Explanatory frameworks for non-sustainable natural resource management practices: a critique of the perception rationale

Rutten, M.M.E.M.; Benda Bexkman K. von, Flinker H.W.

EXPLANATORY FRAMEWORKS FOR NON-SUSTAINABLE NATURAL RESOURCE MANAGEMENT PRACTICES: A CRITIQUE OF THE "PERCEPTION" RATIONALE

M. Rutten

1. Introduction.

In the wake of research concerning "indigenous environmental knowledge" so called "perception" studies regain interest. Differing perceptions and poor communication between policymakers and the people on sustainability of livelihood practices, the argument goes, foremost explains why development efforts in the colonial and post-colonial periods failed (Boerma et al. 1996; Oba 1985; Stiles 1993; Showers 1994; Swantz 1995). The suggestion is that an understanding and inclusion of local perceptions will foremost solve these problems. Once we listen to them and learn from them we will be able to provide a significant recipe for sustainable progress.

In the following a historical overview of environmental problems will be presented as found in Southern Kenya, in particularly in Kajiado District, home of the Maasai pastoralists and increasingly also of other mainly agricultural groups such as the Kikuyu and Kamba people.

We will discuss the district's major environmental problems, their causes and strategies to combat them in the past and now by individuals, government institutions and non-governmental organizations. Special attention will be directed at the effects of land tenure changes and water development efforts. It will be argued that the (inter)national political-economic context has been and still is responsible for the district's major environmental problem, i.e., water resources depletion. Any intervention by non-governmental organizations or local pressure groups should take into account this political context and its specific interests in order to understand and combat the district's environmental problems.

2. Pastoralists and the environment.

The negative view of pastoralists and dryland utilization has held momentum in the circles of colonial regimes, modern national governments and the international donor community alike. Mainstream thinking blamed pastoralists for destabilizing an inherently stable equilibrial dryland system by overgrazing resulting in progressive desertification. In Africa many livestock development projects were initiated more or less explicitly based on this school of thought in the 1960-80 period. However, the new routes suggested mostly in response to a temporary breakdown of the pastoral system were not able to strengthen the security of the pastoral livelihoods. Instead they often resulted, after spending huge sums of money, in new socio-economic and political-juridical frameworks which were hostile towards a sustainable and viable livestock economy for a majority of pastoralists (Bennet et al. 1986; Oxby 1981; Sanford 1983). Apparently the traditional, irrational and mobile pastoralists were a group too difficult to handle.

Lately the enduring stereotype of the conservative pastoralists has slightly changed to the benefit of the livestock keepers (World Bank 1992:378). It is recognized that mobility and keeping (large) herds of milk animals is an economically wise and sustainable utilization of the scarce and fragile natural resources of the world's drylands (Sandford 1983; Bekure et al. 1991; Behnke 1985; Ellis & Swift 1988; Scoones et al. 1992). Pastoral systems are as non-equilibrial as the environment

it is perpetuated in. The link between availability of forage and the density of herbivores is weak. Rainfall in arid and semi-arid areas is a much stronger factor. Pastoralists have developed for over a long period specific knowledge that is able to deal with this variability reasonably well.

So, why is it that reports of degradation of natural resources in semiarid areas continue to be published that foremost blame pastoralists' behaviour? And what exactly is the cause, nature and extent of the degradation of resources? Let us turn to an analysis of Maasai pastoralists' history of resource use in Kenya.

3. Degradation of natural resources in Maasailand?

3.1 Introduction.

Kajiado District is located in the southern part of Kenya in the Rift Valley Province bordering Tanzania. It comprises a total of some 22,000 km2 and inhabited some 265,000 people by 1989, slightly half of them Maasai pastoralists (see box 1 for Maasai land history).

Box 1: History of land use and land policy in Maasailand.

The history of Maasai land use and land policy since the end of the 19th century until today is one of exchange, reduction, closure and top-down implemented range experiments. About a century ago the Maasai controlled a vast area of some 160,000 km2 stretching from 1+ north to 6+ south of the equator. In 1904 a Treaty was signed and the British removed the Kenyan Maasai from their best grazing areas and restricted them into two separated Maasai reserves, totalling some 24,000 km2. This was a reduction to some 35-40 percent of their former territory.

Local Maasai officers, knowledgeable of the Maasai situation, disapproved with this move of the Colonial authorities. Naivasha Province assistant commissioner Bagge stated that the Maasai had occupied the Naivasha District for at least one hundred years, and that their system of land use with large herds over a long period of time had "brought the pasture into its present condition which has proved so alluring an attraction to the land hunter". The Maasai cattle had converted rough veld into 'sweet' pasture (Sorrenson 1968:191). Commissioner Jackson in a 1904 memorandum on the Maasai question states 'The Masai will never give us serious trouble, so long as we treat them fairly, and do not deprive them of their best and favourite grazing grounds -i.e., those in the vicinity of Lake Naivasha. (..) I learn, however, from a letter [from assistant commissioner Hobley] that applications for large areas have been received amounting to 75 per cent of the grazing grounds (..) I cannot see how it is possible to allow these grants without very seriously interfering with native interests' (Sandford 1919:22/23).

Bagge and Jacksons' appeals were fruitless. In 1911, the "Second Maasai Treaty" was signed. The northern Reserve was lost to the benefit of a few influential settlers and the Maasai were regrouped in an extended southern Reserve comprising some 38,000 km2. Large parts of the new pastures, however, suffered from infestation with tsetse fly, lacked water and had an overall lower grazing capacity. Most of this "reserved territory" was traditional Maasai land anyway. The area was declared a closed district. This would last until the late 1960s.

After World War II, colonial development policy turned its attention with more vigour to the so-called African areas without any major change in its overall conception of conservative pastoralists all of whom they believed wished to overstock their pastures at the cost of severely eroded plains. Yet in his handing over report District Commissioner Wainwright wrote to his successor Wilkinson in January 1946: 'I consider it an urgent necessity to let some organised stock farming experiment going as an example to the Masai. It is obviously useless for administrative officers, whom the Masai know to be lacking in all knowledge about cattle, trying to persuade the Masai to accept paddocking and methods of stock improvement without a successful example of the scheme in action, using their own types of stock and land, to show them' (KNA/HOR 1946).

By the early 1960s a mixture of events -a major drought, Independence, land grab by educated Maasai, influx of non-Maasai agriculturalists, loss of land to Game parks - would set the tone for new land tenure arrangements. In the end the Maasai accepted the introduction of so-called group ranches. Private title deeds were issued to a group of Maasai households. This, the Maasai hoped, would stop the influx of outsiders, prevent landgrabbing and allow for development of (water) infrastructure.

Soils, rainfall regimes and vegetation cover differ significantly. Roughly speaking half of the

district is in the semi-arid zone, one third is arid and only 6-8 percent has some reasonable potential for cultivation. Nowadays the importance of cultivation in terms of land occupation and, even more profoundly, by the number of producers involved is increasing rapidly, foremost because of immigration of non-Maasai agriculturalists.

However, livestock keeping was and still is the economic backbone of the district. In 1988 633,000 cattle and 967,000 sheep and goats were counted. This is equivalent to a total of 515,633 Stock Units (SU). By the late 1980s some 60 percent of the population derived its livelihood from livestock production. This means that since the 1930s the per capita ownership of animals has declined from 15 to 3 SU (Rutten 1992:6). A minimum level of 4 SU/capita is considered to be an absolute bottom line.

