

Goat Herd Dynamics during Drought and Recovery Periods among the Rendille Pastoralists of Northern Kenya

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Abstract

Goats are the most valued livestock among Rendille pastoralists of Northern Kenya. They form an important part of their livelihood through provision of food, generation of income and socio-cultural functions. Restocking of herds after drought is easier due to high prolific rates of goats. A major constraint to sustainable goat keeping is frequent droughts that influence goat population dynamics. The aim of the current study was to evaluate the influence of drought frequencies on goat herd dynamics among Rendille pastoralists. The study was conducted through administration of structured and semi structured questionnaires to 40 households. Only 26 households gave more consistent information and were used for data analysis. The data collected were exits (sales, mortalities, exchanges, slaughter for home use and for ceremonies, losses, destocked, thefts and predation) and entries (births, purchases, exchanges, gifts and restocking) of goats during drought (2005/2006, 2008/2009, and 2010/2011) and recovery periods (2006/2007 and 2009/2010). Analysis of data was done using SPSS (Version 16.0) computer software. There were no significant differences in mortality and sales between 2005 and 2008 while significant differences were noted between 2005 and 2010 and 2008 and 2010. There were no significant differences in recovery periods. The results showed that goat off take among the Rendille pastoralists were mortalities and sales while replacements after the drought were through natural reproduction. Due to active participation in markets by pastoralists, financial institutions should be established in rural areas to allow them save money that would otherwise be lost through deaths during drought.

Key Words: Goats, Herd Dynamics, Droughts, Northern Kenya

INTRODUCTION

Small ruminants contribute about 30% of the total red meat production in Kenya and 4% of the total milk production comes from goats (Kiptarus, 2005; Ahuya *et al.*, 2005). Small ruminant meat (chevon and mutton) is preferred more than beef by 55% of Kenya's population and 52% of combined population of Marsabit and Nairobi (Juma *et al.*, 2010; Mailu & Rutto, 2010). This phenomenon was explained by the latter authors as a factor of high supply and low price and also low cholesterol content.

The higher dependence of goats by pastoralists is due to their adaptive capacity in arid environments. Being browsers and selective feeders, goats can easily feed on a wide range of ASAL vegetation composed of trees and shrubs which cannot be easily valorized by other livestock species such as cattle and sheep. Higher reproduction rates of goats facilitate herd restoration after drought losses. Goats can also be used to rebuild the herd through conversion of goat herds into larger stock of cattle and camels. Goats can easily be converted into cash to meet the daily food requirements as well as other non-food products unlike the large stock (cattle and camels) and because of the aforementioned reason goats have been termed as —small change (Pavanello, 2010).

Goats play a significant role in the economy and nutrition of pastoral communities in arid and semi arid areas. They provide them with both tangible benefits including food, income, manure and hides and intangible benefits such as settling debts, cultural and ceremonial practices, savings and security against climatic risks and uncertainties (Kosgey, 2004; Ahuya *et al.*, 2005; Aklilu & Catley, 2010; Dossa *et al.*, 2007; Kosgey *et al.*, 2008; Sun, 2005).

Frequent and prolonged droughts currently aggravated by climate change make goats more attractive to pastoral communities since they can easily be destocked and restocked as required. They can also thrive well on wide variety of trees and shrubs found in arid and semi arid areas where no other crops can grow albeit through irrigation. However, the increasing frequencies of droughts, increasing competition for rangeland resources, insecurity in rangeland resources and drought time grazing zones and restriction on the movement across national boundaries are some of the challenges that lead to an indirect decline in goat production and productivity in ASAL areas (Ngaira, 2009; Barton *et al.*, 2001).

Since most of the red meat consumed in Kenya comes from arid and semiarid areas, retrospective study on goat populations, off take and replacements is important in understanding the major regulators of pastoral goat herds during droughts and recovery periods. This will give an insight on the viability of pastoral production systems and also forms a basis for developing guidelines appropriate for enhancing goat off-take in response to future drought effects and for identifying opportunities that will shape and improve the future of goat production in ASAL areas.

