

## Stopping the Desert spread—with a Camel

by Daniel Stiles

The Chalbi Desert of northern Kenya is one of the hottest and most arid areas in all of sub-Saharan Africa, yet even here people manage to adapt to the harsh conditions and survive from what meagre resources the land has to offer. That prodigious feat is made possible by the utilization of a beast which inspires the deepest love and affection from its owners, interspersed by moments of profound loathing. Many other desert-dwelling peoples of Africa, the Middle East and Asia who would not survive but for the remarkable qualities of the camel have a similar love-hate relationship with it. This haughty and cantankerous creature is highly misunderstood by the rest of mankind, who are inclined to think that it has nothing to do with contemporary life, belonging solely to the dying world of the nomadic pastoralist. They are wrong, inasmuch as the camel could improve the lives of untold numbers of people and also save from desertification the remaining rangeland of Africa. The future of the dromedary camel concerns us all. So does the history of its past.

Flying over northern Kenya today it is difficult to believe that the sparse *Acacia* scrub one sees was once thick woodland, and that the barren, dusty patches at one time were lakes, ponds or waving fields of lush grass. Thousands of square kilometres of bleak lava cobbles and boulders were once probably covered by at least a metre of soil, held in place by trees, shrubs and grass. Most of the vegetation is now gone, and so is the soil. The Chalbi itself was once a lake that rivalled the present Lake Turkana (8,000 km<sup>2</sup>) in area. Much has changed over the past few millennia in terms of climate, environment, and the culture and economy of man in the region. The dessication of northern Kenya is not an isolated case, and what happened there has parallels all over Africa and other parts of the world. Since the origin of domestic plants and animals—the so-called 'Neolithic Revolution'—many parts of the world have degenerated from highly productive habitats into desert or near desert. A big question that is

generating much heat and dust of its own is the cause of this land degradation, and what can we do to halt or reverse it.

Are the more recent deserts—those formed since the end of the Pleistocene some 10,000 years ago—due to desertization or rather to desertification? *Desertization* refers to a situation where rainfall decreases over time and becomes low and variable, punctuated by extended periods of drought, which leads to a steady impoverishment of wild plant and animal life.<sup>1</sup> It is a relatively slow process and its cause is climatic change, on account of atmospheric alterations or topographic changes such as the eruption of a mountain chain which blocks moist air from travelling to the leeward side. *Desertification* is caused by the misuse of land by man and his livestock. In arid areas the first stage is deforestation when people chop down trees and bushes to clear land for cultivation or for fuel, fodder and construction materials faster than seedlings can sprout and grow. The next stage occurs when animals overgraze and trample the land, leaving bare soil at the mercy of wind and water erosion. The entire process takes place much faster than desertization, and it can happen even without climatic change.

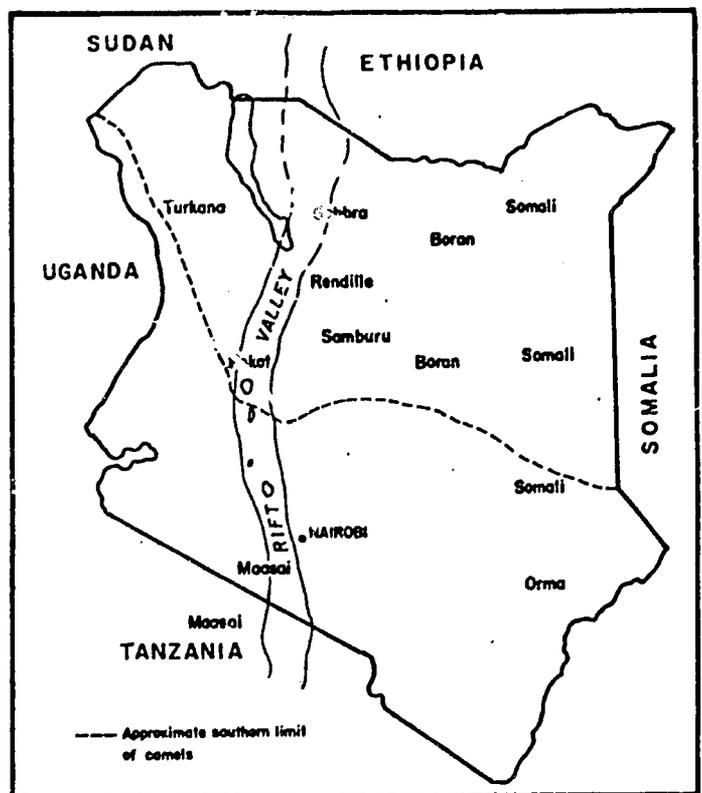
It is difficult to disassociate those two processes in

