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**AN OVERVIEW OF DROUGHT STRATEGIES
AND LAND USE
IN AFRICAN PASTORAL SYSTEMS**

by

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INTRODUCTION: THE ECOLOGY OF AFRICAN RANGELANDS

1. Africa contains a substantial portion of the world's arid and semi-arid rangeland, extending over three million square kilometers. These arid zones support an estimated 16-22 million pastoral population (Widstrand, 1975) and nearly 500 million head of livestock (FAO, 1975).
2. Despite their marginal productive capacity, the arid and semi-arid rangelands of the continent are highly diverse in climate, land forms, soil types and vegetation. These rangelands are characterised by their high spatial and temporal variability in precipitation which directly affects plant productivity.
3. Pastoral nomadism, the major land use of the region, is adapted to variable forage supplies and water distribution. The ability of nomadic people to survive in these marginal lands is attributed to their opportunistic mobility and diversified livestock husbandry.
4. Recurrent drought and famine are a common feature of African rangelands. This has been vividly illustrated in the Sahelian drought of 1969-1973 and the recent drought of 1983-1984 which has claimed numerous lives. Furthermore, overgrazing, sedentarisation of formerly nomadic communities, water development without sound ecological considerations, exclusion of the nomads from vital drought reserves and their compression onto smaller and more fragile land have all contributed to the deterioration of African rangelands. The people most affected by recurrent drought are the pastoral nomads. Their livestock are decimated and reports at the time of drought estimated several million livestock starving accompanied by horrifying human suffering.
5. Drought is not a new phenomenon to the pastoral nomads. Historically they have suffered numerous such disasters. Their survival can be attributed to a wide spectrum of adaptive strategies. Some of the strategies are ecologically based, while others depend upon socio-economic and cultural mechanisms. There is, however, serious concern that these drought strategies are breaking down. Today, more pastoralists are seeking outside help than ever before.

This has been graphically demonstrated in Ethiopia, Somalia, Kenya and some Sahelian countries where dispossessed nomads sought survival in refugee camps, relief and urban centers (Lewis, 1975; Caldwell, 1975; Kaplan *et al.*, 1977; Cahill, 1980; Hogg, 1983).

6. In this paper we review: (1) pastoral nomadic strategies for mitigating drought effects, including the ecological and social significance of these strategies; (2) conditions contributing to the gradual breakdown of nomadism; and (3) some current drought policies in pastoral areas. The review cannot claim to be exhaustive, but highlights the general problems faced by pastoral peoples.
7. The functioning of the ecological system is dependent on complex interrelationship between people, animal life, plants and the physical environment. Large expanses of savanna which are known to be some of the most productive ecological systems in terms of plants and animal biomass, are sustained through a dynamic balance of human activity - grazing and burning - and a broad diversity of grazing wild herbivores and predation through carnivores. Pastoral nomadism which forms part of the functioning of this ecosystem is a biological necessity for human survival in this environment.
8. The distribution of pastoral peoples of tropical Africa have been illustrated by Hans Jahnke (1982). The areas used constitute the continent's arid and semi-arid rangelands. In these eco-climatic zones, the rainy season varies from a few weeks to three to four months (Le Houerou, 1980); growing time of forage plants varies from less than 90 days in northern fringes of the Sahara to 180 days in the Savanna Zone (Wallen and Gwynne, 1978; Jahnke 1982). Potential evapotranspiration is extremely high: 1500 to 2500mm per year, in some places almost always exceeding actual rainfall (Berry 1975; Gallais and Sedikou 1978). Such high evapotranspiration demands result in moisture deficits which drastically reduce duration of plant growth and therefore green forage availability.
9. Furthermore, rainfall variability, both in space and time, causes uneven and unpredictable levels of forage productivity (Le Houerou and Host, 1977; Herlocker and Dolan, 1980; Lamprey and Yusuf 1981). For example, in northern Kenya, during the drought years of 1968 to 1976, mean annual rainfall was approximately 50mm. In

contrast, rainfall In 1977 was over 350mm, which was reflected in greatly increased plant production (Lamprey and Yusuf, 1981). Even more important is the spatial distribution of rainfall, especially in the rangelands of East Africa, where rainfall is produced by individual storms (Wallen and Gwynne, 1978). This has important influence on how the range resources are used by nomads.