Rainfall is the single most important factor influencing agricultural activities, whether crop or livestock production. Norton-Griffiths (1977:iii) has shown that annual rainfalls in Kajiado District are strongly influenced by mountains, hills and the Rift Valley. High rainfalls occur around the Ngong and Chyulu Hills, the slopes of Mt. Kilimanjaro and the western wall of the Rift Valley, with even isolated hills such as near Namanga producing locally higher rainfall. The rangelands of Kajiado District are characterised by lower rainfalls, particularly around Lake Magadi and in parts of the Amboseli basin. This is either due to rainshadow effects from neighbouring hills and mountains or, as in the Amboseli case, to divergent wind flows between mountain ranges.

The Maasai pastoralists differentiate a large range of water sources: (seasonal) rivers, springs, pools, artificial pans, wells, boreholes, sand and sub-surface dams, pipelines. These sources are supposed to serve a (fast growing) demand of 223,000 m3 per day broken down in an estimated 31,000 for livestock; 8,000 for wildlife; 15,000 for human consumption and 170,000 m3/day for irrigation. Boreholes, gauged springs and rivers have a maximum potential of 180,000 m3/day. This results in a deficit of 40,000 m3 per day, making the provision of water a major problem in Kajiado District. In the larger areas of the district streams are virtually non-existent. Alternative sources which could meet the shortfall in demand such as shallow wells, pans and dams are crucial especially in times of drought.

The overall potential carrying capacity of Kajiado District expressed in stock units (SU) per hectare ranges between 465,555 and 1,584,425 SU. This range in (safe) stocking rates shows the variety in potential carrying capacity between the dry and wet season, respectively. Because of the seasonality and erratic nature of rainfall and forage availability in the district access to grazing areas and water is secured in the pastoral community by traditional resource management institutions. These customary arrangements are operated on different geographical scales. On sectional level the Maasai regulate access to land and water resources. Members of other sections are obliged to ask for permission to enter other section's territory. Also on neighbourhood level families co-operate, for example, by preserving pastures for dry season grazing. The selective use of water sources is also part of these resource use arrangements. Nowadays these traditional forms of resource governance are being eroded.

In the following an overview will be presented of the main environmental problems the people in Kajiado District face. These problems will be discussed in relation to the main economic activities discussed above: livestock keeping, cultivation and wildlife viewing. Special attention will be given to the socio-political context in which these environmental problems, sometimes presumably, exist.

3.2 Land degradation in Maasailand: myth or reality?

Desertification expresses itself in three main ways:

- over-exploitation and degradation of rangelands;
- decline in fertility and soil structure gradually leading to soil loss in rainfed croplands;
- degradation of irrigated croplands (IIED).

A report by Rapp and Helden (1979) on land degradation and the need for environmental monitoring in African drylands concluded that present knowledge about types, extent, causes and rates of desertification processes in Kenya is limited (Darkoh 1990:21). Indeed after many decades of irrefutable statements on desertification it is concluded by the 1990s that accurate data on the degree and rate of desertification in various parts of the world are still lacking to define the magnitude of the problem in all regions and localities, as well as to the extent to which human beings are responsible for the process.

Mainguet (1990:16) explains that the 'word desertification, created four decades ago became a trap which ambushed scientists, planners, donor countries, governments of the affected countries, and the mass media. It was a trap because of the erroneous attempt to define different realities with the same word, and also because it became a political alibi or an "institutional fact" for the donor countries and the assisted nations'. She continues stating that 'With the exception of regions around the towns or around permanent water sources, there is the impression that overgrazing in environmental degradation has been overestimated in south sub-Saharan Africa' (Mainguet 1990:67). Other more important factors for degradation are ploughing, land clearing and drought.

Also in Kajiado District scientist have expressed different views concerning the existence and magnitude of, and causes for land degradation (see box 2). Moreover, Potter found that using 15 different combinations of height and frequency of cutting grass to estimate herbage growth resulted in '15 quite different assessments of potential herbage availability for a grazing animal, with no clear indication as to which was the "right" value' (Potter 1989:13). Still Potter showed that grasslands did not lose long-term productivity even when continuously grazed at a stocking level of 2 ha/TLU (Bekure et al. 1991:169). Modern ecologists nowadays seem to conclude that the resilience to recover of the east african savannas is much higher than thought before.

Box 2: Maasai land degradation?

Nyakweba (1987) concluded for central Kajiado in 1984 during a period of extreme stress that 'the range condition is stable and good because in almost very plot sampled, the perennial plants dominated the annuals.' Touber (1982) who conducted a reconnaissance soil and vegetation survey in another drought period (1975-78) concludes that of the vegetation in the south eastern part of Kajiado poor or very poor grasses were marginally present during a period of extreme drought in Maasai history. The area was dominated by grass species classified in the moderate-good range. Njoka estimated for the Kaputiei area using vegetation measurements on 24 permanent transects that North Kaputiei grasslands on black-cotton soils had not deteriorated between 1969 and 1977. However, South Kaputiei and some parts of Central Kaputiei grasslands on red soils sustained severe range degradation (46 and 18 percent in poor condition). Also Dunne (1977) states that palatable vegetation cover disappeared and erosion rates increased during the 1970s in Kajiado District. We should realize, however, that these surveys were conducted at the time of a severe drought period in Maasailand In addition, Njoka classifies pennisetum mezianum and pennisetum stramineum as unpalatable grass species, whereas other authors state that only the mature plant is unpalatable and new growth is well grazed (Pratt & Gwynne 1978:245). Also concerning causes for desertification and the resilience of the denuded areas experts leave one in the dark. According to Darkoh the felling of trees and shrubs by nomads for the construction of livestock enclosures is one of the most important causes of desertification (Darkoh 1990:25). Njoka states that the range development inputs in the Kaputiei region are responsible for the rapid increase of livestock. For example, water facilities more than doubled between 1968 and 1974 in the Kaputiei ranges (Njoka 1979:181). Apparently ecologists in the 1970s could not agree on the extent and causes for degradation.

This is also illustrated by the explanation for the loss of some 90 percent of Amboseli National Park's full grown Acacia xanthophloea trees by the early 1980s. Initially it was thought that (male) elephants were responsible for this by stripping the trees of their bark a practice which was reported by Blaauw as early as 1927! Yet, it turned out that these old trees were dying because of a rise of the water table and increased salinity due to unrestricted tree felling for agricultural purposes on Mt. Kilimanjaro. But the growth in the concentration of elephants inside the park yearround, foremost the result of the ban on hunting, might affect the carrying capacity of the park as well as the spill over areas. The elephants are currently busy destroying the young Acacia trees inside the park (see Moss 1989:262). At the same time Maasai near Amboseli National Park express their discontent about large grazing areas being lost to the growth of dense stands of commiphora trees. Rhino's and elephants used to reduce the woody vegetation and to make mudpools for watering livestock.

More recent research has shown that the savannas vegetation will always disappear during a period of drought either with or without livestock being on the pastures. The plants and grasses simply die and rejuvenate again after the first rains arrive. Human mismanagement might worsen the depletion of the grasscover but it is hard to determine the balance between natural and human induced degradation. And as long as the degradation is not irreversible, the vegetative cover will return to its full diversity.

The type of land tenure, range versus ranch, also determines the potential carrying capacity of pastures. Potter recently suggested a 4 ha/TLU stocking level for a 100 ha farm. In other words the pastoral strategy of mobility allows for much higher stocking rates. Yet, in the past this view was not shared by the colonial authorities. Most of their ideas were, however, based on questimates and expectations. No succesful ranching experiments had been tried until the late 1940s (see box 3).