MATERIALS AND METHODS

Location of the Study Sites

The study was conducted in Laisamis County of Northern Kenya between the months of March and May 2011. Laisamis covers an area of 20,265.7 km² with a population of 65,669 persons and the major inhabitants are the Rendille communities who are camel and small stock herders.

Rainfall in the low lying areas of Marsabit is low, erratic and highly variable with an annual average ranging between 100 and 200 mm in the low lying areas like Laisamis. Rainfall pattern is bimodal with long rains occurring between the months of April and June and short rains occurring between the months of November and December. Temperatures vary between 23⁰C and 34⁰C and the average annual maximum temperature goes beyond 30⁰C (Ngutu & Recke, 2006). The dominant vegetation in Rendille lowland area is dwarf shrub dominated by *Indigofera spp* and bushland dominated by *Acacia spp*. However, vegetation availability in area depends on rainfall, soil types and height above sea level.

Data Collection

Six villages in Laisamis County of Northern Kenya were selected for data collection based the number of settlements in each village and the livestock species kept. Korr, Namarei, Limoti, Ngurunit, Ilaut and Farakoren were the main study sites and the majority of inhabitants in these areas are Rendille keeping small ruminants mainly goats. Individual household interviews by use of structured and semi structured questionnaires were conducted in six villages within Laisamis where Rendille pastoralists were the major target groups. Interviews were conducted feasibly because of the involvement of a Rendille livestock keeper who was able to communicate with the researcher in both English and Swahili and with the research participant in local Rendille language.

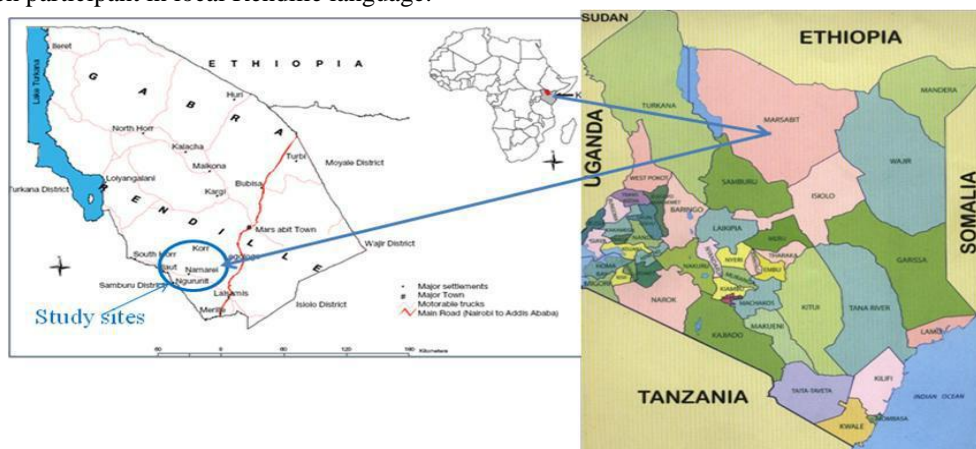


Figure 1. A map of study sites in Marsabit District
Source: Modified from Warui and Kshatriya, 2009

Forty households were interviewed and the data collected were mainly off-take of goats during drought and recovery periods. However, 26 households who were to recall the data in question and gave more consistent information were used for data analysis. Individual household interviews on number of goat that exited (off take) and entered (replacement) the herd in different ways were conducted based on herders' recall of events during and after droughts.

Off take of goats were categorized as voluntary and involuntary. Voluntary off take was defined as the number of goats leaving the herd under the owner's decision or will to do so. Involuntary off take is a spontaneous off take that occurs without the owner's decision. Voluntary off take include sales, slaughters for home use and for ceremonies, exchanges, gifts and governmental or non government organization destocking while involuntary off take include deaths, predation, thefts, missing or lost.