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Africa because there is good evidence for climatic change at the same time that domestic animals first appeared and spread, beginning between 7,000 and 8,000 years ago in the Nile Valley and the Sahara.<sup>2, 3</sup> Did migrating pastoralists in spreading south and east out of the Sahara create the arid wastes we see today in the Sahel and northern Kenya, or was the cause climatic change? If pastoral activities were then more at fault, it follows that they still will be today; consequently how can the situation best be changed to preserve the rangelands that remain? The question is an important one for Africa, as the continent is highly dependent on livestock. The value of livestock food and other products is \$10 billion annually, while cereal production is worth only about \$8.5 billion.<sup>4</sup> Nevertheless Africa still has to import 80,000 metric tonnes of domestic animal products a year because of its burgeoning population. Most livestock production comes from pastoralists, but with the steady degradation and loss of their land, production will inevitably drop—unless something is done.

The story in northern Kenya can begin some 8,000 years ago. Approximately 30 kilometres west of the present Chalbi 'shore' line samples of fresh water snail shells in lake deposits which are located at a height between 30 and 40 metres above the floor of the dry lake flats have a carbon-14 date of  $8100 \pm 220$  b.p.<sup>5</sup> The Chalbi floods today after heavy rains, but never extends anywhere near those dated lake sediments. If the deposits are the remains of an 8,000 year old Lake Chalbi, as is most likely, it would indicate that rainfall was significantly higher then than at the present time. The Chalbi is an internal basin fed exclusively by runoff waters from rain which falls on the surrounding highlands; hence a high lake level is evidence of high rainfall. An expanded Chalbi lake at that time is in accord with the results of studies conducted on lakes located to the north in the Ethiopian Rift Valley, to the south in the Kenyan central rift, and also nearer at hand around Lake Turkana.<sup>6, 7, 8, 9</sup>

Archaeological research shows that man inhabited most of the Saharan region at that time, which was then a well watered savannah, with the result that in the Sahara and in East Africa fishing became an important part of the economy.<sup>10, 11</sup> Sometime between 4,000 and 5,000 years ago Late Stone Age pastoralists began to filter into northern Kenya from the north.<sup>12</sup> Pollen collected from pits dug into the Chalbi show that *Podocarpus* forests on the surrounding highlands were much more extensive than today.<sup>13</sup> The region was probably one of wooded savannah, tall grasslands and with numerous streams feeding the permanent Lake Chalbi. Those early pastoralists herded cattle, sheep and goats, possibly cultivated sorghum, made pottery with a wide variety of styles, pecked out lava and pumice cobbles to make vessels, and buried their dead under stone cairns. The oldest cairn burial yet known from East Africa comes from near Kalacha, an oasis on the eastern margin of the Chalbi. The human skeleton under the stone mound dates to approximately 1500 BC. Those first East African pastoralists probably were Southern Cushitic language speakers who were migrating down the Great Rift Valley in



Map of Kenya showing most important pastoral peoples. search of richer pastures.<sup>14</sup>