Box 3: History of Range Degradation in Kajiado District until 1945.

Colonial policies considered the Maasai rangelands to be overgrazed. Hard evidence, however, is hard to trace. For example, at the time of the 1933 drought the Colonial Administration blamed the Maasai for having too many animals. The Maasai responded by reminding that they had lost large tracts of their best grazing pastures. The Maasai gained support from an official report stating that some 40 percent of the Maasai pastures were now useless, either due to the presence of livestock diseases or as a result of lack of water. Also Committees looking into the overgrazing issue, often came to Kenya just after a major drought had brought the arid and semi-arid areas in poor conditions. This resulted in grazing management projects based on western systems characterised by equilibrium as opposed to the non-equilibrium farming systems of the drylands.

In the mid-1940s, thumbwise estimates pinned the Maasai grazing area worth about twenty acres to the beast whereas about one beast to every ten acres was thought to be the stocking rate. The Maasai area was considered to be 100% overstocked. Removing animals and banking the result for purposes of development was the solution. The authorities blamed the Maasai for not willing to sell their animals. Yet they 'forgot' to mention the provision by the Maasai of a total of 123,000 head of cattle, or about over one sixth of their total stock population, towards the War Fund in the 1940-45 period. This 'free' destocking as well as the unfavourable or complete restrictions on the sale of pastoral cattle to protect the settler cattle markets is hardly refered to when discussing issues of 'overgrazing'. Likewise the enormous amount of wildlife roaming the savannas were not taken into account. However, the Maasai had to share their pastures with large amounts of grazers. Amboseli 'can certainly lay down claims to being the most closely populated area of big game in the world' (HOR Jan. 1946).

The 1950 grazing control experiments made the Kajiado Administration conclude that except for its northern border, Kajiado District was, owing to the vagaries of the rains, not suited for a static form of ranching (KDAR 1953). The Konza experiment had shown the high costs of operation and maintenance as well as the possible risks of overgrazing. In spite of these experiences the implementation of boundaries and the imposition of stock quotas again were core measures in the group ranch experiments of the 1960s. However, it was later admitted that only 45 percent of the Phase I group ranches were considered ecologically viable, others lacking sufficient dry and wet season grazing areas. Indeed as a result of failing rains, infestations of army worms and cattle diseases group ranch members were often forced to trespass boundaries. Finally, range ecologists feared that if the group ranches were developed as proposed they would suffer overgrazing resulting in the deterioration of rangeland resources (Rutten 1992:291).

Since the 1980s the big group ranches are in a process of subdivision into small individually owned parcels. Today's individual land ownership by which ranches are fenced might prove to be more threatening to the rangeland's productivity. Permanent presence on the same spot yearround will destroy all palatable grasses, being replaced by less juicy ones and even poisonous shrubs. The

soils are trampled firmly preventing vegetation regrowth. It is only now that Maasailand is at risk from an environmental point of view. One of the striking research findings on the effects of group ranch subdivision is that many Maasai used returns from selling part of their land to buy more livestock, instead of destocking their individual ranch. This increase in livestock numbers occurred irrespective whether the ranch was theoretically over or understocked (Rutten 1992). This attitude can be partly explained by that the use of the pastures still remained communal. Maasai pastoralists are well aware of the non-equilibrium character of their semi-arid area. Though the character of the mobility patterns is changing. Cash payments for grazing as compared to the old system of locating animals with friends and relatives in other areas for free or usufruct are on the increase nowadays. A positive aspect is that it allows poor Maasai to turn some of 'their' unused grasses into livestock.

Land degradation is not restricted to desertification or physical destruction of pastures. It also includes erosion of topsoils in cultivated fields, the loss of soil fertility or the salinization of irrigated fields. Most manifest forms of land degradation can be observed in located spots in Kajiado District, e.g., Embolioi, where since 1968 areas of pasture land are turned into wastelands because of gypsum strip-mining using bulldozers and shovels. By early 1985 an estimated 2,000 acres had been lasted to waste (KT 28/03/85).

Also prime and crucial grazing land will be lost because of the Ewaso Ngiro river multipurpose project. This project encompasses the creation of water reservoirs resulting in the downstream loss of some 800 ha of very important grazing land due to the creation of a permanent wetland. The loss of salt licks, the creation of denser woodland which is a good habitat for wildlife and tsetse fly, and increased erosion of river banks is assessed as well.

In spite of this, the Kenya Wildlife Service (KWS) and World Wildlife Fund (WWF) expressed their concern about the potential for unsustainable increase of livestock due to provision of yearround watering points. At present, permanent settlement in this area is limited by the seasonal availability of water.

In another location downstream, however, an irregularly flooded plain will loose its overbank flooding ceasing the deposition of sediments. This will hamper the maintenance of star grass in this dry season grazing zone. It is important to realize that these areas are vital for the neighbouring group ranches because of no alternative options and that loss of these resources will make the surrounding grazing lands useless (KPC 1993:5-33).

The Ewaso Ngiro project also foresees the expansion of irrigated agriculture. Fears have been raised by the World Bank about possible soil salinization because of slightly saline water in combination with prolonged irrigation while lacking sufficient rainfall to leach salts below the plant root zone. Indeed experiences in other parts of Kajiado District show that immigrants after the use of saline borehole water to irrigate fields for some years only were confronted with dwindling yields because of the salinization of the topsoil.

Otherwise the influx of agriculturalists is a threat in itself to the medium and long term viability of Kajiado District's ecosystem. Among the negative consequences are the use of farming methods suited for the humid regions but probably devastating to the vulnerable semi-arid soils (Odundo 1992:20). Removal of vegetation, especially in sloping areas, will bring high risks of sheet, wind and gully erosion. For this reason Touber (1983:171) advised to discourage the practice of rainfed agriculture and gravity irrigation. However, cultivation is booming in Kajiado District. The area under irrigated cultivation has increased rapidly and has even moved down the slopes into the

wetlands The Ministry of Agriculture is active in promoting grass stripping, trashlines, unploughed strips and gully control on arable land.

There is a striking similarity with the location of most seriously denuded and eroded locations reported at present and in the past. Gully erosion is mostly found nearby roads, railway lines, deforested hills, cattle trekking routes, and river banks, especially after heavy rains (KNA/HOR Jan. 1946, KDAR 1967; Touber 1983; Bekure et al. 1991) Denuded areas are mostly found near permanent watering places such as boreholes, dams, the waterpipeline road and water tanks (KNA/HOR 1956; Talbot 1960; Touber 1983; Bekure et al. 1991; KDDP 1994) Also during colonial times this phenomenon of location specific land degradation was noticed. The Ministry of Livestock tries to address some of these problems though it should be noticed that these projects are rather minor tasks within the total plan of operation.

Soil fertility is in general moderately high, due to the widely distributed presence of volcanic ashes. This also allows for high infiltration rates of rain water. Therefore sheet or splash erosion is mainly restricted to the low lying plains of Basement System rocks owing to a strong surface sealing. Wind erosion hazard exists foremost in the Amboseli basin which is aggravated by off-road driving (tourist) cars which continuously damage the vegetation of the Amboseli lake terraces, though some improvements have been made in 1977 inside the park such as the relocation of much of the parks's infrastructure and a less destructive road system the park had to be closed temporarily to recover in 1993

3 3 Deforestation in Maasailand

Recent administrative annual reports for Kajiado District highlight the central position of deforestation and afforestation programmes within the Ministry of Environment and Natural Resources These projects are foremost conducted in the district's high potential zones (KDDP 1994-96) (see box 4)

Box 4.