Table 1. Occurrences of long and short rains during drought and recovery periods

		Long rain	Short rain
Drought years	2005	x	x
	2008	x	✓
	2010	✓	x
	2011	x	---
Normal Years	2006	✓	✓
	2007	✓	✓
	2009	x	✓

✓ = rain, x = no rain

The questionnaire was retrospective in nature and covered the year 2005 until 2011 during which three droughts of 2005/2006, 2008/2009 and 2010/2011 occurred. The normal years were 2006/2007 and 2009/2010. The drought of 2005 and 2010 was evident from the failure of the Nov-Dec short rains and below average rainfall amounts (80.2mm) of 2005 Apr-June long rains. For the 2009 drought, there was a failure of long rains but short rains in most of the study villages were experienced (Ekuam, 2007; FEWS NET, 2005).

Data Analysis

Data collected from study site was entered and coded in Microsoft Excel and later exported to Statistical Package of Social Sciences (SPSS version 16.0) for analysis. Voluntary and involuntary off take were compared between drought and normal years. The number of households interviewed in was forty; however, after the checking for the consistency of data and the households who were able to recall different events in different years only 26 households gave more or less consistent information which was then used for analysis.

Descriptive statistics such as mean, frequencies and percentages were used to present the data in a tabular and graphical form. Significant differences in the comparison of means between the drought and normal years were tested using a one-way ANOVA test.

RESULTS

Voluntary and Involuntary Offtake of Goats during Droughts

With respect to voluntary off take, sale of goats was high, 5.4 ± 7.0 , 3.9 ± 3.6 , 1.3 ± 3.0 ($P < 0.05$) in all the drought years 2005/2006, 2008/2009 and 2010/2011 respectively. However, variations in the number of goats that exited the herd through sales occurred between years. There was a significant difference in the number of goats sold and number of goats destocked between the drought years

Table 2. Voluntary and involuntary offtake of goats during droughts (n=26 households)

Offtake	2005/2006	2008/2009	2010/2011	df	F value	P value
Voluntary offtake						
Sales	5.4±7.0 ^a	3.9±3.6 ^a	1.3±3.0 ^b	2	5.0	0.01*
SHU	0.7±1.1	0.9±1.6	0.2±0.8	2	2.1	0.13
SCER	1.1±1.5	1.5±1.5	0.9±1.3	2	0.9	0.41
Exchange	0.3±0.8	0.1±0.3	0.0±0.0	2	2.6	0.08
Destocked	0.1±0.3 ^a	0.7±0.9 ^b	0.3±0.5 ^a	2	7.5	0.001*
Involuntary offtake						
Deaths	22.9±47.6 ^a	11.1±12.9 ^a	0.9±2.4 ^b	2	3.9	0.02*
Losses	0.9±1.3	1.0±2.6	0.3±0.6	2	1.4	0.3
Stolen	0.7±3.3	0.1±0.6	0.0±0.0	2	0.9	0.4
Predated	1.0±1.8 ^a	0.8±1.2 ^a	0.2±0.5 ^b	2	3.0	0.05*

SHU =slaughtered for home use, SCER= slaughtered for ceremonies

Means that have different superscripts are significantly different from each other (Tukey HSD, $P<0.05$). *Significantly different at $P<0.05$

In the case of involuntary offtake there was a significant difference between the number of deaths and number of goats predated in all the drought years (Table 2). The major cause of death is drought effects and starvation resulting from the imbalance between the forage supply and nutritional demand of livestock.

Voluntary and Involuntary Offtake of Goats after the Drought

Table 3 presents the voluntary and involuntary off take of goats during the recovery periods of 2006/2007 and 2009/2010.