For the next 3,000 years a highly varied procession of pastoralists entered Kenya from the north: Eastern Cushites such as ancestors of the Rendille, Somali, and Oromo (Galla) from Ethiopia and Somalia, followed first by Southern Nilotes (Kalenjin ancestors) and then by Eastern Nilotes (Maasai, Samburu, Turkana) from the Sudan and Uganda. All of those people were originally cattle pastoralists, although they also herded sheep and goats. Already 1,000 years ago the lakes were much lower than earlier on, but the fact that Lake Chalbi still existed suggests that there was still more rainfall than today. The Chalbi had greatly shrunk in size from the days when it lapped at the foot of Mt. Kulal, and charcoal in a hearth buried 90 cm under the surface of a sand dune near North Horr dated to  $1150 \pm 110$  b.p. indicates that desiccation and land degradation had begun.<sup>13</sup> Pastoralists were now living on extensive sand dunes on the north end of a lake which had once covered the entire area. Geological evidence from near Kalacha suggests that the lake had almost dried up by the 9th century AD, and that it became an ephemeral lake by approximately the 13th of 14th century, probably much as it is today.<sup>13, 15</sup>

Coincidentally, it was at about the same time that the Chalbi was invaded by a people who built huge rings of lava cobbles and pebbles around the graves of their dead, some measuring up to 20m (65 feet) in diameter.<sup>14</sup> Some camel pastoralists today continue the practice of putting a stone ring around a grave in the Chalbi region, but their rings are much smaller than the earlier ones. Could the carbon-14 dated 200-600 year old giant rings be remnants of the first camel pastoralists to immigrate into the Chalbi area? The drying up of the Chalbi, which signals more arid conditions than previously, fits well with a hypothesis that a camel herding people began migrating into the region between the 10th and 13th centuries.

Over the centuries the camel has slowly been moving west and south from out of the Horn, a living indicator of a dying environment. The camel has now spread to the west of Lake Turkana, to the Nilotic people for whom the lake was named. The Turkana were originally cattle pastoralists when they arrived in Kenya in the 18th century. But their large numbers and herds soon caused severe environmental degradation. Their own oral traditions recount a land rich in rain, trees and grass just three generations ago. Today there is a desert. In the 19th century they began to raid the Rendille and Gabbra, stealing camels from them. Today the Turkana have large camel herds and without them they would not be able to survive in their increasingly hostile environment.

The same process is taking place further south in Kenya. The Samburu, northern cousins of the Maasai, live south of the Rendille in relatively heavy *Acacia* bush country. They are also blessed with several high rainfall mountain areas which provide good grazing for cattle—once the forests have been burned down, which is happening at an alarming rate. The Samburu have been compressed into about 60 per cent of their early 20th century range by pressure from surrounding peoples and by land alienation for a national park and private ranches south of them, and their population has grown considerably over the past 80 years. The ancient response of migrating to better pastures is no longer open to them. Increased population necessitates larger herds to feed the people, which when coupled with smaller grazing lands inevitably leads to overgrazing, deforestation and desertification. As a result of a drop in the productivity of the land, which is then expressed in lower milk, meat and blood yields from livestock, the Samburu have recently become interested in acquiring camels. The price is very high, preventing the acquisition of as many camels as the Samburu would want.<sup>16</sup>

The Pokot, who live south of the Turkana and west of the Samburu, are also turning to camels. Those fierce pastoralists have managed to build up quite substantial camel herds from incessant raiding on the Turkana. Camels are now even spreading south of Lake Baringo to the Maasai-speaking Njemps (Il Chamus). Camels cannot move any further south by natural means as the land is owned by farmers and ranchers. The land used to be occupied by the Maasai, but the British colonial government moved the Maasai south and opened the land to European settlement. Most of the land has now been transferred to indigenous Kenyan ownership since independence in 1963, but modern agricultural techniques and a private land tenure system still prevail. If it were not for that barrier of private land and fences in all probability camels would continue their southward migration down the dry Rift Valley to the Maasai and with them into Tanzania and eventually even further south. Kenya marks the most southerly extent of camel expansion in Africa, yet they would do comparatively well in many parts of southern Africa.

