

# CAMEL HUSBANDRY, HEALTH AND WELFARE HANDBOOK

Tailored for Samburu County



Prepared under the auspices of Science-based and co-produced transformative Rangeland Management Practices – how to deal with encroachment of unwanted woody species (TRAMAP Kenya Research Project, under AgriFoSe2030 Challenge II)  
Funded by AgriFose2030 Programme

## TRAMAP Partners:







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## AUTHORS BIO'S



**Dr. Jane Mutune** is an Environmental Governance expert in rural livelihoods and resilience. Her background equips her with the knowledge and skills necessary to address specific ecosystem needs and challenges in arid and semi-arid areas. Jane is the principal investigator of 'Science-based and co-produced transformative Rangeland Management Practices – how to deal with encroachment of unwanted woody species dubbed TRAMAP Kenya, Project. She has organized and implemented co-learning platforms with livestock keepers, agro-pastoralists, and development partners through training programs, workshops, and knowledge-sharing sessions on rangeland ecosystem restoration, value addition, camel husbandry, small livestock production, and apiculture to empower communities with skills and knowledge needed for sustainable livelihoods and resilience in Samburu County. Currently, Jane is a lecturer at the University of Nairobi, Wangari Maathai Institute for Peace and Environmental Studies. She can be reached at [janemm@uonbi.ac.ke](mailto:janemm@uonbi.ac.ke)



**Dr. Stephen Mureithi** is a Senior Lecturer and Researcher at the University of Nairobi's Department of Land Resource Management and Agricultural Technology, University of Nairobi. He is a leading Kenyan scientist in Rangeland Ecology and Management and has extensive knowledge of the East African rangelands and the pastoralist and agro-pastoralist systems. His current research focuses on the direct effects of disturbance on dryland ecosystems, and restoration of degraded lands and its impact on land, water, livestock and pastoral livelihoods. He is a key resource person implementing pasture and fodder production and livelihood asset creation component in the various research projects under Triple L Initiative <https://www.slu.se/triplel/>, among other initiatives. He can be reached via [stemureithi@uonbi.ac.ke](mailto:stemureithi@uonbi.ac.ke)



**Dr. Staline Kibet** is a Dryland Resource Management and dryland livelihood specialist with over 20 years of research and training experience. Passionate about promoting home grown solutions to aspects of livelihood, food insecurity and environmental degradation especially within dryland environments. Strong believer in linking/integrating scientific and indigenous knowledge to harness opportunities and provide integrated solutions for sustainable development. Dr. Kibet's research relates to indigenous knowledge, participatory scenario analysis and planning approaches to assessing and addressing climate change impacts, socio-ecological dynamics, restoration of degraded landscapes, invasive species management, biodiversity and sustainable livelihoods of communities living on semi-arid lands. He has published in books and peer reviewed journals and writes policy briefs and blogs. Dr. Kibet currently works as a Lecturer at Department of Land Resource Management and Agricultural Technology, Faculty of Agriculture, University of Nairobi, <https://larmat.uonbi.ac.ke/staff/dr-staline-kibet>



**Nathaniel Kipleting** is an Agribusiness professional with expertise in crop and livestock marketing. His background equips him with knowledge and skills necessary to address specific needs and challenges in Arid and Semi-Arid areas. He has actively collaborated with livestock keepers, pastoralists through training programs, workshops, and knowledge-sharing sessions on rangeland management, camel husbandry, small livestock production and apiculture with the aim of empowering them with skills and knowledge needed for sustainable livelihoods and resilience in Arid and Semi-Arid Areas. He has also pursued courses and workshops focused on Rangeland Management and Integrated Camel Management. Currently he is working at the County Government of Samburu as Sub-County Livestock Production Officer Samburu East Sub-County. He can be reached at [tumna07@gmail.com](mailto:tumna07@gmail.com)



**Mr. Kevin Omondi Miruye** is an Africa Agriculture Knowledge Transfer Program (AAKTP) Research Associate, a food scientist and a researcher at the University of Egerton Department of Food Science and Dairy Technology. He works in a camel milk value chain to develop innovative and improved methods of production, preservation, and utilization of camel milk. This entail product development and consumer/market research. He can be reached via [miruyekevin@gmail.com](mailto:miruyekevin@gmail.com) .



**Dr. Pauline Gitonga** is affiliated with Colorado State University's Department of Biomedical Sciences and is a Consultant for ASAL eXtension Ltd. Her work revolves around capacity building and managing research projects that aim at translating research into practical and innovative solutions that transform pastoralists' and agro-pastoralists' livelihoods. Pauline is committed to sustainable livestock health management, and her one-health approach integrates participatory and evidence-based strategies. At the heart of her mission lies the empowerment of communities to ensure food and economic security while preserving rangeland resources. She has proven expertise in the provision of livestock extension and clinical services, continuous professional development training of in-service animal health staff, policy development, and project management. Pauline is open to collaborative opportunities with like-minded individuals and institutions. She can be reached at [asalexension@gmail.com](mailto:asalexension@gmail.com)



**Dr. Samuel Piwa Letereuwa** is a veterinary surgeon who worked as a veterinarian for Farm Africa whose main mission was promotion of Camel Health and Production in Samburu and Marsabit districts of Kenya, from 1993 to 1996 before taking up a position in southern Sudan as a field veterinarian with the VSF Belgium Community-based Animal Health Programme (CBAHP) from 1996 until 2002. From mid-2002 he joined the Rinderpest Eradication Project as Regional Veterinarian in Upper Nile Southern Sudan, where he continued until the end of the project in 2007. In 2007 he obtained an MSc in Managing Rural Development from the University of London and continued to work as a consultant in various organizations such as Pastoralist Governance and Development Project (PGDP) and International Livestock Research Institute (ILRI). In 2016 he joined the County Government of Samburu where he participated in various courses like Integrated Camel Management (ICM) and is currently an Assistant Director of Veterinary Services and a longtime camel keeper. He can be reached at [sletereuwa@yahoo.com](mailto:sletereuwa@yahoo.com)



**Joel Lalaigwanani** is an experienced camel keeper in Samburu East Sub-County with a deep passion for camel husbandry. Over the years, he has acquired indigenous knowledge passed down through generations of camel keepers, participating in two training programs on camel husbandry facilitated by the TRAMAP Project enhanced his skills and understanding of modern best practices. Being well-versed in various aspects of camel management, including nutrition, breeding, reproduction and health care enables him to provide valuable advice and guidance to fellow camel keepers, emphasizing the importance of consulting animal health professionals for proper disease treatment and control. He is currently a second-year student at Mount Kenya University, pursuing a certificate in Animal Health and Production. During his attachment at the County Government of Samburu, Directorate of Veterinary Services, he actively participated in various activities such as Contagious Caprine Pleuropneumonia (CCPP) and Peste des Petits Ruminants (PPR) vaccinations aimed at improving his practical skills. He can be reached at [lalaijoeli@gmail.com](mailto:lalaijoeli@gmail.com)

# ABBREVIATION

ASAL	Arid and Semi-arid Lands
CDR	Community Disease Reporter
KCA	Kenya Camel Association
NGO	Non governmental organization
TRAMAP	Science-based and co-produced Transformative Rangeland Management Practices
UON	University of Nairobi



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# EXECUTIVE SUMMARY

The role of camels in livelihoods of Kenya pastoral communities has increased in the recent past event among traditionally cattle keepers. This has been seen as an adaptive management strategy in response to increasing climatic variability and change. This change has been particularly evident among the Samburu community of northern Kenya. Camel keeping among the community appears to be a success story of a locally driven initiative by people who are typically thought to be amongst the most vulnerable to climate change and to have 'low adaptive capacity'. The initiative has also been taken up by development organizations as well as the county governments, which have started to help communities restock with camels viewed as 'the most resilient livestock'. The County government of Samburu for example has been donating camels to vulnerable households as a means to build their resilience after majority lost their cattle, goats and sheep to droughts, diseases and/or theft. Increase in bush encroachment and subsequent decline in grazing capacity, increase in resource-based conflicts in the county may have also informed the choice of camel as preferred alternative species. Whereas the initiative to donate camels to vulnerable households was noble, it was noted that a number of them sold off the camels soon after due to lack of husbandry skills and/or demand for immediate basic needs.

TRAMAP Kenya sought to fill in the capacity need gap and thus help the County Government to realize the intended impact. This Camel Husbandry, Health and Welfare Handbook was co-developed as part of experiential training and co-learning undertaken in 2023 in Samburu County. The training participants were drawn among camel keepers (both experienced and non-experienced), community disease reporters (CDRs), camel husbandry practitioners (Kenya Camel Association), livestock extension officers, State Department of Livestock Production, Samburu County, animal health and welfare experts (ASAL eXtension) and researchers (University of Nairobi).

The training adopted both theoretical and practical sessions and have been packaged into seven sections on this handbook. The handbook commences with a brief introduction about the camel keeping in Kenya and the role it is taking in the country's economy in light of increasing vulnerability of pastoral communities as a result of negative impacts of climate change and land degradation.

Section I provides some facts about camels and why they are the best fit for dryland environment and better adaptive livestock to increasing climate variability and change. Moreover, there are large tracts of land in Kenya rangelands that have experienced unprecedented increase in bush encroachment and are no longer suitable for grazers such as cattle and sheep. This section gives way to learning about the importance of camels in the lives of pastoral communities and in particular the Samburu people in Section II. Whereas camel keeping is a fairly new phenomenon among the Samburu relative to their neighbours such as Rendille and Turkana communities, it is already gaining a place within the community social fabric in providing goods and services.

Section III looks at the various camel breeds and breeding management. The training participants learned about physical characteristics, level of milk production, advantages and disadvantages of keeping the various breeds and possibilities of crossbreeding them. The section also highlights key aspects to look for in breeding management system. Beside breeding, feeding and nutrition is critical in camel keeping, an aspect addressed with in section IV. All nutritional requirements for different growth stages of camels as well as key forages common in Samburu landscape have been captured.