Table 3. Voluntary and involuntary offtake of goats after the drought (n=26 households)

Goats	Mean		df	F value	P value
	2006/2007	2009/2010			
Voluntary offtake					
Sales	1.7±2.5	1.3±1.6	1	0.6	0.4
SHU	0.4±0.6	0.9±2.6	1	1.3	0.3
SCER	1.4±1.3	1.4±1.4	1	0.0	1.0
Involuntary offtake					
Deaths	0.8±1.9	0.9±1.5	1	0.3	0.9
Stolen	0.2±0.5	0.1±0.3	1	0.5	0.5
Lost	0.3±0.5	0.2±0.5	1	0.3	0.6
Predated	0.2±0.5	0.6±1.1	1	3.7	0.06

SHU= Slaughtered for home use, SCER= Slaughtered for ceremonies

Voluntary offtake was mainly through sales (1.7±2.5 and 1.3±1.6) and slaughter for ceremonies (1.4±1.3 and 1.4±1.4) however the mean number of goats slaughtered for ceremonies in the two years was the same. There was no significant difference in the means for all offtake reasons between the two normal years.

Death accounted for most of the involuntary offtake during the two recovery periods of 2006/2007 and 2009/2010 whose corresponding figures were 0.8±1.9 and 0.9±1.5. The number of goats that were stolen, missing and predated was negligible between the two years.

Goat Herd Replacement during Recovery Periods

From Table 4, the Rendille pastoralists rebuild their goat herds through natural reproduction (births), purchases, exchange, borrowing and gifts. However the paramount strategies of herd build-up are natural reproduction (births) and purchases. The average number of goats that entered the flock through birth is 11.7±10.3 and 15.7±13.5 and 2.2±5.6 and 1.5±3.4 in 2006/2007 and 2009/2010 respectively. The mean

number of goats brought into the herd through borrowing was significantly higher in 2009/2010 (1.2±2.3) than in 2006/2007 where none of the goats were borrowed for replacements (ANOVA, $P=0.05$). The least of the restocking strategies was in form of gifts.

Table 4. Mean number of goat herd replacements after the droughts

Variable (n=26)	2006/2007	2009/2010	df	F value	P value
Births	11.7±10.3	15.7±13.5	1	1.4	0.2
Purchases	2.2±5.6	1.5±3.4	1	0.2	0.6
Gifts	0.0	0.0±0.2	1	1.0	0.3
Borrowed	0.0	1.2±2.3	1	7.0	0.01*
Exchanged	0.5±2.4	0.1±0.6	1	0.6	0.4

DISCUSSION

Voluntary Offtake of Goats during Droughts and Recovery Periods

The higher voluntary off take of goats during the drought years of 2005 and 2008 was due to regular sales to buy foods and other non-food household requirements. The decline in livestock productivity during droughts forces Rendille pastoralists to increase the off take of goats to purchase cereal based diets which they have to rely on for their energy supply. Since all people are affected by the droughts and they have to feed themselves, most of them flood the markets with goat posing negative influence on goat prices. It is worth noting that pastoralists sell more goats when they have higher cash needs especially during the droughts when milk production by all lactating females has plummeted.

Destocking is an intervention that involves voluntary purchasing of live animals from drought stricken areas to salvage the value of those animals that could have died due to drought effects and to reduce the capital losses by pastoralists. Destocking is a mitigation strategy that reduces the impacts of drought on household's food security because of the distribution of meat to the destitute pastoralists. In Laisamis, the Red Cross Society of Kenya (RCSK), Ministry of Livestock (MoL), and CIFA projects implemented this program of destocking which was ongoing during the time of study in 2011. The Rendille households derived the benefits from this process either in cash or in kind (meat, hides).