People like the Samburu, Turkana and Pokot have a deep emotional attachment to cattle built up over centuries of interrelations and mutual dependence with



Photo: Daniel Slites

A young Gabbra girl taking a herd of goats to graze. The sharp hooves of these goats will tear up the ground surface and their sharp teeth will devour every edible scrap of vegetation in their path.

them. A cow or bull is not simply a piece of property or a source of food for the Kenyan cattle pastoralist; each animal is like a part of the family, being named and cared for, and it can have an important social or ritual significance. What then is the great attraction of the camel for such cattle-loving people? Why do they desire it? In a trade a good milch camel will fetch between two and five cows and up to 30 sheep and goats—if a milch camel for trade could ever be found. The pastoralists with small camel herds are also constantly complaining that available camels are too few and too expensive. They want to increase their camel herd, but are unable to do so.

There are some excellent reasons why the camel is so sought after. Some the pastoralist realizes, others he does not appear to be conscious of. Indeed anyone interested in combating desertification should be interested in the unique qualities of the camel, some of which have only recently become appreciated as a result of detailed research within the last decade. The camel is significantly superior to other livestock animals in terms of food production, its effect on the environment, and even in controlling human population growth. The camel should not be thought of as a specialized animal, adapted only to deserts. In fact, the camel is an extremely versatile animal, while it is the cow which is the more specialized in terms of its needs and potential uses.

#### Milk Production

The average female camel in northern Kenya produces from five to ten times more milk per lactation

period than a cow. A camel will lactate for more than a year after giving birth while the cow usually ceases giving milk within nine months or less. During the rainy season when pasturage is good the camel will give an average of about 10 litres of milk a day; a cow will produce less than 5 litres. In the dry season the cow will practically dry up while the camel will continue throughout to give from 3 to 5 litres a day of milk—approximately that which a cow will give at the best of times. Thus, a camel will consistently provide a substantial quantity of milk for human consumption over the course of an entire year, while cow's milk production is relatively small and highly variable.<sup>17</sup> Because of the very low milk producing capacity of the cow during dry periods, and their poor resistance to drought, the cattle pastoralist tries to have the largest herd that he can. There is no thought of culling unproductive animals to take pressure off the pasture; the expectation being that an unproductive animal may survive the next drought and then be used to trade for grain or for some calves to rebuild the herd. With everyone trying to maximize his herd the limited rangeland inevitably suffers.

The feeding habits of cattle and small stock are also much more destructive than those of camels. Cattle and sheep feed almost entirely on grass, as long as it is available. They also eat the green leaves of shrubs and herbs in the understory. The goat will devour almost anything within its reach, including *Acacia* seedlings, which seriously reduces tree reproduction. All three species travel to and from grazing areas and watering points in bunched up herds with their hard and sharp hooves kicking up clouds of dust as they scuff the earth. The cumulative results are the stripping of ground cover and the very destructive trampling of that barren land. Erosion gulleys that end up carrying away tons of top soil often start out as livestock trails.

Camels, on the other hand, have a very wide diet and eat the leaves of shrubs, trees and herbs, as well as grass.<sup>16</sup> They do not overgraze any type of vegetation, and they can eat into the upper stories of vegetation that other animals cannot (except for tree climbing goats), thus lessening pressure on the lower vegetation levels. Camels also disperse much more and travel farther than other livestock types while feeding, a trait which again lessens the effects of vegetation consumption. The dispersed movement pattern of camels also reduces the effects of trampling, although with their soft, flat hoofless feet little damage is caused anyway. In short, camels do not strip and kick up soil from the ground with the result that soil loss is minimized and trees have a much better chance to reproduce.<sup>19</sup>

#### Food Conversion Efficiency

The camel is also much more efficient than the cow in converting vegetation into milk. Studies in northern Kenya show that a camel can produce one litre of milk for human consumption from about two kilograms of vegetation dry matter. To produce an equivalent litre for human use a cow must consume more than nine kilos of dry matter.<sup>17</sup> The camel, then, is more than

four times more efficient than cattle in converting its food to human food. The implications of this finding for the future of pastoral economies in semi-arid and arid lands cannot be underestimated.