Section V addressed camel health needs. Like all other livestock, camel health is essential for productive and profitable stock. Key pests and diseases common in Samburu, their symptoms, and disease burden have been highlighted and some of the practical steps to manage them. Closely related to health is welfare which has been addressed in details in section VI. Principles of camel welfare have been highlighted and the various handling and restraining that infringe on good welfare practices.

The last section VII explains the various products that camels can provide, how to add value as well as how to market the same. Key camel's products include meat, milk and hides. All of which are easily perishable and prone to contamination and therefore, hygiene in handling them is crucial for safety of handlers and consumers of the products. In all the sections, where applicable Samburu translation equivalent have been provided to ease understanding among targeted users. That notwithstanding, the handbook can be used to build capacity of camel keepers in all the ASAL Counties.

Conclusion and recommendations have also been provided as key carry home messages.

# INTRODUCTION

In Kenya, Samburu County, camel farming is changing from traditional extensive forms to modern semi-intensive or even intensive forms. This could lead to change in perception of camel farming as an environmentally unsustainable production system to environmentally sustainable production system. The challenges for all promoters of camel keeping is to maintain the “sustainability tag” image, management of the camel populations in line with the good feeding program, good handling practices and camel best breeding practices. The growing demand for camel products demands keen attention to effective husbandry, excellent health and welfare. This provides both opportunities and constraints to pastoral camel keepers that this handbook hopes to address.

Camels are domesticated animals found mainly in the North eastern part of Kenya, specifically in arid and semi-arid environments. There are only two species of domesticated camels; one-humped called dromedary, and two humped called Bactrian camel. The one-humped dromedary dominates up 94% of the world’s camel population, while two-humped Bactrian camels make up the remaining 6%. In Kenya only the dromedary camels are reared predominantly in northern Kenya. As at 2019, it was estimated that there were 4.6 million camels in Kenya largely in the north, north eastern and coastal regions.

Camels are managed based on indigenous knowledge and in mobile extensive systems, which is the most efficient way of utilizing rangeland resources that are spatially and temporally dispersed. In Samburu county camel keeping is rapidly changing from traditional extensive form to modern intensive form. Pastoralists use camels for many purposes; they are a source of meat and milk, a means of transport, draught power and most recently in sporting events. In Kenya, Rendille, Turkana and Somali communities have kept camels for hundreds if not thousands of years as a livelihood asset as well as play social roles such as wealth status, gift token, bride price, or commodity for paying fines for transgression.

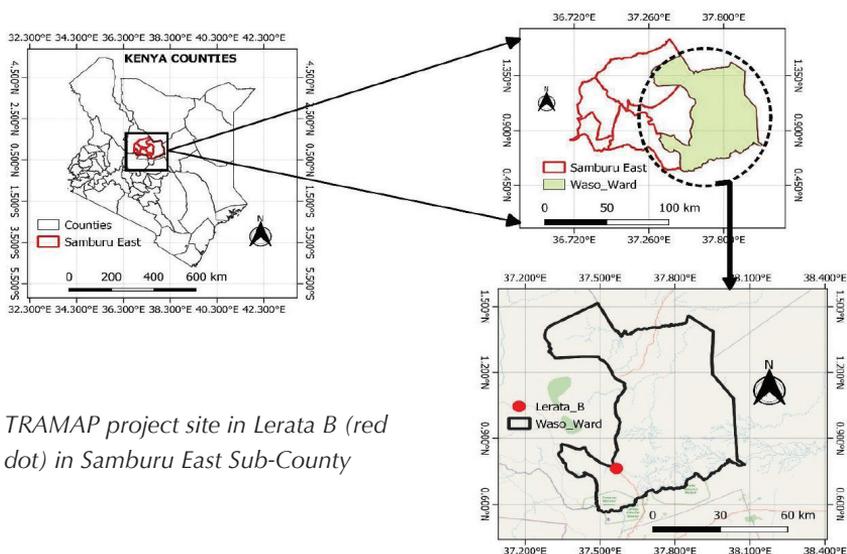
In the arid and semi-arid regions, camels play an increasing role in securing people’s livelihood, especially with their milk and meat supply. However, despite the ever-increasing demand for camel milk, the sector still faces a myriad of challenges. Some of these challenges include absence of milk cooling facilities to facilitate bulking, use of unhygienic containers, presence of diseases. When addressed, it can strengthen the value chain and make it profitable and sustainable.

The pastoralists now sell camel milk as a source of income generation (Elhadi et al 2015). The bulk of marketed milk reaches consumers through informal marketing. Camel milk marketed informally is usually sold raw and in small quantities over varying distances from source to market, ranging from 20 to 400 km, especially for those middlemen supplying the Nairobi market. The means of transport include walking, donkeys, bicycles and motor vehicles. The increase in marketing of camel milk for herders’ household income generation has raised concern over the hygienic management and preservation of the milk. Whereas income from camel milk has been

proven to provide income to vulnerable pastoral groups, health concerns have been raised on raw milk handling. The long distance on poor roads to reach the market, the use of inappropriate milk containers as well as means of transport predisposes the milk to contaminations and thus lowers the quality.

### Project area description

TRAMAP Project was implemented in Samburu County, which is one of the nine arid Counties in Kenya (see Map). Samburu County is known for its unique cultural practices, beautiful landscapes and home to a diverse species of classic savanna wildlife such as elephants, lions, rhino, leopard, buffaloes among others. Samburu County covers an area of 21,090 square kilometers and its population is projected to reach 370,547 by the year 2025. The county is made up of three sub-counties namely Samburu North, Samburu Central and Samburu East. Samburu East sub-county, the host of TRAMAP project is the largest with an area of 10,016 square kilometres with a projected population of 93,127 by 2025. This is a lowland area with average annual precipitation of 320 mm and therefore unsuitable for crop production. The residents here therefore rely heavily on livestock keeping (mainly cattle, sheep and goats) and most recently camel keeping. The frequent drought associated with climate change has affected the area significantly and loss of livestock due to scarcity of pasture and water and opportunistic diseases is common. In addition, resource-based conflicts are common during severe droughts. The County government has prioritised Samburu East and Samburu North to benefit from camel donations to rebuild their livelihoods and future resilience. It is for this reason TRAMAP prioritised the region to strengthen their capacity during the Camel Husbandry health and Welfare Training of Trainers workshop. Other participants came from Samburu Central and Samburu North Sub-Counties.



*TRAMAP project site in Lerata B (red dot) in Samburu East Sub-County*

# SECTION I:

## ABOUT CAMELS



*Closed nostrils*



*Split lips*



*Long eyelashes*

Camels are domesticated animals found mainly in arid and semi-arid environments (ASAL) of the world. There are two species of domesticated camels; one humped dromedary, and two humped Bactrian camels. The one-humped dromedary makes up 94% of the world's camel population, while two-humped Bactrian camels make up 6%. In Kenya, only one-humped dromedary species are kept. As at 2019, it was estimated that there are a population of 4.6 million camels in Kenya predominantly in the north, northern eastern and coastal regions.

### **Camel Adaptations to arid conditions**

The camel, unlike other domestic animals, has about unique adaptations for survival under conditions of heat, drought and water deprivation. These adaptations enable it to survive and access remote pastures. Thus, it is able to produce during drought when other animals stop lactating or even die. Anatomical adaptations of camels include long legs that lift their bodies well above the hot ground, sternal pad that keeps a camel's body above the ground when seated, nostrils that can close against dust, large padded feet to support their weight in sand, long eyelashes and a membrane to protect the eye against dust.

Physiological adaptations include fat stored in the hump during times of plenty to be used in times of need, the fat also insulates a camel's back from high mid-day solar radiation. Camels breathe slowly and so lose less moisture from the lungs while some moisture condenses in the nostrils. Body heat is lost through blood vessels near the skin. Camels urinate down their hind legs, which help in heat loss when it evaporates. They can lose 25% of water but their blood remains fluid and can drink a large volume of water (at least a third of its body weight) at one watering without any problem. Their red blood cells may swell several times their normal size after drinking without rupture ('does not suffer water poisoning'). Camels may allow their body temperature to super-heat by 6 degrees centigrade before sweating and also super cool at night. Their kidneys are highly efficient producing concentrated urine and they may recycle urea and often produce very dry feces.

Behavioral adaptations include sitting while facing the sun so as to expose a minimal surface area to the sun to avoid rise in body heat and subsequent water loss through sweating. In the face of global warming and all the associated hazards, the camel with its many attributes will be a key animal for pastoralists to keep in the future to minimize losses and build more resilient livelihoods in the arid lands.

**Table 1. Camel adaptations (Mooto neikoo Ntames)**

English	Samburu
Camels have long eyelashes and a membrane to protect the eyes against dust.	Keata ntames lpaapit oodoo longonyek opik nkongu loip
Camel has nostrils that can close against dust	Neeta ngume naidim neikeno naibok ngulupo onterit peemejik atua
Camel has a fat in its hump that can be broken into energy	Keata lata torug naaku nguvu enyana tenesasu tanaa tenelau ntoki naja tangata naodo naa nia shi peemita rug
Camel body temperature changes from 34°C to 41.7°C depending on the environment	Keibelekenya nkirewaj esesen tampari kutuka 34°C mpaka 41.7°C. tankaraki nkirewaj tanaa sii nkurubi enkop natii teiniakata



# SECTION II:

## IMPORTANCE OF CAMELS

Key products derived from camels are milk, meat, hides, and bones which were previously used for subsistence but are increasingly being commercialized. Untapped potentials are also being explored. Such initiatives include value addition along the market chain, ecotourism, and draught power.