10. Recurrent drought is a common problem in African rangelands. The areas most susceptible to drought problems are those which are subject to erratic seasonal variation in precipitation. Drought on these rangeland reduces forage production and water supplies, placing serious pressure on the livestock industry. The pastoral nomads have evolved numerous adaptive strategies which ensure their survival. These strategies are reviewed briefly below, as a backdrop for an analysis of the reasons why some are no longer effective.

PASTORAL STRATEGIES FOR MITIGATION OF DROUGHT

Livestock Numbers and Diversity

11. Nomads often occupy specific tribal territories. Lands within a tribal territory are often partitioned into 'wet season' and 'dry season' ranges. Wet season ranges are the product of seasonal rains. These areas are dominated by annual vegetation and, except for a short period of the year, remain waterless and uninhabited. Dry season ranges, on the other hand, are high potential areas and include pockets of highlands, riparian ecosystems, flood plains or lake shores and the tsetse infested ranges, traditionally considered as 'drought grazing reserves' (Figure 1). Some drought strategies used by pastoral nomads in respect of these lands have been outlined by several authors (Wood and Knight, 1975; Dahl and Hjort, 1979; Hogg, 1980; and R. and N. Dyson-Hudson, 1980; Mengestu, 1981; Cassanelli, 1982; Sandford, 1982). These vary in time and intensity from location to location in the drought-afflicted area - and will be activated sequentially under progressively worsening conditons (Hogg, 1980 and Cassanelli, 1982). The strategies used are dependent on whether drought conditions are 'local', (affecting only the group's territory) or 'regional' (affecting all neighbouring regions).
12. Drought strategies used by nomadic pastoralists are highly variable.

They depend upon past drought history, the kinds of livestock raised, and available resources. In a general sense, the entire concept of nomadism may be considered as a means of coping with and exploiting highly variable resources. This is made possible in part through the ability of nomads to maintain several species of diverse herds of livestock - camels, cattle, sheep and goats - and by their geographical mobility.

13. It is often argued that nomads keep too many animals, far above what the range resources are capable of supporting. Large herds are then unable to survive drought induced periods of low forage production. Nomads on the other hands believe large numbers of stock are essential to get through the drought years (Brokensha *et al.*, 1977). This misunderstanding led Diuldle Laya (1975:79,-80) and co-workers, interviewing Wo'daa'be nomads during the Sahelian drought of 1969-1973, to ask one tribal member:

Q: How many cattle do you need to induce your return to *nomadism*?

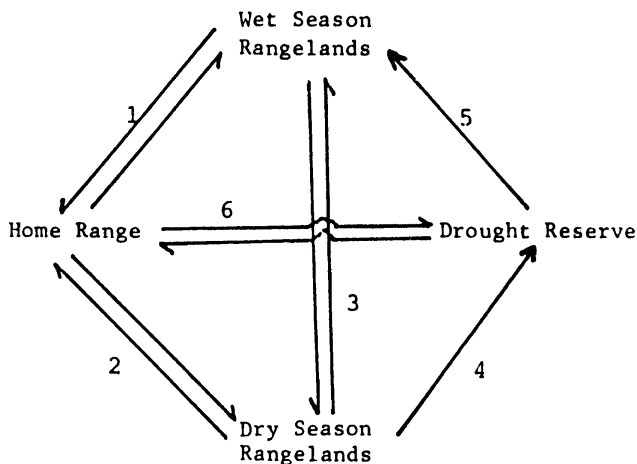
A: I think you know the number we need.

Q: If you had five cows....

A: I used to have 40 head of cattle which did not provide enough....

14. Hidore and Elton (1975) speculate that the Masai of Kenya and Tanzania own large herds because these are considered as insurance against drought losses. This is based upon the theory that the more stock a man has the better the chance that more of his herd will survive a drought. In justification of the hypothesis, Eckholm (1975) argues that in the nomadic family, being largely isolated from the cash economy, more animals are needed to meet basic food requirements. Surplus stock beyond a basic 'minimum' are both an investment and a form of insurance in the drought years when some animals may be sold to buy food grains.
15. Pastoralists need large herds not only to meet household requirements but also as a means of building social alliances through transfer of livestock to friends and kin as loans. These transactions could then be called upon in times of need. Individual families whose herds were lost to drought could approach affines for

Fig. 1 A Schematic Model Representing Movements of Pastoralists Between Home Ranges, Wet Season Rangelands, Dry Season Rangelands and Drought Reserve.