Goat production is the mainstay of pastoralists' food security, slaughtering of goats for meat consumption and for ritual events was a regular activity. Goats were slaughtered for household meat consumption although it seldom happened in special cases for example as an honor of special visitors, relatives or friends. Sato (1997) also found that meat consumption in the Rendille land is a luxury and is limited to festivities and emergencies, for example in cases of sickness, circumcision, marriage/wedding, death and when a woman gives birth. In the case of droughts, men and women assemble in the dry riverbed (*laga*) or in the mountain whereby goats or sheep have to be sacrificed to gods during a prayer requesting for rain or as thanksgiving to ancestral spirits as was also observed from the study in South Africa (Mahanjana & Cronje, 2000). The major traditional sacrificial ceremony in Rendille community is *Sorio* that is held four times in a year and where every married man or woman takes part in the celebration by slaughtering goats.

Goats serve multiple roles to people who keep them and it is important for pastoralists themselves, government and nongovernmental organizations to prioritize the developments that are geared towards improvement of goats and other livelihood strategies in pastoral areas that will ensure a continuous supply of food.

Involuntary Offtake of Goats during Droughts and Recovery Periods

Mortality accounted for the largest proportion of involuntary off take of goats during the drought years of 2005 and 2008. In 2010/2011, the number of deaths on goats per household was negligible due to this drought being on its early stages. Death is mainly caused by the starvation or the imbalance between the forage supply and nutritional demand of goat. Higher livestock deaths were also observed in Samburu Central and Laikipia North District as a result of 2008/2009 drought, in Eastern Ethiopia (Baars, 2000)

and Turkana (McCabe, 1987; Sato, 1997). A study by Sieff (1999) and Homann *et al.* (2007) however, found a different observation of goat diseases, 47% and 68% as a major cause of death on goats owned by pastoralists of Tanzania and Zimbabwe respectively.

High mortality of goats due to drought is a constraint to goat production in arid and semi arid areas of Northern Kenya. Strategies geared towards prevention or reduction of mortalities and increasing productivity in pastoral areas should be a key agenda in the development programs. The intervention of governments and its ministries and NGOs on the reduction of drought impacts on livestock should be effective and the response initiated on time. For example destocking programs that salvage the value of goats that could be lost due to drought effects and restocking programs that ensures herd recovery from drought losses should be implemented on time.

Involuntary off take of goat through losses, thefts and predation were negligible compared to sales and mortalities. Goats fall a prey of wild animals while they are grazing in the fields or at night while they are in their enclosures. Among the predators mentioned by Rendille pastoralists were lions, leopards, cheetah, monkeys and large pythons or snakes. Proper livestock husbandry and efficient night time protection reduces predation (Ogeto, 2007).

Goat Herd Replacements during Recovery Period in Laisamis District

Goats enter into the herds through births and acquisitions (purchases, gifts, loans, exchanges and restocking). Goat replacement through natural reproduction has been the major strategy to build the herd after losses and to maintain a viable herd that can be able to support pastoralist's household (Table 4) and the total worth of the purchased goats depends on their intended purpose such as to maintain a viable herd, to slaughter for home consumption and for ceremonial functions, to fatten for later use or for sale at a better price or to start a livestock business.

CONCLUSION

The results from this study show that drought related mortalities, sales and births influenced goat herd dynamics in pastoral areas. Despite herd maximization as an insurance strategy against climate vagaries, pastoral developments are constrained by ecological and household socio economic factors. The major constraint to goat production in pastoral areas is mortalities, associated with the effects of droughts, which outpace the replacements either through natural reproduction or purchases.

Pastoralists use wild plants such as *Zehmeria scabra*, *Tarenna graveolens* and *Acacia tortilis* pods and other plants and tubers as dry season feed in addition to their traditional lifestyle of mobility to exploit the variation in pasture and water resources. The government of Kenya under the ministry of environment together with nongovernmental organizations should join hands with pastoralists in strengthening the efforts to conserve and manage the ASAL vegetation that can be used during droughts as livestock feed. Due to active participation in markets by pastoralists, financial institutions should be established in rural areas to allow them save money that would otherwise be lost through deaths during drought.

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BIO-DATA

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