### Milk

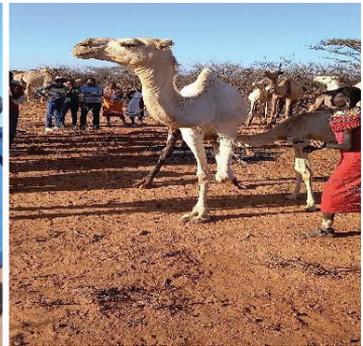
Camels are kept mainly for milk sometimes referred to as ‘the white Gold of the desert’. However the high vitamin C content in camel milk is of great advantage to ASAL dwellers who have limited access to fruits and vegetables. It is also believed to have medicinal value e.g. beneficial effects in management of high blood pressure, diabetes etc. Camel milk has antibacterial, antifungal, anti-inflammatory, anti-oxidant and antiviral properties. Camel milk contains compounds that may help guard against disease-causing organisms and improve immunity.



*Samburu woman handling camel*



*Samburu Man milking a camel*



*Samburu woman milking a camel*

**Table 2. Importance of Camel /Sapatisho entames)**

Importance of Camels	Sapatisho entames
Food - Milk	Keeta kule
Food - Meat	Keta nkiri
Food - Blood	Lodo
Hide	Lchoni
Compensation	Keishori aitemeletie Itungana oara talmarei
Dowry	Keitaini tenkiyama nabo toolokop apude nkishu
Source of income	Keitami Silinkini
Transportation	Kenapieki Lola
Sports	Keitumiari tangamata enkuguran enkuetata

## Work and Transport

Pastoralists use male camels mainly for drawing water, carrying building materials and other belongings, shifting young children, old people and young stock and ferrying surplus milk to the market.

## Tourism, Mobile services and Sports

Camel racing and trekking safaris have great potential to earn the owners and trainer's income from ecotourism. Parts of northern Kenya and Rift Valley are highly suited to this as they may offer a combination of wildlife and mountain scenery. Camel racing in Kenya is still in its infancy but has already gained international recognition. Camels could also be used to provide mobile special outreach services to remote destinations with their equipment.

## Social and cultural uses

Camels play an important role as a medium for regulating most aspects of socio-cultural and religious lifestyles of camel keeping communities. A man without camels is disadvantaged because he cannot shift with the rest of the community, draw water from far distances or provide enough for his family especially during drought. A family without camels is considered to be poor, in spite of having other livestock species.



*Camels racing during the Maralal Camel Derby in northern Kenya. (Photo Nathaniel Tum)*

The camel is regarded as a symbol of wealth, status and prestige. For example, amongst the Somali pastoralists, families or clans with large camel herds are regarded as being wealthy with a higher social status and influence, and often become opinion leaders within the community. The culture of most indigenous camel keepers revolves around camels e.g. Rendille and Gabbra regularly perform traditional ceremonies for blessing camels i.e. the *Sorio*. Camels are required in important ceremonies such as marriage, burial and religious events. Among the Somalis, camels are used to pay Zakat (tithe or offering). In fact camels are becoming a mandatory species for dowry payment even among communities that have recently adopted camels such as the Samburu. There are many cultural dances in praise of camels.

Camels are used as a medium for resolving disputes and for compensation between individuals, families or clans. For example, among the Somalis compensation for killing a man or a woman is pegged at 100 and 50 camels respectively according to the Madogashe declaration. Camels are seen as a store of wealth, investment and banking system or security against drought, disease and other natural calamities. In some communities, camels are also loaned to the needy as a way of spreading risks and assisting others.





# SECTION III:

## CAMEL BREEDS AND BREEDING

Camel is a seasonal breeder and unlike other livestock both male and female come into heat during the breeding season. This season is called Rutt or Musth in reference to male. Breeding season occur between November and March. The gestation period in camels is 390 days with average birth weight 35-40 kgs.

There are three camel breeds in Kenya, namely Somali, Rendille/Gabbara and Turkana.

These breeds derived their names from communities who rear them. Table 3 provides some of the characteristics associated with these breeds.

**Table 3. Summary of the breeds in English and Samburu languages**

English	Samburu	Image
Somali breed	ndapara	
Somali breed has the following characteristics;	Netiu ndapara	
Largest in body size (450 - 850 kg)	Keata sesen sapuk (average 550 kg)	
Daily milk yield of 3 - 5 litres	Keata kule kumo	
Heavy feeder	Kedaa oleng	
Not suited for rocky terrain because of the weight	Keiba soit	
Largely creamish in coat	Keiporog tomua	

Gabbara/Rendile breed	Ntames e rantile	
Compared to Somali breed, Rendille/ Gabbara breed has is;	Netiu ntames e rantile	
Smaller in size (300 -550kg)	Keata sesen kiti (300-550kg)	
Lower in milk yield (average 1 - 3 litres daily)	Meata kule oleng	
Does better under poor pasture conditions and rough terrain	Kesham lpurkel onkop nagol elowuan ee soito	
Coat color is mainly cream or brown	Keiporog mua	

### Sexual maturity

Females become active at 4 to 5 years of age and give birth when about 5 to 6 years old.

- A male on the other hand attains sexual maturity at around 5 years but begins to serve actively at around 6 years when his canine teeth are sufficiently developed for fighting.

### Recommended bull: female ratio

- Normally a camel keeper should maintain one dominant bull of between 6 to 12 years with one younger bull as his replacement.
- More than one breeding bull may be required depending on the herd size.
- A bull: female ratio of 1:50 is appropriate when sufficient forage is available.



*Camel mating*

## Signs of a male bull's peak fertility (rut)

- Loss of appetite and condition.
- Usually aggressive and difficult to handle (Chases away all the other males and even humans)
- Frequent urination and splashing urine on the back by flicking the tail.
- Prolific secretion from the poll glands situated behind the ears and rubbing the secretion onto plants as a way of marking its territory.
- Protrusion of a soft palatal flap from the mouth (with air, in form of a pink balloon as shown in the picture below)
- Making characteristic noises and continuously grinding their teeth with saliva flowing from the mouth.
- Rutting bulls should be separated as they may fight to death.



*Secretion from the poll glands situated behind the ears of male camel*

## Sexual maturity (*Ng'amata nabaki*)

English	Samburu
Sexual maturity in males	Ng'amata nabaki laur Ntamesi
A male on the other hand attain sexual maturity at around 5 years	Kore taatua larin imet keidim atewienie ntames.
Male begins to serve actively at around 6 years	Larin imet mpaka ile nogoro
Sexual maturity in females	Ng'amata nabaki Ntawuo laur
Females become active at 4 to 5 years of age and give birth when about 5 to 6 years old.	Kore taatua larin ongwan mpaka imet nengasu ntawuo ayeu laing'oni neisho taatua larin imet tanaa ilee

**Signs of heat in females** (*Tenemanumanu ntames*)

English	Samburu
Making characteristic noise	Aipurr ana laing’oni
Sits next to the male	Noboitere laing’oni
May show swelling of the vulva	Nebashbashu sedi
Restlessness	Noloolo
Mucous discharge	Neitai nkare
Frequent urination	Neisirisiru nkula
May have reduced milk yield	Neaku kule kuni

**Rutting Rendille Bull**

Notice the protruding soft palate



*Protrusion of a soft palatal flap (Dulla)*

## Pregnancy diagnosis

- A traditional method of telling if a camel is pregnant, is to stand near it and raise your hand, then check for the raising of the tail and passing of some urine. If it does so, this indicates pregnancy.
- A pregnant camel will also raise her tail when a bull approaches her.
- The camel begins to show this sign 2-4 weeks after conception. Gestation period of a camel is 12-14 months

## Signs of pregnancy (*Nkututudolinoto etemes naiturukum*)

English	Samburu
Cocking the tail when approached by human or bull and urinates	Keshum lkidong'oe , neisirisiru nkula
The camel dries up	Keyei
Camel becomes more attracted to bull	Kesham laingoni
Some hate the bull	Neibai mbata laur
Gains weight	Neng'asu apiru
Enlargement of the abdomen	Neng'er nkosheke
Enlargement of the udder	Neng'asu anang'u nyawa

## Good breeding practices

### 1. Avoid inbreeding by:

- Replacing the breeding bull at 12 years when its first daughters become sexually mature.
- Exchanging bulls with neighbors.
- Use of two or more breeding bulls.

### 2. Use young bulls below 13 years. Such bulls have:

- High ability to follow and mount females.
- High service rate.
- Come to rut faster after the dry season and serve for a longer period in any given breeding season
- Higher conception rates of females availed for service.

### 3. Females

- Use females of less or equal to 6 calvings. Such younger females;
- normally have good body condition
- produce more milk for the calf and humans and
- their calves show a higher growth rate.

**Good breeding practices (Nkitiisho supat)**

English	Samburu
Select good quality bull	Yaki laur supat lempeko
Select calm and friendly bull	Niyeki laur obor
Cross breeding of different breeds	Nuntushul mpekui napaasha ee ntamesi elkuume, ee samale tanaa naarantile
Cross breed with high milk producers	Niyeki ntamesi laur loata ngoteny kule

- Bull approach is faster in spreading the desired traits because one breeding bull has the capacity to serve 50 days in a breeding season while a female would only give birth to one calf at a time.

**Calving Management****Signs of labour (Saisai)**

English	Samburu
Restlessness including lying down and standing up	Nengasu alolo, neperper
Enlargement of the udder	Nenang'u nyawa
Make characteristic noise	Neiru
Loss of appetite	Medaa
Frequently chewing cud	Nenya Nkamuruai oleng
Contraction of uterus muscles	Neirenya
Sagging of the ligaments at the root of the tail	Nodung Lkurum

**Calving Management**

- Separate the camel from the rest of the herd and keep it in the boma
- Be near the camel
- In case of difficult calving, gently manipulate - Make the mother lie down to ensure that the calf is not dropped while the mother is standing.
- Remove birth fluids on the calf body particularly around the nose
- Treat the cut end of the umbilical cord with some iodine, strong salt solution or just tie it in a knot or with a clean string.
- Put the calf in front of the mother until the mother makes some low groaning noise.