The Kajiado District Development Plan for 1994-96 mentions for the Ministry's achievements in the 1989-93 period the planting of 104 ha of forest in the Loitokitok area, the planting of trees on Ngong hills, the afforestation of hilltops and the raising and distribution of seedlings. Plans are developed mostly along the same lines, including smalholder afforestation and the improvement of water catchments in the high potential areas. Except for a silvo pastoral project and the rehabilitation of some springs no environmental actions are planned directly addressing the pastoral population by this Ministry. (Lack of manpower, funds, political influence). If at all these actions are addressed by way of a sectoral approach (i.e. through the Ministries of Livestock and Water Development).

Also in colonial reports deforestation is a major point of concern. In the late 1940s, especially the Chyulu and Loitokitok Hills were threatened by the cutting of trees on too steep slopes These high-potential areas had suffered from charcoal burning and forest clearing for agricultural

purposes in particular. Initially the Maasai disagreed with implementing strict rules but by 1949, another year with semi-drought conditions, some strict measures were introduced. Initially the Maasai feared that the gazetting of forests would once more mean the loss of vital dry season grazing areas. Only when the clearing of trees by illegal squatters for agricultural purposes threatened their access to dry season grazing areas and deprived them of water sources downstream, they agreed. For example, in 1946 it was reported that the swamps at the foothills near Namanga no longer hold hippo's as it used to as late as 1929 (KNA/DC/KAJ.3/1). A start was made with soil conservation measures -the terracing of steep slopes, the prohibition of cultivation near river bedsand an order issued prohibiting the cutting of trees in forest areas.

Still in the 1950s, the practice of charcoal burning and forest clearing continued. In the Nguruman area a large number of alien squatters who had destroyed several hundred large trees were removed and the area was declared closed for cultivation by 1960. By contrast, the Kajiado administration allowed the Magadi Soda Company to cut trees in between Lake Magadi and the Nguruman area to a total of almost 17,000 tons per year at a rate of Ksh 2/per ton in the 1950s. This is equivalent to some 175 percent of the total annual district's human population demand during that period (see box 5).

During colonial times fuelwood, sand and manure were officially exported from Kajiado District. The cutting of trees on Mt. Kilimanjaro footslopes for timber provision to the military forces was operated by Indians. Later on cutting for building huts and firewood increased the risks of landslides because of a diminished water conserving capacity. As early as 1975 reports existed claiming that the eastern portion of the County Council Loitokitok forest was being destroyed by settlers felling fresh trees either for posts or for selling firewood and charcoal. This resulted in the reduction of the availability of water from the springs in the Kuku plains (DN 10/12/1975). Cutting trees for charcoal was banned. By April 1976, in order to replace the destroyed trees, people were allowed to settle in the forest to cultivate under the "plant by cultivation" scheme.

Box 5.

In 1945 the Magadi Soda Company obtained its fuel from a concession to cut thorn forest on the banks of the Uaso Nyiro on payment of royalties to the Local Native Council. The forest was not rejuvenating and all efforts by the Company to replant failed. In later years the area between the river and the Nguruman Escarpment was cut. The Administration did not bother because the area was very flat and full of tsetse fly it was argued. Another company (KMQ) run by Italians cut fuel from a broad valley some 10 miles or more on beyond the factory in Mile 46. This company was repeatedly warned on too much and illegal cutting (KNA/DC/KAJ.3/1).

In spite of the central position of cultivators, loggers and mining companies in deforestation processes in Kajiado District according to Darkoh desertification in Kenyan rangelands is foremost the result of pastoralists felling trees and shrubs for the construction of livestock enclosures (Darkoh 1990:25). Jensen (1984), however, has shown that Maasai pastoralists are extremely low wood

consumers (see box 6).

Box 6.

Wood is consumed for fuel (355 kg/capita/annum), construction of houses and fencing of settlements and corrals (101 kg/capita/annum) mainly. Maasai used branches from nearby trees for fencing and collect dead wood for fuel, sometimes from abandoned settlements. Though increasingly Maasai can also be seen along the roads trying to sell a bag of charcoal. In comparison Turkana pastoralists roaming in a similar environment consumed 416 kg/capita/annum fuelwood and 1,009 kg/capita/annum for construction, whereas the Kenyan average is estimated at 1,900-3,300 kg/capita/annum (Western & Ssemakula 1980). With population densities of 3 persons/km2 for Amboseli and 1 person/km2 for Turkana wood utilization rates in the two areas are thought to be more or less similar. Ellis et al. (1984:185) concluded for Turkana that these modes of wood exploitation did not show detrimental effects and that no evidence of deforestation or other misuse of the environment was available.

Felling of trees, though officially not allowed, does mainly occur in the vicinity of the fast growing towns of the district. Poor people, mostly non-or half-Maasai, try to make a living by charcoal burning which is locally sold or exported to Nairobi. Also non-Maasai employed in the rural areas near mining locations engage in this activity.

3.4 Depletion of water sources in Maasailand.

Access to secure water sources was lost when the Maasai were moved from the north to the "extended" southern reserve in 1911. Among the main reasons to accept the loss of land and the introduction of grazing experiments were promises of increased provision of water through dams and boreholes. Not seldom, however, these sources were constructed using Maasai tax money. Eager to improve and conserve the availability of water, Maasai themselves invested in shallow wells nearby seasonal rivers. Blaauw when crossing Maasailand in 1927 expresses his astonishment about a construction of stones made by Maasai to conserve spring water that used to flow abundantly towards a nearby river where cattle spoiled and polluted it by trampling (Blaauw 1927:96).

Nowadays the number of water points is booming due to the subdivision of group ranches. Especially pans, roof catchments and shallow wells near the homestead are under construction. Apparently the lack of water in Kajiado District will soon be a past experience. However, since the late 1970s Maasai frequently express their worries about diminishing flows in the district's rivers. Indeed comparing stream flows of rivers in the 1930s with today's situation shows that less rivers are perennial. Causes for this are not yet clear. Possible reasons might be less rainfall, deforestation and loss of recharge capacity due to sand harvesting from the rivers. Since colonial times great quantities of sand have, legally and illegally, been taken from rivers (KDAR 1929; KNA/HOR 1946). The sand is mostly taken by Indians for the construction industry in Nairobi. For example, in 1949 55,000 tons of sand was officially exported from the district. This practise still continues.

Another recent worrying phenomenon is the rapid reduction in the quality of water in the intensively cultivated Ngong area. Too many boreholes in a too small area have resulted in a situation

whereby borehole water in the area is turning brackish. Suggestions to move the venue of issuing drilling permits from Nairobi to Kajiado will not be successful as long as the politics remains the way they are. Elite Maasai politicians have always tried to please their home areas by "bringing water projects". Likewise in other parts of the district conflicts over water development projects arose because of politicians opposing each other.

As a result of subdivision of group ranches land is becoming a commodity throughout the district. Immigration is high. Besides an influx of small cultivators horticultural and ostrich farms, poultry ventures, schools and training institutes are buying land in the recently subdivided parts of Kajiado District. They all need huge quantities of water for production or consumption purposes. As a result the number of roofcatchments, storage tanks and boreholes is on the increase. It is yet too early to reach to conclusions but careful monitoring is needed whether indiscriminate drilling of boreholes will affect water levels in nearby shallow wells and rivers.