Another environmental plus for the camel is the type of settlement pattern it permits for people. The more dispersed settlements and livestock are, the less the land is affected by tree and bush cutting for firewood, and stock enclosures, and by livestock grazing and trampling. Camels are justly famous for their ability to go for long periods without drinking, and they can carry water long distances to settlements for human needs. Camel pastoralists can thus live in areas where there is good pasture but no water. Cattle pastoralists have no such option since their animals have to be watered at least every three days, making it necessary to live within a maximum radius of about 40 kilometres from a water source, although 15 to 20 km is more common. This tends to concentrate cattle people in certain parts of the range, putting excess pressure on natural resources, while leaving other areas unused. Camel pastoralists can live up to 80 km from water, allowing a more even distribution of settlements over the land.

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#### Camel Herders on the Move

In northern Kenya and most other semi-arid and arid areas rain falls unpredictably in patches over the landscape. It is rain that spurs plants to grow, so the pastoralists must be ready to go where the rain has fallen. Mobility is therefore essential, and it is that perpetual chase for patches of good grazing that makes the pastoralist a nomad. If a settlement stays in one area too long overgrazing results and the people create a surrounding circle of uprooted bushes and grotesque trees with lopped off limbs. Camel pastoralists like the Gabbra will move ten times in a year, but cattle people like the Samburu might stay in the same place for several years. It is a very great effort for cattle pastoralists to move, but camel people can pack everything on the backs of their beasts and be on the move with 24 hours notice.

The last environmental advantage of camel pastoralism over that of cattle pastoralism is one of the most important. Cattle pastoralists burn bush, forest and savannah to create grasslands, because cattle depend on grass. Camel pastoralists do not need to burn because camels do very well in a bush environment. Fire has undoubtedly done more to modify the earth's terrestrial habitats than any other single factor, and most fires have been and are anthropogenic. In highland areas where rainfall is high the creation of grassland plains might not be environmentally deleterious.

The Serengeti, for example, is a very productive habitat for animal biomass as is well known. The long term effects of repeated burning in lowland areas can have disastrous consequences, however. Rainfall tends to be much more unreliable in areas below approximately 1200 m in East Africa, and once protective bush has been burned off a prolonged drought can result in severe erosion and environmental degradation.

### Population Restraint

In addition to the food and environmental advantages provided by the camel's physiological and behavioural attributes, the camel is also the only domestic animal that has demonstrated its ability to control human population growth. If livestock are the primary source of food, and if they regulate the creation of new families by their availability, then without outside economic inputs human population cannot grow faster than the herd. Cattle herds can increase up to 15 per cent a year under ideal conditions, and this is after counting those that have been eaten. Normally, however, over the long term a herd will grow at a 3.4 per cent annual rate.<sup>20</sup> Small stock herds grow at rates up to 30 and 40 per cent annually, but high off-take rates keep real growth lower. A camel herd usually grows at an average rate of only 1.5 per cent a year, and a 5 per cent growth would be considered extremely good by most pastoralists. Because of the slow growth of camel herds societies dependent on them practice many different types of social controls to regulate marriage and birth.

For example, the Samburu (cattle herders) and Rendille (camel people) are neighbours and they occupy roughly similar habitats in northern Kenya, though Samburu-land receives on the average somewhat higher rainfall. Between 1969 and 1979 the Samburu tribe grew by 34.4 per cent, or at a 3.0 per cent annual rate. The Rendille increased by only 16.4 per cent, or about 1.6 per cent a year, one of the lowest growth rates in Kenya (the national average was almost 4 per cent for this period, the highest in the world).<sup>21</sup> These human growth rate figures are remarkably close to expected herd growth rates. Just the overall size of the two groups demonstrates that cattle people tend to be more numerous than camel people; Samburu number more than 75,000 while there are fewer than 20,000 true Rendille. The difference is probably even greater between the closely related Boran cattle and Gabbra camel peoples, but no accurate growth figures are available since these two peoples commonly cross back and forth to and from Ethiopia.