- Assist the calf to suckle and if the mother refuses to suckle her calf which is especially common with first calvers, smear the mother with some birth fluids around the nostrils.
- If she still proves difficult, isolate and try to scare her so that it only sees the calf around her. This helps in forcing the mother to accept the calf. In case of the death of the mother, cover the foster mother with the hide of the mother to enhance acceptance.
- Note: If mother dies two months post-birth, the calf rarely survives.
- Must witness dropping of placenta although retention is very rare; can also be removed manually.



*Camel calving*

**Calving Management (*Reteto entames*)**

English	Samburu
Tie front leg	Niyen nkeju
Give chance to lie down by itself	Nilam metepero apeny
Hold the legs and pull while another person holds the head to avoid hitting the ground	Numbung nkejek ayietu neibung likae ltungani nkwe
Assist the camel to stand to avoid uterine prolapse	Ninyoyie meitasho poomolotu nkosheke
Peel off amniotic sac	Nintae mpareriai
Monitor the camel until the placenta drops	Nirrip meitai mudong
Palpate the udder	Numbungbung motomoo nyirig



# SECTION IV:

## CAMEL HEALTH

The health of camels determines your prosperity as a livestock keeper. The list of diseases was co-produced with Samburu camel keepers reflects the diseases that cause them the highest economic losses in terms of money spent in treating them, loss of milk and death of animals. It is important for camel keepers to know so that they can identify signs early. Early identification of diseases leads to better treatment outcomes. The health of camels is linked to the health of humans. Camel keepers need to be aware of zoonotic diseases so that they can protect themselves and produce safe food. Zoonotic diseases are diseases transmitted between people and animals such as Anthrax (Lokuchum), Brucellosis (Moyian e kule), Rift Valley fever (Lkibirototo) and Rabies (Nkwang). The use of drugs in camels without seeking veterinary diagnosis is causing drug resistance in camels and humans as drugs given to camels end up in milk and meat that are consumed by humans. Proper diagnosis and proper use of drugs prevents development of resistance. The table below highlights priority camel diseases in Samburu County.

English	Samburu
<b>1. Camel Cough</b>	<b>Lchama</b>
<i>Main Clinical Signs</i>	<i>Nkutodolunoto</i>
Coughing	Kolua
Difficulty in breathing	Kegarama / Keirum
Nasal discharge	Koruko Lchama
<i>Recommended Action</i>	<i>Asat Nairirikino</i>
Consult veterinary officer for correct drug dosage	Mpoto Lkitarii Mikitiliki Ldewa Supat



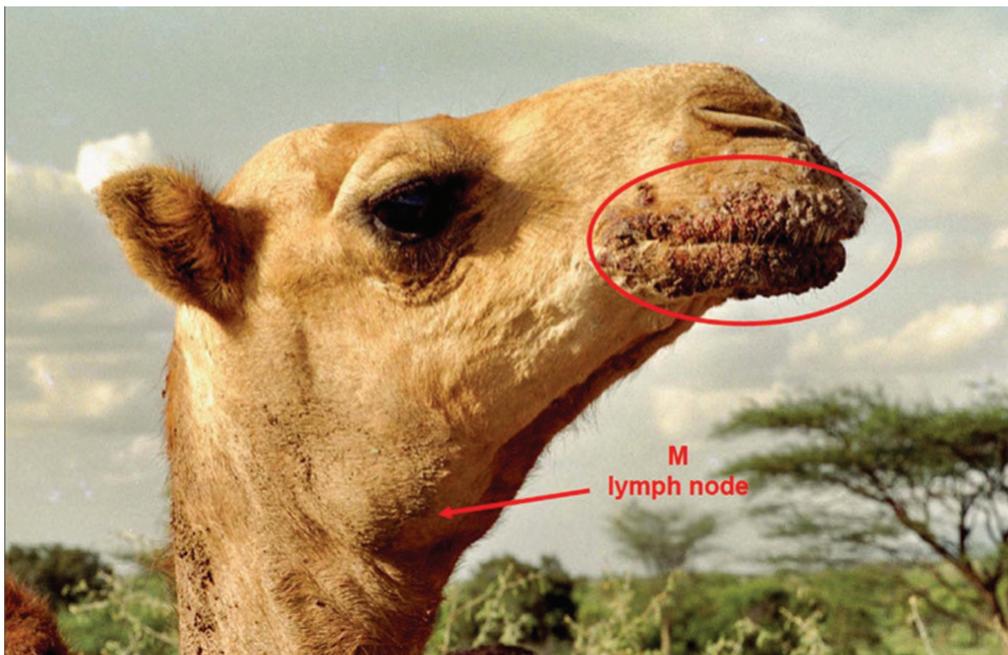
Kegarama (Difficult breathing)



Koruko Lchama (Nasal discharge)

*(Photo credit: Emmanuel Lesiantam- Samburu County)*

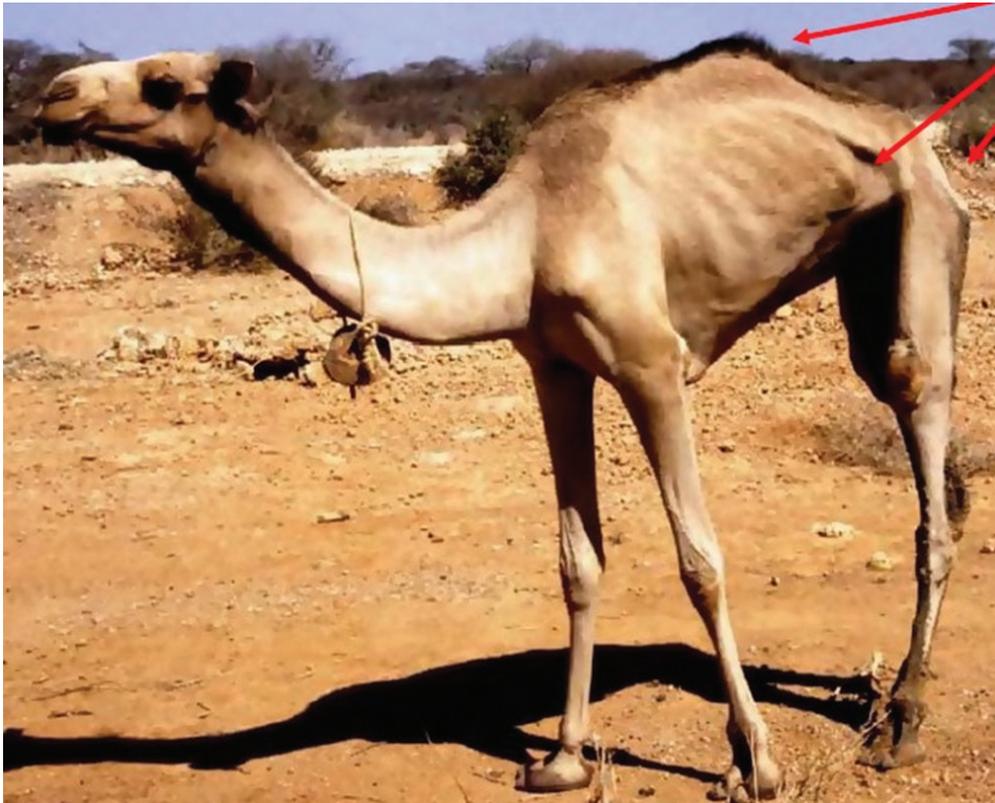
English	Samburu
<b>2. Camel Orf / Camel Contagious Ecthyma(CCE)</b>	<b>Abitiro</b>
<i>Main Clinical Signs</i>	<i>Nkutodolunoto</i>
Swollen mouth	Nejei Nkutuk
Wounds in the mouth	Nejing Ng'oldonyot Nkutuk
Swollen lymph nodes	Nejei Lng'arng'ar
<i>Recommended Action</i>	<i>Asat Nairirikino</i>
Wash with salty water	Keituki Tankare e Chumvi
Apply sheep fat	Neeli Talata e Nker



Nejing Ng'oldonyot Nkutuk (Wounds in the mouth) and Nejei Lng'arng'ar (Swollen lymphnode)

(Photo credit: Dr. Maurizio Dioli- Veterinary Camel Expert)

English	Samburu
<b>3. Trypanosomiasis</b>	<b>Saar</b>
<i>Main Clinical Signs</i>	<i>Nkutodolunoto</i>
Emaciation	Keidoosari
Unpleasant body smell	Neibung Nkuama Torno
Pale/white eye membranes	Neiborru Sunyuai Enkong'u
Death	Neye
<i>Recommended Action</i>	<i>Asat Nairirikino</i>
Consult veterinary officer for correct drug dosage	Mpoto Lkitarii Mikitiliki Ldewa Supat
Jugular bleeding	Kong'ori



Keidoosari (Emaciation)

(Photo credit: Dr. Maurizio Dioli- Veterinarian and Camel Expert)

English	Samburu
<b>4. Camel pox</b>	<b>Nariri</b>
<i>Main Clinical Signs</i>	<i>Nkutodolunoto</i>
Itching	Koojo
Rough hair coat	Keririu Sesen
Abortion	Keibirunye
Swelling of all lymph nodes	Keitejia Lng'arng'ar Pooki
<i>Recommended Action</i>	<i>Asat Nairirikino</i>
Consult veterinary officer for correct drug dosage	Mpoto Lkitarii Mikitiliki Ldewa Supat



Keririu Sesen (Rough hair coat)

(Photo credit: Dr. Maurizio Dioli- Veterinarian and Camel Expert)

English	Samburu
<b>5. Rabies</b>	<b>Nkwang</b>
<i>Main Clinical Signs</i>	<i>Nkutodolunoto</i>
Sudden change in behaviour	Neibelekenya Lwenet
Bites other animals	Nowony Nkule Suom
Running wild	Neisig
Excessive salivation	Sampulal
<i>Recommended Action</i>	<i>Asat Nairirikino</i>
Consult veterinary officer for vaccination	Mpoto Lkitarii Mikitiliki Ldewa Orem
Isolate animal and tie its legs to stop it running away	Tegelu Niyen
Zoonotic disease if bitten by rabid animal seek immediate medical attention	Keitarasu Suom Ltung'ana Anamoy-an Tunukuwony Siomi Nulo Sipitali