Legend: Livestock movement between ranges represented by 3, 2, 3, 4, 5, & 6. 6 also represents movement of households between home range and drought reserve.

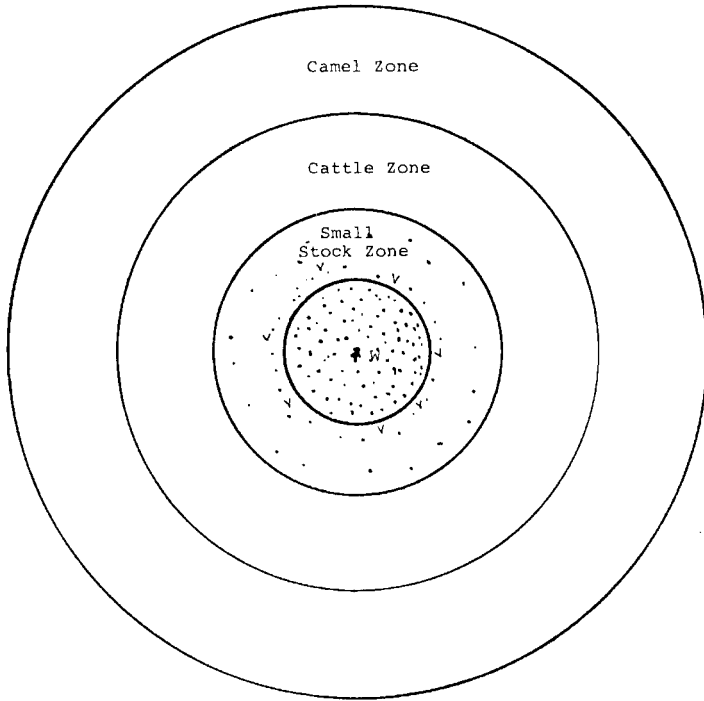
assistance in replenishing their breeding stock (Cassanelli, 1982). This has been taking place in an environment where government insurance facilities or banks are non-existent

16. The objective of herd maximisation is best realised through herd diversification. Several types of animals are maintained to secure survival of pastoral households. The use of different livestock species has ecological and economic implications. Different species fill different ecological niches and therefore may be more efficient than a single species. Each kind of stock prefers to graze certain plant

species and certain types of topography. For example, camels and goats are considered to be, browsers, although they may be grazers at certain times. Cattle and sheep, however, are largely grazers. An area containing both grasses and shrubs may be utilised best with a combination of different ruminant species employing different grazing habits (Franke *et al.*, 1980). Different ruminant species display differential digestibility of various dietary constituents. For example, goats have better ability for utilising fodder than do either cattle or sheep (Lundholm, 1976).

17. Another advantage of multi-species herds relates to animal water requirements. In semi-arid rangelands of Africa, cattle are watered every other day. Therefore, the effective grazing distance from a watering point is quite limited. On the other hand, during the dry season, camels can graze up to 60-80km away from a water source and only have to be watered every one or two weeks. Small stock (sheep and goats) must be watered once every week.
18. During periods of severe drought (lasting two to three years) when geographical mobility is not possible and forage supply critically limiting, livestock survival becomes a major consideration. The pastoral nomads of northern Kenya (Boran and Gabra) for example, respond to this problem by moving all livestock from degraded rangelands closer to permanent water, into areas of the range which because of lack of water, had remained unused. This strategy does, however, raise some problems for the pastoralists and their livestock. Livestock are kept away from water for a much longer period than during a normal dry season, and distance to water is substantially increased for all livestock species. Depending on the distance moved (69-80km for camels, 30-40km for cattle, and 20-30km for small stock) two watering strategies are used. Boran and Gabra pastoralists identify this as *Orrisa* (ie. being on the road for more than 12 animal trekking hours and *Buulto* (ie. establishing night-stop camps between base camp and water source). When only a day's journey to reach water source is necessary, *Orrisa* is used; if the livestock must camp for a night between the base camp and the water source, *Buulto* applies. Using these strategies, the pastoralists establish some kind of grazing zone for each livestock class, based on the livestock's effective walking distance and forage availability (Fig.2).

