalli*) plants which are used to make live fences. This species is sparsely distributed in Isiolo County since it is only available in a few homesteads and in small quantities. The information gathered from focus group discussions indicated that the plant has become very popular as a camel forage. Camel keepers have been sourcing the forage from the neighbouring County (Meru), and this has promoted peri-urban camel rearing in Isiolo town.

**Conclusion and recommendations**

Although *E. tirucalli* and other shrubs have appeared and others have been introduced, perhaps as a result of climate variability, they were few and in small quantities. Thus, these plants would not be enough as a supplementary feed for the camel populations, as drought has become severe and more frequent than 50 years ago. Therefore, this study recommends that pastoralists in Isiolo County should be encouraged to plant *E. tirucalli* in their farms. The Borana pastoralists need to be trained on appropriate methods of propagating the plant.



**Figure 1** Camel feeds gathered during drought seasons

### Competing interests

The authors declare that they have no competing interests.

### Authors' contributions

AFK identified the research site, recruited the enumerators and collected and analysed the data. JGW's contribution included data analysis and compiling and editing the work. Both authors read and approved the final manuscript.

### Authors' information

AFK is a PhD holder from the University of Nairobi. She is a Senior Research Officer at Kenya Agricultural Research Institute, working as a socio-economist. She has coordinated projects funded by the World Bank and European Union in the arid and semi-arid regions of Kenya. She has carried out policy-related work, research, community development, university lecturing and monitoring and evaluation in local and international organizations based in Kenya. JGW is a post-graduate student at the Catholic University of Eastern Africa. He works as an instructor in the school for the deaf Technical Institute Karen. He was a project coordinator of SOS based in Nairobi.

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