Neibelekenya Lwenet (Sudden change in behaviour)

*(Photo credit: Research Institute for Biological Safety Problems» of the Ministry of Health of the Republic of Kazakhstan)*



Sampulal (Excessive salivation)

*(Photo credit St. Loius Zoo)*

English	Samburu
<b>6. Haemorrhagic Septicaemia</b>	<b>Nalng'arng'ari</b>
<i>Main Clinical Signs</i>	<i>Nkutodolunoto</i>
Sneezing	Kessin
Coughing	Kolua
Difficulty in breathing	Kegarama / Keirum
Groaning	Kedia
Swelling of entire neck lymph nodes	Nejei Lng'arng'ar Lemurt
<i>Recommended Action</i>	<i>Asat Nairirikino</i>
Consult veterinary officer for correct drug and dosage	Mpoto Lkitarii Mikitiliki Ldewa Supat



Nejei Lng'arng'ar Lemurt (Swelling of the neck lymph nodes)

(Photo credit Francis Kirinyal, Marsabit County)

English	Samburu
<b>7. Anthrax</b>	<b>Lokuchum</b>
<i>Main Clinical Signs</i>	<i>Nkutodolunoto</i>
Blood oozing from all body openings	Keimu Lodo Udot Pooki e Sesen
Blood does not clot	Moku Lodo Teneye
No rigor mortis	Meikarbobo Sesen Teneye
<i>Recommended Action</i>	<i>Asat Nairirikino</i>
Isolate sick animal	Kegelakini Lale
Burn or bury dead animal	Teneye Nepejori Tanaa E nukari
Do not open dead animal or soil will be contaminated	Meyieng'i Pee Meitarruo Nkulupo
Consult veterinary officer for vaccination	Mpoto Lkitarii Mikitiliki Ldewa Orem
Zoonotic disease	Keitarasu Suom Ltung'ana Anamoyan



Keimu Lodo Udot Pooki e Sesen (Blood oozing from all body openings)

(Photo credit Fraz MK, Sohail M, Muhammad NM and Sayed A A.)

English	Samburu
<b>8. Rift Valley Fever</b>	<b>Lkibirot</b>
<i>Brucellosis</i>	<i>Moyian e kule</i>
<i>Main Clinical Signs</i>	<i>Nkutodolunoto</i>
Abortion storms	Keibiru
Retained placenta	Keibok Mudong
<i>Recommended Action</i>	<i>Asat Nairirikino</i>
Consult veterinary officer for vaccination	Mpoto Lkitarii Mikitiliki Ldewa Orem
Zoonotic disease	Keitarasu Suom Ltung'ana Anamoyan



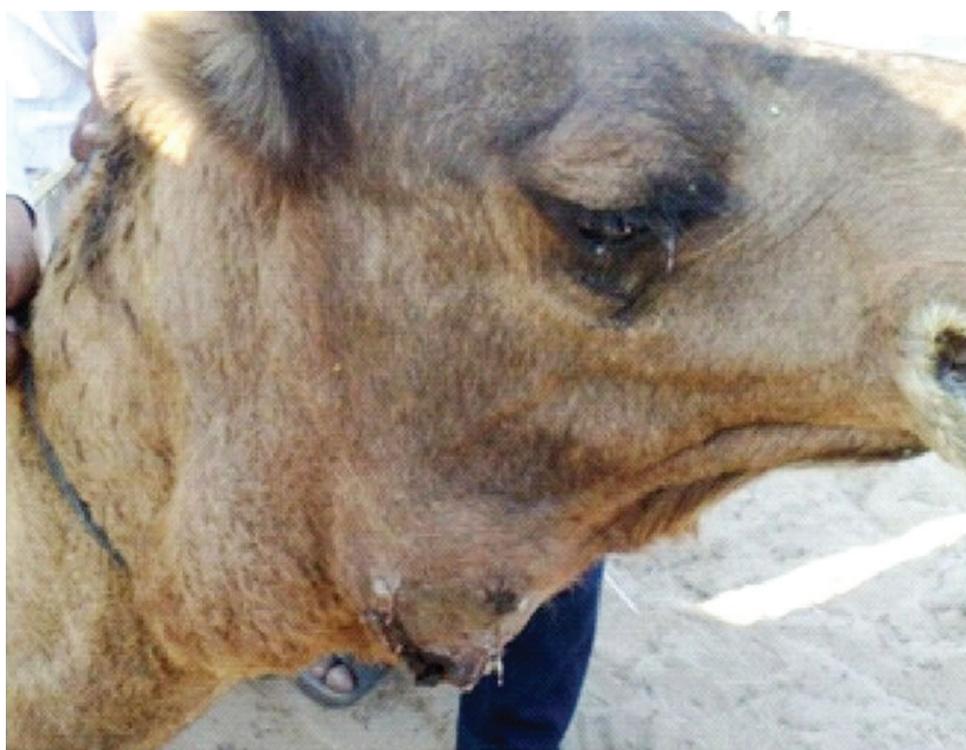
Keibok Mudong (Retained Placenta)

Keibiru (Abortion storms)

(Photo credit: Tibary A. and Anouassi A.)

Photo credit: Emmanuel Lesiantam- Samburu County)

English	Samburu
<b>10. Abscesses</b>	<b>Ntubui</b>
<i>Main Clinical Signs</i>	<i>Nkutodolunoto</i>
Swelling of affected area	Kejei
Sickly behaviour	Neitomwai
<i>Recommended Action</i>	<i>Asat Nairirikino</i>
Use suitable plants (short thorns) to fence the boma	Towuasherie Lkeek Supat
Clear tree stumps	Tudung'o Nturlegen Toboo



Kejei (Swelling of affected area)

*(Photo credit Shirish Dadarao Narnaware)*

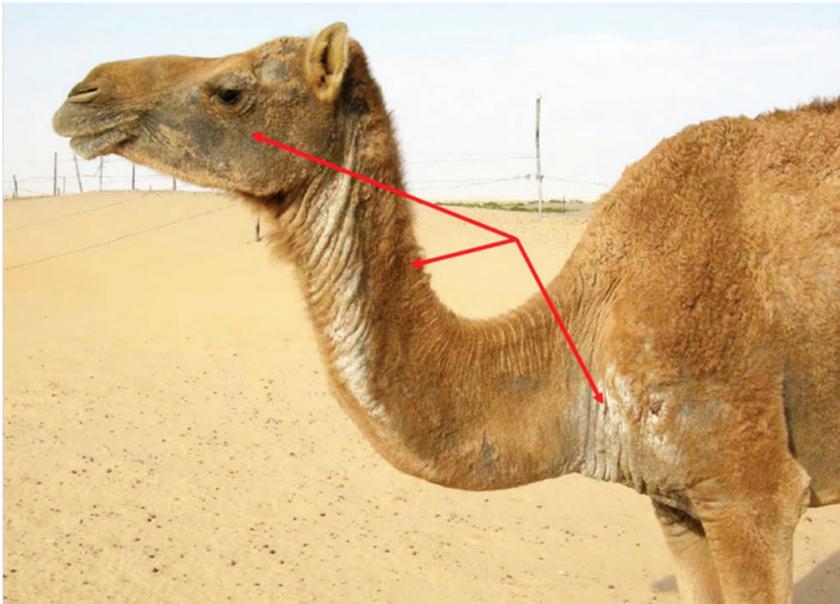
English	Samburu
<b>11. Helminthiasis / Worms</b>	<b>Ntumwa</b>
<i>Main Clinical Signs</i>	<i>Nkutodolunoto</i>
Profuse diarrhoea	Keirri Oleng
Loss of weight	Kesasu
Worms in the faeces	Keilio Ntumwua Tolkileleng
<i>Recommended Action</i>	<i>Asat Nairirikino</i>
Deworm animals with the correct drug dosage	Keishori Ldawa Lenkutuk
Take animals to salt lick areas	Kerewi Lbolio



Ntumwa (Worms)

(Picture credit Dr. Margie Bale and Tara from Camel Connection)

English	Samburu
<b>12. Mange</b>	<b>Lpepedo</b>
<i>Main Clinical Signs</i>	<i>Nkutodolunoto</i>
Itching	Koojo
Darkened and thickened skin	Neirririu Lchoni
Loss of hair	Neidosdoso
Emaciation	Nesasu
<i>Recommended Action</i>	<i>Asat Nairirikino</i>
Wash or spray with acaricide	Keituki Te Tip
Smear used engine oil	Ne Elieki Oi
Consult a veterinary doctor for the correct Ivermectin dosage	Mpoto Lkitarii Mikitiliki Nowua Naromectin Oremi
Wrong Ivermectin dosage can kill animal and affect humans who eat the dead animal	Kear Ldewa Lemeiririkino Siomi. Neitomuai Ltung'ana Oonya Suom Naatuata Eremo Ldawa



Neirririu Lchoni (darkened thickened skin) and Neidosdoso (loss of hair)

(Photo credit: Dr. Maurizio Dioli- Veterinarian and Camel Expert)

# SECTION V:

## CAMEL FEEDING AND NUTRITION

### Feeding and Nutrition in camels

Good nutrition is very important for growth, reproduction and milk production. Good nutrition implies that the camel must get sufficient proteins, energy, roughage, minerals and water.

### Feeding habits

Young camels begin to browse at the age of one month. Foraging camels spread over a large area thus minimizing pressure on a particular area. Their long legs and neck enable them to browse up to 3 m above the ground, a height not reached by other livestock.

Due to their specific forage preferences and feeding at higher levels, camels are rarely in direct competition with other animals (notably cattle, goats and sheep) for grazing and therefore a combination of these species results in increased productivity per unit of land.