As with range degradation, wildlife plays also a role in the degradation of water resources. With especially elephants protected but foremost restricted to the swampy areas of Amboseli (see below) it is stated that quality of water is diminishing because of urine and droppings. Sometimes the elephants leave the area and roam over neighbouring areas in search of fresh water destroying the eyes of springs by trampling on it. Spring protection programmes try to revive these sources.

The swamps north of Mt. Kilimanjaro are reserve dry season grazing areas. Their capacity is said to have been reduced due to the expansion of irrigated agriculture, especially since 1982. Some are now gradually disappearing thus reducing the holding capacity of range land near such an area (e.g., Namelok, Rombo, Kimana-Tikondo, Inkisanchani). Like the Maasai pastoralists, those irrigators in schemes depending on water from Noolturesh river (e.g., Inkisanchani) are afraid that piping water from the Noolturesh spring towards Machakos District, will undermine their livelihood (Masharen 1989:11) (see box 7).

Box 7: Noolturesh (or Kilimanjaro) Water Pipeline.

The project was completed in 1992 and immediately dubbed a White Elephant in the district by some experts because of the magnitude, layout and the real calculated ultimate demands against the source.The spring has a gauged yield of 200 l per second at the lowest. Take off by the new pipeline was designed at 168 l per second flow. This combined with the old railway pipeline flow of 17 l per second from the same source not to mention the demand for the Loitokitok network leaves the source virtually dry! Attempts to have more water have been tried but with no satisfactory results. Boreholes have been dug to find out the effects of pumping upstream and downstream of the source.

Today, the town with the biggest demand in terms of requirements, Kajiado, gets about 11% of the water that is collected from the source. Machakos having water supply alternatives receives 66% of the supply. The rest goes to Athi River Town that in the real sense was well served by the boreholes in the area. An unplanned sidebranch was constructed to reach the Divisional Headquarters of the new Mashuru Division. Technical consultants have warned that the Noolturesh supply will, however, not be enough for the growing demands of the three towns. Extra sources should be developed near these towns and the pipeline could be used mainly to serve the rangelands with a supplementary function for the urban areas. At the present time the local Maasai will hardly profit if at all from this mega-project.

Indeed water flows from the source are increasingly reducing. The irrigation downstream has died and at the same time the swamps in between Mt. Kilimanjaro and Chyulu Hills have disappeared to the detriment of the local livestock keepers and wildlife. The main reason for the drying of the swamps is the too high amount of water taken from the source. In addition to basic design problems a number of other reasons are responsible for the loss of Noolturesh water.

Water is spoiled along the pipeline because of spearing of valves by Maasai herdmen to water livestock. A lack of watering points for local Maasai and too high and irrealistic revenue collection -by way of counting stockis part of the problem. Also flat rate revenue collection does not instigate people to conserve water and nowadays the irrigation of crops along certain parts of the pipeline using Noolturesh water has gained momentum. Finally, though foremost, politics has interfered in diverting lines and tapping water from the Noolturesh pipeline. For example, recently Noolturesh water was diverted to a newly started rose farm owned by top politicians. It is estimated that the Stoni Athi Ltd horticultural farm has a water storage capacity of 6,000,000 liters. The company's water storage would be sufficient to supply 120,000 people per day (EAC 19/07/96). Public water is turned to private farm use and exported as rose flowers to Europe (further) enriching a small Kenyan elite while local inhabitants of Kajiado District are left with reducing quantities of water to fight over.

Water depleting effects of the Ewaso Ngiro (south) Multipurpose project, at the western border zone of the district, are not yet clear. During the first filling of the reservoirs, the river flow may be extremely reduced or even stopped resulting in too salty water. Later water availability is expected to increase upstream while lost downstream. The creation of artificial floods by releasing water from the reservoirs is recommended The question is how can this be guaranteed? Moreover the newly created wetlands might increase malaria and other water-born diseases

3 5 (Chemical) pollution in Maasailand

Though not a major environmental problem yet, concerns are increasingly expressed about the rise in pollution of natural resources, especially water. As a result of the use of chemicals and fertilizers for combatting crop diseases in agricultural areas, the drinking water for the Maasai herds and people downstream has become polluted The Ewaso Ngiro carries pesticides as a result of wheat farming in Narok District And what will be the effect of the traditionally high rates of pesticide using flower industry? Mining and small industries such as tanneries in Athi River town also pollute the streams flowing in Kajiado District. In the past livestock owners near Portland's Cement complained of high rates of sick animals due to emissions from the plant. The rapid growth of small urban centres lacking good sewage systems and maintenance also threatens human health

Water is also affected as a result of dipping cattle to kill tickspassing diseases near shallow wells. Remains of acaracide wash inside the shallow wells causing risks for humans and animals alike. Structural adjustment has raised prices of these inputs in some cases forcing farmers to retreat to the use of illegal drugs and pesticides including DDT instead of acaracides.

3.6 Loss of biodiversity in Maasailand

The loss of biodiversity in Kajiado District foremost concentrates on the general reduction of wildlife and the loss of certain game species. A striking feature of colonial reports and travel stories are the enormous amounts of wildlife mentioned. Joseph Thomson recorded big numbers of game and wrote often about the easiness of shooting big game (e.g., four rhinos, one giraffe, four zebras,

and four antelopes within six hours Thomson 1883:162). This is no longer the case for each and every species. Several reasons can be mentioned for this process. Drought took its toll. Official "sports" hunting has reduced large numbers of game. During this century until the 1970s official hunting blocks in Kajiado District legally allowed, after paying royalties, the killing of many lions, leopards, elephants and rhinos next to buffalos and common game animals. More recently, and rather more significantly, elephants and rhinos are endangered due to poaching for ivory and horn (see box 8).

Box 8: Wildlife numbers.

Rhinos in Kenya declined from 20,000 in 1971 to some 600 by 1986 (DN 01/11/88). Though the Amboseli rhino population increased slightly after years of decline by 1977, there are now only a few remaining. Amboseli elephant numbers have been fairly stable over this period numbering some 750. In Kenya, however, elephant numbers decreased from 70,000 to only 18,000 between 1980-90 (DN 27/02/90). In the whole of Africa they dwindled from 1.5 million to 500,000 700,000 over this same period (DN 20/01/90). By the end of the 1980s poaching had increased considerably in Kenya. To combat the poachers the Kenyan Government increased the anti-poaching budget to Ksh. 120 m. for 1988/89 and intensified the search for the poachers (DN 27/10/88). Ex-civil war soldiers from Somalia and Ethiopia were said to be responsible for the killing of the animals. Their target was the rhino's horn and the elephants tusks.

Yet, poaching as such is not a new phenomenon. In 1959 the district commissioner reports 'There has been a considerable amount of poaching by Wakamba along the Machakos border but there have also been cases of poaching by the Masai which is unusual. One reason put forward is that the rigorous control of rhino killing in Tanganyika raised the black market price for rhino horn to fantastic heights and tempted some local Masai to kill rhino and smuggle the horn [through Somali and Chagga middlemen] over the border (..) The Masai have lived with game and tolerated it under the old custom of seasonal grazing but the new fashion for ranches raises new problems of fencing (KDAR 1959). 'The Masai luckily are not interested in other game poaching but young men are apt from bravado to occasionally leave a spear in an elephant or wound a lion. Most other poaching is done on a considerable scale by Kamba intruders' (KDAR 1960).