The surest—and perhaps only—way to halt desertification is to stabilize human population growth and reduce livestock herd sizes. It is very unlikely that either of those desirable objectives can be achieved as long as pastoralists depend primarily on cattle. The history of the spread of camels has shown that their southward movement was not due to climatic change alone. It is a history that chronicles what an economy based on cattle and small stock can do to the environment. The fast growth of the herds encourages



Photo: Daniel Siller

A Rendille man preparing to milk a camel. This camel in the course of a year will give between two and three times the amount of milk for human consumption as a cow.

and makes possible high human population growth. When the range is in good condition and rainfall is plentiful there is copious milk, meat and blood to feed a growing population. When the grazing deteriorated the people simply moved on. Woodland is destroyed by tree-felling and by burning each year to regenerate the grass that the cattle need. A forest is transformed into a savannah, and the savannah into a treeless plain. Trampling and overgrazing finish off the ground cover. Wind blows dust into the atmosphere, a devegetated land reflects the sun's rays back into the sky, heating the dust. There is little moisture to evaporate into the air from such a land, and when humid air moves into this dry region from elsewhere it has difficulty forming rain clouds. Precipitation decreases over time, lakes and streams dry up, and a desert is created.<sup>22,23</sup> Man has created it, and he has actually modified the climate himself. The notion that land is merely a passive factor in climatic change, reacting helplessly to the vagaries of rain and temperature, can no longer be accepted. Conditions of land surface are inter-active with variables determining climate, and changes in the land can cause micro-climatic changes, with as yet unknown effects at the macro level.

Near the end of the desertification process, when the rains become more erratic and unpredictable, and cattle begin to die from drought, the camel makes his appearance. The camel can resist the drought, allowing life to continue. When the drought ends the cattle herds rebuild themselves, humans reproduce to replace those who died, and the cycle begins anew. Over centuries or millennia of these cycles a desert so desolate results that no cattle at all can survive, except in favoured spots. It was not global climatic change alone that degraded these lands; the process of desertification was greatly assisted by man and his beasts,

and it is still happening today in northern Kenya and other parts of Africa.

It would be interesting to see what would happen if cattle, sheep and goats could be reduced in northern Kenya substantially, to be replaced by fewer numbers of camels. If managed well there would be no loss of food production and the land and its wildlife would benefit considerably. Bringing camels into an area before the desert is created might well halt the desertification process, if it is integrated with an overall programme of education and training to teach the pastoralists care and management of camels and good land use methods. Camel breeding stations, centres where cattle and small stock could be traded for camels, a marketing scheme with incentives to trade and an efficient system to supply beef and mutton to the towns could all lead to a healthier people and environment.<sup>17</sup> It is not realistic to expect pastoralists to give up cattle entirely, they are too important culturally, but the herds could be greatly reduced if the attitudes of the people could be slightly modified and if the incentives were there.

It would be a long, slow process, as societies need time to develop new ways of organizing labour and for adapting their institutions and beliefs to a modified economy. Camels are not easy animals to live with, which is a main reason why people do not adopt them until forced to by environmental circumstances, but a desert is not easy to live with either. If camels can help to halt the spread of deserts then they may be the animal of the future rather than one of the past. The people who want camels should be given help to obtain them—that alone might do more to improve the life of pastoralists than many expensive, socially disruptive development projects. The pastoralists, at least, would appreciate the camels more than an irrigated field of cotton. In the long term, so would the land.

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Note: The views expressed in this article are my own and do not necessarily reflect those of UNEP.



Photo: Daniel Stiles

Camels can feed at higher levels of vegetation, thus easing pressure on vital ground cover.