Given the opportunity, camels prefer to feed on shrubs and trees. However, in the absence of browse forages they can comfortably live on herbs and annual grasses. A camel requires 8-10 hours of grazing daily to be satisfied. This depends on breed, body size and feed availability. In an ideal situation, camels are able to select a high-quality diet that provides all the nutrients required by the body. During the dry season, when other forages are scarce, camels can browse on the green twigs of trees that other livestock species cannot reach, enabling them to survive droughts.

### Mineral requirements

This depends on the age, condition (lactating or pregnant mothers) or health situation of the camel.

#### *signs mineral deficiency (Singate)*

English	Samburu
Dehydration	Notoi
Restlessness	Keirrana
Licking of soil or ash	Nemej nkulupo/nkuron
Pica/ chewing bones	Nenya loik
Move to natural salt licks	Nopuo netii lbolio
Poor feeding	Melak naimot

## Water requirements

The camel is the most efficient livestock in water utilization in the body by being able to reabsorb most of the water in the kidney, avoiding water loss through evaporation, among others. Camels get sufficient water from the feed in wet seasons and may not require direct watering. Dry seasons and drought periods: watering camels is required at intervals not exceeding 5 to 8 days. Lactating camels should be watered at least every six days with adequate forage available. Camels can drink up to 25% of their body weight within a few minutes, however ample time should be given to the camel to drink several times with resting intervals to meet its requirements. Dehydration in camels can be tested by the skin elasticity by pulling out the loose skin e.g. the neck or lower part of the abdomen and then release. If the skin reverts back to its normal position quickly, it suggests that the animal may not require water. However, if the skin takes long to revert to its normal position, this suggests a significant degree of dehydration.

## Supplementary feeding in camels

Under normal circumstances camels can get enough and a quality diet from natural vegetation.

However, during periods of feed scarcity, supplementary feeding would certainly be beneficial to camels particularly pregnant, lactating and calves.

- Supplementation can be achieved through harvesting and storage of some feed material e.g. acacia pods especially for the settled households.
- The nutritional quality of natural vegetation is highest at the time when vegetation is beginning to dry up and this would be the most appropriate harvesting time.
- Grass hay, minerals supplement and concentrates like dairy cubes could be bought from the market and fed to camels. However, this may prove expensive and only affordable for a few high yielding breeds like Pakistani.

## Feeding camels

Camels are browsers, meaning they feed predominantly on twigs, shrubs and forbs. Occasionally, camels may also graze, especially during the wet season. Camels therefore preferred flat terrain within wooded grassland, woodland, and bushland/shrubland.

Herding of camels in natural vegetation is a common practice among the majority of pastoralists in Kenya. Camel herding is a skill that is well developed. As a camel herder, learning and understanding camel's 'language' is key to successful herding trips. One must learn when camels are anxious, afraid, sad, and/or not enjoying the available forage etc.

Herding camels is not just about leading and driving camels from Boma to the field but is a skill. Herding can be in two forms, drive them to pasture and leave them unattended or tend (to shepherd) One must also know/learn camel preferred forage plants to be able to guide them well during herding. Below are some of the preferred browse species.

**Preferred browse by camels**

Samburu names	Scientific name
Lgirigiri	<i>Acacia brevispica</i>
Sesiai	<i>Acacia elatior</i>
Eiiti	<i>Acacia mellifera</i>
	<i>Acacia paoli</i>
Ltepes	<i>Acacia tortilis</i>
Silalei	<i>Boswellia neglecta</i>
Lorosoro?	<i>Cadaba glandulosa</i>
Leminshiria	<i>Combretum aculeatum</i>
Lcheni-ngiro	<i>Commiphora africana</i>
Lgweita	<i>Cordia sinensis</i>
Irii	<i>Grewia tembensis</i>
Lpupoi	<i>Grewia villosa</i>
Lgiriai	<i>Lawsonia inermis</i>
Lemaloni	<i>Premna resinosa</i>
Sucha?	<i>Barleria acanthoides</i>
Serichoi	<i>Barleria eranthomoides</i>
	<i>Barleria proxima</i>
Lmejarai	<i>Indigofera cliffordiana</i>
Lkitagesi	<i>Indigofera spinosa</i>
	<i>Justicia caurulea</i>
Lturkan	<i>Sericocomopsis hildebrandtii</i>
Lmarag	<i>Blepharis linhaarifolia</i>
Naiteteiyai	<i>Commelina banghelensis</i>

## Feeding pregnant mother

- Balanced nutrition with plenty of water is required during pregnancy.
- Feed quantity should be increased by 25% for growing fetuses.
- Fighting in camels should be avoided as this can lead to rupture of the uterus.
- Kicking and biting on the abdomen should be avoided as far as possible.
- Plenty of green and dry fodder is necessary.
- The diet generally prescribed during pregnancy is as follows:
- Concentrate Mix 5kgs
- Tree fodder 20-25 kgs
- Salt 30gms

## Feeding calves

### Newborn to 5 days (weigh 35-40 Kg)

- Feed purely on mother's milk up to 8 times in a day
- Provide clean dry and quite shelter
- Ensure the naval remain clean and dry

### One week to two months

- Feed on mother's milk but reduce from 8 to 4 times a day
- Provide clean, dry quite shelter
- Provide companion animal, preferably other calves

### Two to Four Month

- Feed on mother's milk once per day
- Feed high protein solid feed such as Acacia browse, pods
- Provide clean, dry shelter

### Four to Nine Months – Weaner

- Wean the calves to a high protein diet and can accompany the rest of the herds in the grazing fields.

# SECTION VI:

## CAMEL WELFARE

Camel welfare is important to consider in production to ensure optimum productivity, long healthy life, and better income. We have highlighted the principles of camel welfare as well as practices that may impact negatively on their welfare to create awareness and promote good camel keeping practices.

Just like humans, animals feel pain and deserve to live in an environment that guarantees normal physical, mental, and behavioral development. *Atuwana ake Itungana kening abaki suom mion, naa keirikino peemany ng’oji supat nemeiran sesen lenye tanaa ng’eno enye*

### Principles of camel welfare

There are five principles of animal welfare that all livestock keepers should adhere to in pursuit of sustainable production.

**Table 6.1. Principles of camel welfare**

No	English	Samburu
1	Freedom from hunger and thirst	Haki pemeata sumash tanaa nkure
2	Freedom from environmental discomfort	Haki peemany ng’oji supat
3	Freedom from pain, injury and disease	Haki peemening mion, nomororoito nemeirasu moyatin
4	Freedom to express normal behaviour	Haki peas nkidimat enyana
5	Freedom from fear and distress	Haki pemeiputukuny nomotum pikiri



Anti-suckling device - Teats tied up.  
Photo by Atif Abdelgadir



Blindfolding camels while at work or to force fostering.

Source: <https://memorablemeanders.blogspot.com/2010/09/producing-sesame-oil-in-desert.html>

**Table 6.2. Practices that deny freedom from hunger and thirst (Ramati naamatiki suom haki pemeata sumash tanaa nkure)**

	English	Samburu	Images
1	Forced fostering practices – camels prevented from feeding and drinking to force them to accept a calf.	Aisich natashama ngirig	
2	Forced weaning – Weaners are cut above the nostrils to induce pain when it tries to suckle. This also interfere with browsing and watering	Mbarata e nkume aworie ntames	

**Table 6.3. Practices that deny freedom from environmental discomfort (Ramati naamatiki suom emany ngoji supat)**

English	Samburu	Images
Prolong stay in boma with accumulated droppings	<u>Mbikoto</u> <u>naado to boo</u> <u>nabo nabore</u> <u>ltulugumi</u>	
Camel boma establish in poorly drained soils -gets muddy during wet season	<u>Tonowuae</u> <u>boo tong'oji</u> <u>neisordon</u>	

**Table 6.4. Practices that deny freedom from pain, injuries and diseases  
(Ramati naamatiki suom haki peemening mion, nomororoito nemerasu moyatin)**

English	Samburu	Images
Tying the teat to prevent suckling of calves	Airin lki peemenak ngireg/nyirig	
Slicing skin above the nostrils to prevent suckling	Mbarata e nkume aworie ntames	
Hot iron branding for identification and/or treatment	Minchirata entames peyelouni tanaa peitomwuai	
Blocking the anal passage to force fostering	Ripata yantames aisichoki ngireg/nyirig	
Permanent Rope tied around the neck as a means to restrain a male during a rut.		

**Table 6.5. Practices that deny freedom from to express normal behaviour (Ramati naamatiki suom haki peas nkidimat enyana)**

English	Samburu	Images
Restraining the bull from movement during rutting	Ayen laingoni poomolo nemewenie ntamesi nkata pooki tonogoro	

**Table 6.6. Practices that deny freedom from fear and distress (Ramati naamatiki suom haki pemeiputukuny nomotum pikiri)**

English	Samburu	Images
Scaring a camel to force fostering	Aituria ntames peeshamu nyirig/ngireg	A dog tied to a camel calf pen
Blind folding the camel to force fostering	Apik lkuniya nkwe entames pemeitoki adolisho aisichoki ngireg/ nyirig	

## Camel Handling/Restraining

Approaching a camel should be done with a lot of care

- Camels can kick back, forward and to the sides.
- Camel bites can cause serious injury and can even be fatal
- Camel can also trample or sit on someone

Therefore, build trust relationship with your camels when approaching them through positive reinforcement, showing them how to remain still for exams, medical treatment and during milking.

- Where possible entice camels with feeds as you approach them
- Always rub their backs to feel comfortable.
- Make a soothing or instructional tone while approaching the camel

**Table 6.7. Camel needs to be approached with care (Keyieu ntames nyenyikakini ta ntakano)**

English	Samburu	
Camel can kick	Koruaisho	
Camel can bite	Nowonyisho	
Camel can also sit on human	Nepetarisho	

**Table 6.8 Camel handling (Nkubungata e ntames)**

English	Samburu
Make a soothing or instructional tone while approaching the camel	Aimany
Always rub their backs to feel the comfort.	Aiguar ta nkaina
Tie front leg	Aen nkeju
Confine in the boma	Airiki boo

## Restrain and control techniques

Physical restraint is important for the safety of both the personnel and the camel handled.