Also the growth of the human population, leaving less undisturbed pieces of land and blocking migratory routes is partly responsible for the decline in animal numbers. Ecosystems (1982) warns that the expansion of cultivation at the southern border of Nairobi National park blocks migratory routes and is a threat to the future of the park. It also competes with resources inside the park. For example, in October 1996 KWS demolished a dam constructed across the Mbagathi river, which flows through the Nairobi national park toward a hippo pool. It belonged to a sacked Permanent Secretary who meant it to act as a water reservoir for a grand fish and crocodile farming project (DN 19/10/96). Moreover, nowadays Kajiado group ranches are in the process of dissolution and this threatens access of wildlife to the dispersal areas.

KWS' major concern is the group ranches surrounding Amboseli National Park. Western

(1982:304-06) states that permanent restriction of large herbivores to Amboseli Park will lead to a reduction of some 40-50 percent of these populations. Loss of the dispersal areas is thought to be equivalent to a reduction of potential revenues from wildlife of some Ksh. 3.3 million. Thus subdivision of Amboseli's neighbouring group ranches might raise more difficulties in maintaining biodiversity in the Amboseli area. The "spectre of fencing" -which will interrupt the animals' cycles of migration and lead to overcrowding and finally to decimation renewed the Governments' willingness to allocate funds to the surrounding group ranches. The interesting outcome of the "revenue-sharing" exercise has been that game department officials are threatening to exclude Loitokitok group ranches from their share in an annual fee of Ksh. 4,000,000/ - from Amboseli gate earnings if they decide to subdivide. Soon a controversy arose on how to distribute the money among the four selected group ranches. To make matters more complicated the Kajiado County Council and the District Development Committee also put a claim to this new opportunity for raising revenues, arguing that all the Kajiado District inhabitants should profit from the district's wildlife.

Finally a major threat to the biodiversity in the district is the Ewaso Ngiro project. Several Nature Conservation groups expressed their fears that the project might affect flows at the mouth of the river where it enters Lake Natron on the Kenya-Tanzania border. Changes in water flows might lead to the inundation of flamingo nesting areas. The eggs placed on small pillars surrounded by the alkaline water are safeguarded from mammalian predators. A unique Lesser Flamingo breeding grounds might be lost. In addition to biological reasons the Lake is critical for maintaining Kenya's tourist industry at Lakes Nakuru and Bogoria where the flamingos normally reside. Also the chemicals from the irrigation schemes upstream might affect the flamingos. To offset worries it has been proposed to improve security of nests on the south side of the lagoon, to monitor flamingos regularly, to control and prohibit the sustained high flow releases from the reservoirs during critical periods. Yet no real solution has been provided for the water pollution. A final negative impact on biodiversity might be the loss of medical plants, used for traditional healing and rituals, at the reservoir sites.

4. "Perception" versus "political-economic context".

We traced control over natural resources, land and water in particular, exercised by Maasai pastoralists and others in southern Kenya. Over a century, access to and control by Maasai over these resources has been structurally affected in a negative sense. In the arena of colonial political and economic forces the Maasai lost their vast prime, disease free, grazing areas to the white settlers who obtained these lands with the active support of senior colonial officers from 1900 onwards. It was assumed that European settlement was necessary to promote economic development and bear infrastructural and recurrent costs of the Kenyan Protectorate. In cases, senior colonial administrators went to extremes of misinforming the British Foreign Office in London with regard to the land policy. Junior officers working close with Maasai pastoralists indicated to their superiors the soundness of the Maasai ranching system and supported Maasai protests against the removal from the northern grazing areas in return for a small portion of tsetse fly infected, water-lacking, low potential land added to a closed southern reserve. These officers used personal experiences and observations from the ground to reach to similar conclusions as range scientists today; i.e., the Maasai pastoral system is ecologically sound.

We may therefore conclude that during the first decades of colonial regime differing perceptions between the Maasai and the British were not the main cause, if at all, for wrong policies conducted

by the Government. It was a deliberate policy to grab crucial resources for economic reasons It was "coldblooded" murder. Moreover, it shows that there was no single and uniform Administration. Once "pacified" and safely stored in a closed district the Maasai, except for taxation and restrictions in lucrative livestock trading with neighbouring agricultural groups, were left alone. Control over some of the water and land resources to mining companies and cultivators was also lost though in relatively restricted terms.

After the war development efforts became more important and it is now that the role of perception somehow became momentous. The Maasai pastures were considered to be overgrazed by Maasai cattle and grazing experiments were introduced. The ideas of Herskovitz (1926) (the "cattle complex") and Hardin (1968) ("tragedy of the commons") apparently without knowing these scholars prominent in the minds of most colonial officers. The phenomenon of cognitive dissonance apparently did not allow any other view towards the soundness of pastoralism. This fixation of perceptions in the minds of many Europeans found affirmation when they came from the green and lush ambience of Britain to the semi-arid areas of Kenya, especially after periods of extreme drought. Even today, in spite of a whole range of failures of livestock projects based on modern ranching techniques in semi-arid areas and evidence produced that pastoral systems are more sustainable and profitable than modern ranching systems, these ideas prevail.

Yet the British Colonial Administration stated that Kajiado District administrative officers were lacking in all knowledge about cattle and that a successful example of paddocking, in spite of earlier statements that the area was not suited for ranching, was the only lacking reason for acceptance of modern ranching methods. Some officers, however, understood the Maasai indigenous management system of natural resources very well In short this system operates as follows on different geographical levels (section, neighbourhood, family) arrangements are made by the Maasai to safeguard resources for periods of drought. For example within each section Councils of Elders set aside dry season grazing areas and permission to enter a section's territory is mostly given upon request. The Maasai understood the reciprocity of this kind of assistance. Local knowledge accumulated over time based on the experiences of the resource users allowed for a sound use of the available resources Yet the loss of the prime grazing areas in central Kenya placed a huge stress on this traditional resource management system This is the primary reason for environmental stress to be acknowledged when discussing the nomadic pastoral system of the Maasai.

In the 1960s and 70s again the Maasai were victims of severe droughts and new proposals to 'develop' the livestock sector in southern Kenya. This time again, except for Nature Conservation Organizations who well-knowingly extracted crucial swamps in Kajiado, wrong perceptions, partly based on Hardin's "The tragedy of the Commons" concept, were important The group ranch, as proposed by outsiders, was an artificial creation which lacked a firm sociological as well as ecological basis. Though political-economic factors should also be taken into account The Maasai accepted the group ranch concept to stop educated Maasai obtain individual ranches and outsiders entering their district. The group ranches failed mainly due to mismanagement of the group ranch committees and unability to repay the high interest loans. The pastoral Maasai continued their traditional grazing control based on sectional basis The World Bank finally came to realize this as it stated in 1992 that 'African pastoralists, such as the Maasai and Samburu of Kenya are able to exploit apparently marginal savannahs (..) Building on these strengths requires great care, expertise, and patience. But development projects that do not take existing practices into account often fail'. And as recent as May 1995 the World bank reported a need for refining and adjusting, rather than eliminating, traditional pastoral range management practices (Findings no 40, May 1995)

Pastoralism it is identified nowadays in Western minds is an effective response to the uncertainties of a difficult natural environment. Experience and analysis indicate that the livestock numbers associated with these traditional responses rarely reach a proportion that can cause irreversible damage.