The health status of the camel and the intended procedure determine the restraint technique to be used.

## Ways for handling and restraint;

4. Voice – Commanding tone, soothing tone, instructional tone
5. Hands
6. Ropes
7. Cage
8. Chemical restraint involves the use of anesthesia.

## Circumstances for restraint

There are a number of circumstances that warrant restraining a camel. Whatever the reason for restraining, utmost care must be followed (some of the reasons for restraining have been provided in Table ).

English	Samburu
Milking	Peelepi
Medication	Puuntomuai
Prevent movement	Peemekij
Mating	Metewienie laur
To slow walking speed while relocated	Piimikilany
Slaughter	Teneyieng'i
Spraying	Teneituki
Training for sports or for carrying load	Adondor peeroti/peekwetieki
Rutting bull	Tonogoro Laur
vaccination	
Riding	
loading luggage	
Branding	

## Saddling

Saddles are mainly used for carrying loads or people and normally sit over the hump. Some saddles have been adapted for use in pulling carts, plowing among other uses. Whichever the case, the weight of the saddle should rest on the ribs not the hump itself.

## Branding

Branding done by making a cut or use of color on any other part of the camel except the face.  
Reasons for branding (Tipat Lminchire)

English	Samburu
For identification	Peeyiolouni
Specific clan brand	Lminchire lalmarei

Excess branding is discouraged since it decreases the leather value of the hide.

Types of Brandings (*Ridat elminchire*)

- Ear tagging
- Tattoos
- Coloring
- Ringing
- Heat/Fire Branding



*Hot iron branding*



## SECTION VII:

### CAMEL PRODUCTS AND MARKETING

Camels, unlike other livestock species, can survive drought conditions and thus represent a climate adapted animal that can be a source of food and income to the pastoralists. Pastoralists rely on camel milk and meat as a source of protein and income. Increased production of safe camel milk and meat products will improve nutrition, human health, market access and incomes.

Some hygienic management practices can reduce food contamination, reduce post harvest losses and improve health and income. Current practices in milk and meat production by value chain actors present a rudimentary handling of these products and predispose them to contamination.

Camels have many products that are of commercial importance. They include:

- Fresh milk and milk products like naturally fermented milk,
- Meat and Hump fat,
- Hides
- Other by-products (like camel feet [trotters] sold for soup.
- Camel blood,
- Bones and bone marrow

Of all these products, the ones fully exploited at commercial level are meat and milk.

#### *Camel products (Kore kuna kiri keitibiri peenyae mara peemiri)*

English	Samburu
Raw meat	Nkiri e ntames
<b>Camel meat products</b>	
Dry meat	Sirikan
Roasted meat	Lpejoti
Preserved in oil	Lokuli
<b>Preservation methods</b>	
Sun drying	Aisirikan
Roasting	Apej
Oil preservation	Akul

## Camel meat

Camel meat contributes about 20% of total meat consumed. Almost 66% of the national meat production goes through a formal slaughter process, while the rest uses informal channels. Postharvest losses can be as high as 50 per cent of the meat produced, which may cause food insecurity and reduced profit margins to value chain actors. Most of these losses are caused by inappropriate post-harvest handling, processing and preservation techniques.



*Camel meat on offer at a supermarket meat section in Nairobi*

## Hygiene in handling camel meat

Good hygiene practices in food establishments are essential for consumer protection and the control of public health risks. All workers in a food handling area are therefore expected to maintain a high degree of cleanliness of their body and clothing, and wear suitable, clean and, where necessary, protective clothing in order to ensure food safety and public health. Most foodborne pathogens can survive on hands, mouth, skin, bruises, hair, sponges, clothes, and other surfaces for hours or days after the initial contact. In the pastoral environment, camel meat handlers lack experience and technical skills in hygienic handling of meat. Due to these factors, hygiene practices are generally low as seen in the photo below.



*Unhygienic slaughtering and handling of camel meat at a local butchery.*

Noticeable unhygienic practices in the photo include:

- Environment of slaughter is not suitable and not hygienic.
- The meat handlers have no suitable dressings to avoid cross contamination.
- The positioning of the slaughtered camel does not allow proper drainage of blood.
- The floor is splashed with blood and this attracts flies to the environment and contamination occurs.
- The handlers are not properly dressed.

## **Meat preservation methods**

### **Traditional methods**

The main preservation techniques in pastoral/ nomadic regions of Africa are sun-drying and deep frying. These technologies have been associated with high microbial counts since the meat is exposed to the sun and also the drying rate takes a long time. Processing meat impart significant desirable changes on the quality attributes of meat and meat products. However, meat products development poses some technological challenges, mainly with regards to optimizing the formulation, processing, and subsequent storage.

**Some of these methods include:**

**a) Lokuli**

It is an indigenous and ready to eat dehydrated meat product that is preserved in cooking oil. Camel *lokuli* is prepared by cutting boneless camel meat into thin strips then sun drying the meat for 1 hour. The sun-dried meat is then comminuted into small cubes and deep fried in commercial vegetable oil. It is stored in the same oil and consumed little by little as required.



**A**



**B**

*A: camel meat cut into strips and sun-dried in the open by hanging on a drying line.*

*B: The strips after sun-drying are cut into small cubes deep-fried in animal's own fat or vegetable oil and then preserved in oil.*

**b). Others**

Here is a mixture of other methods including;

Sun-drying,

Roasting

Smoking

***Supatisho ekule entames (Importance of Camel milk)***

English	Samburu
Food	Ndaa
Source of income	Kemiri aitam silingini

### Camel hide handling procedures (*Ramat e lchoni lentames*)

Hide is another important camel product that the community can derive income from. It is however important to maintain high quality hide for good prices in the market. To achieve this, one must follow good practices during and after slaughtering. Example are given below

#### Camel hide handling procedures and good practices

English	Samburu
When skinning the camel make sure that you do not cut the hide	Kore tiniyieng ntames ninyok metaa muwud lchoni
Ensure no remains of the flesh from the hide.	Mung'uaki lchoni nkiri
Stretch and sundry the hide soon after slaughter.	Tesho lchoni asiooki eitu erroyo
Apply salt to preserve the hide.	Tipika chumvi peyie meisamisu

Hide has many uses some of which are highlighted below:

#### Importance of camel hides (*Supatisho elchoni Lentames*)

English	Samburu
Sleeping mat	Kepetare
Making straps	Keitainyieki nkeenita
Making guord	Malasin
Making drums	Keitibirieki ldirami
Roofing	Keisiapieki nkaji
Making bags	Keitibirieki lbenia
Making bell straps	Keitibireki ngomet/maitai
Making shoes	Kaitibireki namuka

### Uses of hides

Hides and skins (including camel hides) are important sources of foreign exchange earnings for Kenya and other African countries. Full potential of camel hides has not been realized nor exploited in Kenya due to poor quality of hides which leads to low demand in both domestic and export markets.

### Traditional uses of camel hides include:

- To roof traditional houses of pastoral communities.
- making ropes, guards, drums, seats, sandals, praying mats and water and milk containers.
- Among the Turkana community, hide and skins are eaten as food, and also other communities, especially during famine.

### Curing camel hides

Traditional treatments using salt are commonly used in curing hides resulting in fine camel products after value addition.



*Camel hide guard*



*Salted dried Camel hide*

### Hygiene in handling camel products

There are important factors to ensure when marketing camel products in order to ensure quality products and comply with the law:

- Herder shall maintain personal hygiene.
- Shall be free from any zoonotic disease- cough, sneeze, open wound, diarrhea
- Environment shall be clean from dust
- Food grade container approved for transportation
- Teats shall be free from wound, abscesses, swelling, ticks and mastitis
- Any improvements in the hygiene, processing, packaging and labeling of the products is called value addition and results in fetching higher prices and a bigger market.

**Hygiene in handling camel milk (Ramat supat ekule entames)**

English	Samburu
Clean milking containers well	Keituki ljak olepishiereki
Wash hands before milking	Keituki nkaek
Wash camel teats	Keituki lki
Smoke the milk gourd	Air malasin
Clean out the small charcoal particle in the gourd	Nomusuti mala aitibiraki
In cases of mastitis, drain out all the milk from the udder	Kelepokini nkop nkata naya nyawa

**Camel Products Value Addition****Value addition on Meat**

Production of safe and wholesome meat, meat hygiene and fresh meat marketing is crucial. Meat hygiene rules must be strictly followed in order to produce safe and wholesome meat and meat products. This requires:

- A healthy and clean slaughter-stock.
- Hygienic slaughtering.
- Proper meat inspection and hygienic handling.
- Proper storage and transportation of the meat.
- In the modern methods of handling meat, safety and wholesomeness is adhered to.
- Make sure the camel for slaughter;
  - Has no signs of disease or serious injury.
  - Is not be mistreated before slaughter
  - If treated, not slaughtered before drug withdrawal period is over
  - Make sure slaughtering is hygienic and use a slaughterhouse if accessible)
  - Make sure water for washing and cleaning is available

**Meat Preservation and Packaging**

Simple standard technologies are used at slaughter places in the pastoral areas.

**Large fresh or frozen meat portions**

The retail distribution of large fresh or frozen meat portions requires packaging that protects the product from contamination during the aging, handling and transport, while extending the shelf-life of the product. This can be applied to fresh meats e.g. Bulk portions for distribution and portioned cuts for retail at local butcherries.

**Protection of the product for handling and transport**

Large or bulk portions can be wrapped in food grade polythene for protection from contamination during transportation.



*Modern methods of transportation of meat*

**Smoked, cooked or dried meat**

Value added meat products require packaging that protects and holds the product in place, to enhance shelf-life. The packaging must retain the freshness and display the product in an attractive pack presentation. The table below provides a step by step procedure for preserving meat in oil.