Whereas local livestock officers expressed similar words during the early 1980s when the call for subdivision of the ranches grew louder the Central Government gave in and allowed the dissolution of the group ranches into individual ranches. This process has brought some positive, but foremost negative effects. Subdivision might bring back the flexibility in herd and range management in the hands of the individual producer and prevent exploitation of the poor by the rich. Less well-off Maasai could rent out their land and build up their herd. Yet large numbers of Maasai turned out to be not yet ready to cope with this form of land tenure. Individualization affected cooperation between Maasai pastoralists in foremost a negative way. The relation between Maasai and the (non-Maasai) immigrants is tense. The latter fear to keep livestock because of theft by Maasai.

The most important negative effect of individualization, though, is the commoditization of the land resource. The sale of land earns the Maasai owner in one instant an enormous amount of money. Unfortunately, most of the money earned often goes into non-productive improvements (modern house and excessive drinking) or in improvements of water availability and the buying of livestock. With more land taken out of livestock production there might come a time that more Maasai are forced to leave pastoralism. Land sales speed up this process and the final outcome is of a more structural nature than the (temporary) effect of losing (part of) one's herd. Maasai society is becoming more structurally stratified.

"Historical environmental impact assessment" as explained by Showers (1994) offers some valuable lines of thought and methods of analyzing causes for misperceptions between policymakers and local recepients. She proposes a detailed explanation of the institutional and power relations between the local people and the implementing agency. Whenever project documentation refers to local dissatisfaction or resistance to a project or programme, every effort must be made to find out why, to which extent and how this resistance becomes manifest (Showers 1994). Problematic in this approach, in my opinion, is that it presupposes a situation whereby a project or programme communicates with a community on equal terms if at all. The Kajiado experience shows that the most important environmental problems in the district result from outside interventions. These foremost operated through the informal and affective centres of power, and were foremost directed at a deliberate undermining of the primary resources of the Maasai pastoralists (i.e., land and water). In addition, members from within the Maasai society have grabbed resources and still do. Communication to understand differing perceptions is not sufficient. This is somehow indicated by Stiles et al. (1993) in their recommendation towards UNEP that the international donor community has a role to play in exerting influence, by establishing criteria of conditionality where national governments are unwilling to accord local communities appropriate land tenure that promotes good land management.

Similarly, Stiles et al. -though presenting a valuable analysis of the important political, social, economic as well as natural factors at all geographical scales - stress for donor agencies and governmental bodies the need to foremost interact effectively with all parties involved in the development process. Also governments and NGOs should support local marginalized groups to represent their interests. Unfortunately these recommendations do hardly address ways to cope with individuals or (foreign) companies that operate outside the project sphere. Especially these

parties when collaborating with influential people from within government circles in private enterprises such as wildlife touring companies, flower farms and the like, extract resources directly either legally or illegally at none or far too low costs. This is practice in Kenya -currently as in the colonial past - whereby policymakers and powerful parties misuse public or communally owned resources for personal gain. The recent liberalization of the Kenyan economy in combination with the commoditization of land in Kajiado District has pushed this process ahead.

5. Conclusion.

Reviewing the developments in Kajiado District in the last decades leaves one with the impression of a people under increasing pressure on their way of life. A shrinking land resource because of increasing numbers of Maasai people and the even-faster-growing numbers of immigrant settlers in the district, a lack of a clear Government land policy and corrupt land practices threatening large groups of Maasai off the rangelands they used to control exclusively until very recently all contribute to this.

In addition to land lost for pastoral production, we showed how major water projects are developed at the detriment of the local people. Prior to the implementation of the Noolturesh project local water officers recommended to give a priority to the pastoral people of Kajiado instead of bringing the pipeline all over to Machakos District. The final outcome, however, was nothing but a political design at the perils of the people of the district. The political game was lost by the Maasai to the benefit of outsiders. To make things worse part of the construction was given to unexperienced contractors who were close allies of certain influential politicians.

The reduction in resources of land and water since colonial days is the primary environmental reality Maasai need to face. Within this setting secondary causes might explain specific environmental problems. When proposing strategies for sustainable natural resource management it is essential to differentiate between these primary and secondary causes. Political-economic interests by outsiders is the most serious blockage Maasai have experienced in the past and of today. The "perception" factor has been more profound during the period of top-down implementation of large sectoral development projects in the 1960s and 70s, but certainly was of less importance in the colonial and recent period.

Similar experiences of the lacking explanatory power of the perception framework have been reported elsewhere. For Somalia, Prior (1994) has shown that, after investing in research and participatory processes, problems of perception and miscommunication between the local people and a British NGO were successfully dealt with. However, the political-economic context as defined at the national level turned out to block any real improvement in addressing environmental problems. Evidence shows that, as resource-based production and economic activities become more valuable, the government creates new institutions and policies that enable the priviliged few-to increase their control over productive resources, economic activities, and profits (Dove 1993). Indeed, as stated by Murphree (1996), 'Instead of talking about "participation" policy should be looking at secure entitlements; instead of looking for "communities", it should be looking for contextualized profiles of sustainable, communal property rights regimes'.

Concluding, since the beginning of the 1980s the political-economical factor is pertinent again for understanding causes and processes of environmental degradation in this part of semi-arid Kenya. Local and non-Maasai politicians play their hidden agenda's. They are illegally acquiring plots in not yet adjudicated portions of Kajiado District in preparation for subdivision of the land. They rent the land to foreign-owned horticultural companies, tap public water at the detriment of the Maasai

pastoralists drill (too many) boreholes and acquire at low costs assets in one of East Africa's best game parks. A "perception" framework for explaining management problems of natural resources will not suffice. This approach has a risk of minimizing or even totally overlooking the political-economic context which within a thorough historical analysis should be given our full attention for understanding and explaining natural resource management failures.

REFERENCES:

Behnke, R.H. (1985) 'Measuring the Benefits of Subsistence Versus Commercial Livestock Production in Africa.' In: Agricultural Systems, 16, pp. 109-135.

Bekure, S., P.N. de Leeuw, B.E. Grandin & P.J.H. Neate (1991) Maasai herding. An analysis of the livestock production system of Maasai pastoralists in eastern Kajiado District, Kenya, International Livestock Centre for Africa, ILCA Systems Study 4, Addis Abeba.

Bennet, J.W., S.W. Lawry & J.C. Ridell (1986) Land Tenure and Livestock Development in Sub-Saharan Africa, AID Evaluation Special Study No. 39, Land Tenure Center, University of Wisconsin-Madison, USAID, Washington D.C.

Blaauw, F.E. (1927) Op zoek naar dieren en planten in Britsch oost-afrika, een oorspronkelijk reisverhaal, Van Holkema & Warendorf's uitgevers-mij, Amsterdam.

Boerma, D., A.P. van der Jagt & Y. van der Pijl (1996) The role of perceptions in the conflict between Maasai pastoralists and nature conservation in Kenya, unpublished paper, Wageningen Agricultural University, Wageningen, The Netherlands.

Brown, L.H. (1963) The development of the semi-arid areas of Kenya, Ministry of Agriculture, Nairobi.

Darkoh, M.B. (1990) Kenya's environment and environmental management.' In: Journal of Eastern Africa Research and Development, 20, pp. 21-25.

Dove, M.R. (1993) 'A Revisionist View of Tropical Deforestation and Development.' In: Environmental Conservation, 20, (1).