**Procedures of preserving meat in oil (Nkoitei Naitibirieki Lokuli tanaa mununa)**

English	Samburu
Cut raw meat into small pieces	Tudung’o nkiri metaa kunini
Put into sufuria with water	Nipik suburia o nkare
Cover the sufuria and boil	Nisiap suburia niyier
Add salt	Nipik chumvi
Boil till water dries up	Niyier metimita nkare
Add camel hump fat	Nipik lata
Stir till the meat colour changes to brownish	Nung’ol metaa mugein
Remove and cool	Nudotu airopijie
Pack into the gourd	Nubuk apik mala (Seenderi tanaa nkoiting)

## Transportation

Transportation should be by suitable standardized means like the recommended stainless steel or aluminum container or refrigerated container vehicles.

## Camel Milk Properties

- The fat content mean for camel milk is 3.9 as compared to that of cow milk which is 3.3.
- The solid non-fat percentage (SNF %) is 8.55 meaning more micro-nutrients including lactose and minerals.
- Camel milk is also rich in Vitamin C which varies from 5-10mg %.
- Camel milk is normally consumed as fresh milk, yogurt or fermented milk.

## Making Yogurt

### Procedure for making Camel milk yoghurt (Nkoitei naitibirieki yoghurt)

English	Samburu
Pasteurize milk for 30 minutes at 84 <sup>0</sup> c	Ayier kule (84 <sup>0</sup> c /30 minutes)
Cool the milk to 45 <sup>0</sup> c	Ropijie kule (45 <sup>0</sup> c)
Put starter culture	Tipika starter culture
Then incubate for 6 hours at room temperature to facilitate fermentation	Achum mowoto (6 hours at room temperature)
Cool and pack at 4 <sup>0</sup> c	Ropijie kule mpaka 4 <sup>0</sup> c niriny



*Camel Milk yoghurt processing*



*Camel milk yogurt packed*

### **Milk fermentation procedures**

Camel milk is consumed in the form of fermented milk, known in Samburu language as 'Sucha'. The milk is allowed to ferment naturally at ambient temperature in the jerry can until it turns sour. Due to the spontaneous nature of the fermentation, this traditional method results in a product with varying taste and flavor.

### **Milk storage and transportation**

The Mazzican and Aluminum cans are easy to clean and sterilize. They are also recommended for hygienic transportation of milk from production areas to the aggregation centers.



*Mazzicans*



*Aluminum cans*

## Market for live Camels

The price of camels in northern Kenya has increased 10 times from 2020 due to an increase in the export market.

The average price of camel at the Moyale camel market in 2023 is US \$ 1,400 compared to US \$140 three years ago. The Moyale market serves Kenya, Somalia, Ethiopia and Sudan traders. The main export markets for the camel meat are Egypt and the Gulf Cooperation Council countries of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates. Every market day, an estimated 150 camels are sold at the Moyale market. There are other camel markets in the region that include Lolkuniyiani in Wamba, Merille, Archer's Post and Isiolo in Isiolo County.

## Marketing camel products

Camel products can be marketed by individuals or associations.

**Individual marketing:** This is when you market your products yourself either in the market or rural setup. The advantage is that you are able to interact with customers directly and thus be able to know their needs. The drawback is that this approach limits your sales to those who know or can access you.

**Associations:** These are groups of individuals who choose to market their products as a group. The benefits of group marketing are that they pool together their products and have a larger volume and are thus able to attract a bigger market. There are many women groups which are now successfully marketing camel milk or camel meat in many parts of Northern Kenya. The Anolei women cooperative in Isiolo markets almost 8,000 liters per day of camel milk during the wet season to illustrate the power of associations. They have a refrigerated delivery truck that sells milk in Nairobi from Isiolo.

### Importance of Cooperatives (Tipat eltururr)

English	Samburu
Promote trade	Keretu yioo tolomon Lebeshara
Helps us to discuss issues as a group	Keret Yioo matumoto tonkoito napaasha
Brings unity	Keyau naboisho
Brings people together	Keitutum Itungana Kumok
Help to negotiate better prices	Keretu yioo matum bei supat
Allows for bulking of inputs and outputs	Keaku mali kumo naamiri tanaa nainyang'uni tebei supat
Facilitate access to credit facility	Keretu motumi lon tonkoitieie nalelek
Allows to cheaper value addition	Keretu metaapunya tipat enye

## Record Keeping in Business Enterprises

Records help camel keepers to track farm transactions such as sale of milk, live animals, hides and meat.

### Importance of keeping farm records (supatisho e mpala e ramat)

English	Samburu
It helps to track sales	Piyelou ntoki nitimira
It facilitates access to credit facilities	Keretu ntumoto e looni
It helps in management purposes	Keretu ramat e beshara
It helps you set product price	Keretu teyiolo bei
It helps to know profit and loss	Keretu teyiolo paida o sara

Basic records include:

- Business expenses
- Sales records
- Accounts receivable
- Accounts payable
- Customer list
- Vendors
- Employee information
- Tax documents
- Invoices
- Purchase orders
- Receipts
- Banks statements
- Contracts

Keeping these records will help farmers in a number of ways.:

- To know how much money to invest to create product or service
- Set pricing
- Compare budgeted amounts to actual costs
- Track spending
- Make wise decisions about purchases
- Prepare for tax time
- Access customer and employee information easily
- Protect their business in the event of an audit or employee issue
- Calculate expected profit

To stay compliant and avoid legal trouble, it may be important to keep copies of all records long after they're not useful for day-to-day operations. For example, one may want to keep copies of all your contracts for up to seven years, but you should probably keep auditor reports, annual statements and retirement plan records indefinitely.

### Basic Records (mpala e ramat)

Samburu names	Scientific name
Sales records	Mpala ee nkinyang'a
Receipt	Risiit
Production records	Mpala ee nkidimata
Employees records	Mpala ee Laisiayak

- Put the calf in front of the mother until the mother makes some low groaning noise.
- Assist the calf to suckle and if the mother refuses to suckle her calf which is especially common with first calvers, smear the mother with some birth fluids around the nostrils.
- If she still proves difficult, isolate and try to scare her so that it only sees the calf around her. This helps in forcing the mother to accept the calf. In case of the death of the mother, cover the foster mother with the hide of the mother to enhance acceptance.
- Note: If mother dies two months post-birth, the calf rarely survives.

## CONCLUSIONS AND RECOMMENDATIONS

In northern Kenya, the role played by camels in livelihoods has increased. Pastoralists who historically depended on cattle have started to herd the one-humped camel (*Camelus dromedarius*). The shift has been seen as an adaptation to climate change, 'a means to build climate resilience', as camels can survive severe droughts and continue to contribute to household nutrition and economy in dry periods. It appears to be a success story, a locally driven initiative by people who are typically thought to be amongst the most vulnerable to climate change and to have 'low adaptive capacity'. The initiative has also been taken up by development organizations as well as the county governments, which have started to procure and distribute camels that they view as 'the most resilient livestock.'

Some of the households that have received the camel distributed by the county government are not traditional camel keepers. Therefore, there is need to further build their capacity on suitable camel feeding program, handling practices, camel best breeding practices, health and welfare. This is the gap this handbook that is tailored to Samburu County tried to fill for both farmers, extension workers and the practitioners (NGO's and CBO's) dealing with the camel. The information in the handbook is also applicable to other ASAL Counties in Kenya and the Greater Horn of Africa region.

### Key messages and policy recommendations

1. There is need for capacity building on sustainable rangeland management to ensure the rangeland condition is suitable for livestock production.
2. There is need for sustained extension activities to bridge the knowledge gap of camel diseases and good husbandry practices amongst Samburu camel keepers.
3. Samburu County should consider external sourcing of vaccines for endemic diseases such as Haemorrhagic Septicaemia and camel pox that are causing significant economic losses.
4. The Department of Agriculture, Livestock Development, Veterinary Services and Fisheries should advocate for timely disbursement of funds and advocate for increased budget allocation to the livestock sector.
5. The county should conduct a stakeholder mapping of NGOs and development partners and submit a request for logistic support of Community Disease Reporters (CDRs). This will ensure sustained reporting of diseases and allow the identification of disease hot spots that will, inform outbreak response activities.
6. The county staff from the departments of livestock and veterinary services should facilitate and hold joint extension field visits to bridge the knowledge gap on camel husbandry among livestock keepers in the county.

7. County government should facilitate and encourage public-private partnership with private animal health service providers. They will in turn support delivery of services, especially in areas where the county staff are not available. The private sector should also be trained on reporting using the Kenya Animal Bio-surveillance System (KABS tool) as well as encouraged the private sector to utilize CDRs in their operation.
8. The county should expand the CDRs mandate to include collection of livestock population numbers in the villages they serve. This information will greatly enhance better planning of vaccination activities to increase the coverage.

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# APPENDICES

## Community engagement for the TRAMAP Project at Lerata B, Samburu East Sub-County



*TRAMAP team with community members preparing the rich picture*

## Camel husbandry, health and welfare training workshop at Archer's Post



*TRAMAP Team training ToTs on camel husbandry during the co-learning workshop held in Samburu East, June 2022*



*A veterinary practitioner of ASAL eXtension taking ToTs through priority diseases in Samburu County.*



*An Animal Health Assistant of Samburu County taking ToT's through disease surveillance tool.*



*A camel farmer with the help of an interpreter explains how he treats his camels to the training participants.*



*TRAMAP co-learning on camel parasites, manifestation and side effects during a experiential field trip in Samburu East.*



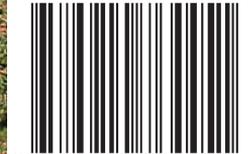
*TRAMAP team and camel farmers experiential demonstration on camel restraining.*



Participatory writeshop that helped to write this manual at Archer's Post, and at University of Nairobi's Wangari Maathai Institute for Peace and Environmental Studies (WMI)



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