Dunne (1977) Intensity and control of soil erosion in Kajiado District, UNDP/FAO Kenya Wildlife Management Project, Project Working Document 12, Nairobi.

Ecosystems (1982) Amboseli/Lower Rift Regional Study, Final Report, report prepared for the Wildlife Planning Unit, Ministry of Tourism and Wildlife, Republic of Kenya.

Ellis, J.E. & D.M. Swift (1988) 'Stability of African pastoral ecosystems: Alternate paradigms and implications for development.' In: Journal of Range Management, Vol. 41 (6), pp. 450-459.

Fallon, L.E. (1962b) Masai Range Resources: Kajiado District, USAID Mission to East Africa,

Nairobi.

Hardin, G. (1968) 'The tragedy of the commons.' In: Science, 162, pp. 1243-48.

Herskovits, M.J. (1926) 'The cattle complex in East Africa.' In: American Anthropologist, 28, pp. 230-664.

Jensen, C.J. (1984) 'Wood use by the Amboseli Maasai, In: Barnes, C., J. Ensminger & Ph. O'Keefe (eds.) Wood, Energy and Households Perspectives on Rural Kenya, Energy, Environment and Development in Africa Series No. 6, The Beijer Institute/Scandinavian Institute of African Studies, Uppsala, pp. 188-204.

Kajiado focus (1991) 'Land sub-division: trials and tribulations?' In: Kajiado Focus, Issue No. 1.
KDAR (Several Years) Kajiado District Annual Report, Kenya National Archives.

KDPP (1994) Kajiado District Development Plan 1994-1996, Republic of Kenya, Ministry of Planning and National Development, Nairobi.

KPC (1993) (Kenya Power Company) Environmental Assessment Stage IV Report Environmental Assessment of Proposals for Ewaso Ngiro River Developments, Ewaso Ngiro (South) Multipurpose Project, Knight Piêsold & Partners, Kent, United Kingdom.

Lawrance, J.C.D., G.J. Humphries, S.R. Simpson, G.M. Gaitta, C.P.R. Nottidge & J.D. MacArthur (1966) Report of the Mission on Land Consolidation and Registration in Kenya 1965-1966, Republic of Kenya, London.

Mainguet, M. (1990) Desertification Natural Background and Human Mismanagement, Springer Verlag, Berlin.

Masharen, S. ole (1989) The Green Revolution in Maasailand, unpublished paper, Arid and Semi-Arid Lands Programme Kajiado District.

Moss, C. (1989) Onder Olifanten. Veertien jaar met een Afrikaanse olifanten-familie, De Boekerij bv, Amsterdam (translation in Dutch of Elephant Memories: thirteen years in the life of an elephant family. Morrow, New York, 1988).

Murphree, M. (1996) 'Articulating voices from the commons: interpretation, translation & facilitation Roles and modes for common property scholarship, In: The Common Property Resource Digest, No. 38, pp. 1-13.

Njoka, T.J. (1979) Ecological and socio-cultural trends of Kaputiei group ranches in Kenya, unpublished Ph.D. thesis, University of California, Berkeley.

Norton-griffiths, M. (1977) Aspects of climate of Kajiado District, UNDP/FAO Kenya Wildlife Management Project (DP/KEN/71/526), Project Working Document No. 13, Wildlife Conservation

and Management Department, Nairobi.

Nyakweba, E.O. (1987) Vegetation map of central Kajiado, Technical Report No. 12, Department of Resource Surveys and Remote Sensing, Ministry of Planning and National Development, Kenya.

Oba, G. (1985) 'Perception of Environment Among Kenyan Pastoralists: Implications for Development.' In: Nomadic Peoples, Nr 19, pp. 33-57.

Odundo, P. (1992) 'The environmental effects of subdivision of group ranches in Kajiado District' In: Klinken, M.K. van (ed.) The Second Conference on the Future of Maasai Pastoralists in Kajiado District, Proceedings of a Conference held at Olkejuado High School, Kajiado, Kenya, 18-21 August, 1991, ASAL Programme, Kajiado pp. 19-23.

Oxby, C. (1981) Group Ranches in Africa. A Study of Group and Commercial Livestcok Production Enterprises and their Application in Tsetse and Trypanosomiasis Control Programmes, with Special Reference to Cattle, FAO, Rome.

Potter (1989) Some Thoughts on the Prospects for Intensification and Diversification in Kenya Maasailand, paper presented at a conference held in Brackenhurst Baptist International Conference Centre, Limuru, Kenya, 28-31 May.

Pratt, D.J. & M.D. Gwynne (eds) (1977 repr. 1978) Rangeland Management and Ecology in East Africa, Hodder and Stoughton, London. Prior, J. (1994) Pastoral Development Planning, Oxfam Development Guidelines No. 9, Oxford.

Rutten, M.M.E.M. (1992) Selling Wealth to Buy Poverty The Process of the Individualization of Landownership Among the Maasai Pastoralists of Kajiado District, Kenya, 1890-1990, PhD thesis, University of Nijmegen, Verlag Breitenbach Publishers, Saarbrucken Fort Lauderdale.

Sandford, G.R. (1919) An Administrative and Political History of the Masai Reserve, Waterlow and Sons Ltd., London.

Sandford, S. (1983) Management of Pastoral Development in the Third World, John Wiley & Sons, Overseas Development Institute, London.

Showers, K.B. (1994) Historical environmental impact assessment: connecting land use history to environmental impact assessment, Working paper No 174, African Studies Center, Boston University.

Sorrenson, M.P.K. (1968) Origins of European Settlement in Kenya, Oxford University Press.
Stiles, D. (ed.) (1993) Listening to the people: social aspects of dry-land management proceedings of an International Workshop Held in Nairobi 14-18 December 1993, United Nations Environment Programme, Nairobi.

Swantz, M-L. (1995) 'Conflicts between the systems of knowledge of the pastoralists and developmentalists: The case of Parakuyo Maasai in Bagamoyo District.' In: Foster, P.G. & S. Maghimbi (eds.) The Tanzanian Peasantry: Further Studies, Avebury, Aldershot, pp. 218-255.

Talbot, L.M. (1960) Land use survey of Narok District, Kenya, (mimeo).

Thomson, J. (1885) Through Masai Land: A Journey of Exploration among the Snowclad Volcanic Mountains and Strange Tribes of Eastern Equatorial Africa being the narrative of the Royal Geographical Society's Expedition to Mount Kenia and lake Victoria Nyanza, 1883-1884, London, Sampson Low, Marston, Searle, & Rivington (Translations in German Durch Massai-Land, Leipzig, F. Brockhaus, 1885; and French Au pays des MassaÄ, Paris, Librairie Hachette et Cie, 1886.

Touber, L., B.J. van der Pouw & V.W. van Engelen (1983) Soils and Vegetation of the Amboseli-Kibwezi Area, Reconnaissance Soil Survey Report No. R6, Kenya Soil Survey, Nairobi.

Western, D. (1982) 'Amboseli national park: Enlisting Landowners to Conserve Migratory Wildlife.' In: Ambio, Vol. 11, no. 5, pp. 302-308.

Western, D. & J. Ssemakula (1980) 'The present and Future Patterns of Consumption and Production of Wood Energy in Kenya.' In: Energy and Environment in East Africa, UNEP Energy Report Series.

World Bank (1992) World Development Report 1992. Development and the Environment, World Development Indicators, Oxford university Press.