Fig. 2 A model of Land Use of Boran and Gabra Pastoralists During 2-3 years Drought



Legend: W - Well/Borehole
V - Semi-sedentary villages
[stippled box] - Heavily degraded ranges

19. When using the *Buulto* strategy, cattle are watered every three to four days, while small stock are watered once every five to seven days. Therefore, cattle are on the road for almost 2½ days out of every four days. It has been estimated that body weight loss may be as much as 17% between drinking intervals (Temple and Reh, 1984). This partly explains why cattle losses compared to other livestock species are so heavy during severe drought years. On the other hand, camels and small stock are able to survive without water for longer periods, during which time they may lose as much as 27% of their body weight (Temple and Reh, 1984). Of goats and sheep, the latter are less tolerant.
20. There is another facet to the importance of herd diversity. Goats and sheep are becoming increasingly important in the pastoral economy (Dahl and Hjort, 1976; Wienpahl, 1985). Their fecundity and hardiness have made them more suitable animals in post-drought herd reconstruction strategies. In Botswana, (Republic of Botswana, 1974) goats reportedly increased approximately 50% two years after the 1965-1966 drought, whereas cattle increased only 20% during the same period. Legesse (1980) describes an interesting adaptational 'evolution' by the seminomadic Boran of Marsabit (Kenya) following the 1970's drought. Unlike their kin the Gabra, Boran have always emphasised cattle herding. Following the 1971-1973 drought, Boran pastoralists sold their few surviving cattle, purchased goats, and moved into the semi-desert area of Gabra country.
21. This change in strategy has not been limited to Boran pastoralists. To meet subsistence requirements of their households, all pastoralists must first build up their small stock herds prior to resuming nomadism.

Mobility as a strategy

22. In order to cope with the varying rainfall and forage distribution, both nomads and their animals must possess a high degree of mobility. Two aspects of mobility should be recognised. Resource exploitation mobility is undertaken in response to unpredictable forage and water availability. Escape mobility involves long distance migration to escape drought conditions. In either case, the primary objective is usually to maximise livestock survival.

23. Resource exploitation mobility allows nomadic herds to utilise widely dispersed forage resources at times when they are most nutritious. Such a system results in annual migratory cycles determined by seasonal changes. The distance moved, routes followed, and the degree of flexibility built into the system vary from year to year, place to place, or herd to herd, and even from community to community (Spooner, 1973; Novikoff, 1976).
24. In the Sahel, cattle traditionally graze two categories of rangelands. Following the rains, cattle nomads move toward ephemeral ranges where surface waters are exhausted and annual plants decline in nutritive quality. At these times, nomads migrate back to dry season ranges, thus completing the cycle of transhumance (Novikoff, 1976). In the Sudan, similar grazing patterns are followed. During the rainy season, camels, sheep and goats move toward the fringes of the Sahara desert, while cattle nomads follow, occupying those zones left by camel nomads. Late in the rainy season, however, camels, cattle, sheep and goats migrate back to the short grass savanna zone. Cattle nomads move south to fly-infested range by the early dry season, while camels, sheep and goats remain in the Savanna zone (El-Arifi, 1975; Sidahmed and Koong, 1984).
25. Dry seasons are the most demanding period for nomads and their herds. Shortages of water supply and poor quality of forage mean that animals must use more energy simply to meet body maintenance requirements. Body reserves may be utilised, resulting in substantial weight loss, emaciation, and finally death.
26. Nomads attempt to minimise such losses for utilising mobility to rapidly convert growing vegetation to animal products. The number of movements undertaken during any year depends on environmental conditions, the state of available resources, and the livestock species being managed. For example, Turkana nomads inhabiting the very arid region of northwestern Kenya moved more than a dozen times per year (McCabe, 1984), while Boran pastoralists occupying a more favourable environment migrated once in six years (Hjort, 1976).
27. Turkana and many pastoral groups of the arid and semi-arid East African rangelands conduct epicyclical movements. Epicyclical movement, in contrast to normal transhumance, follows no well-

defined annual or seasonal pattern. Instead, it is based on movement decisions situationally-based within a context that provides few fixed parameters. Such patterns of land use allow for a high degree of fluidity and variation in the nomadic system and provide an opportunity to individual herd owners to respond independently to annual and seasonal fluctuations (McCabe, 1983).

28. Mobility may be used in managing forage resources. This is achieved by Rendille pastoralists by dividing household stock into home-based and satellite herds (*foora* herds). The latter, mainly composed of dry-cows, castrates, and weaned calves, are grazed in outpost camps while the former are attached to the main camps. Thus, by moving substantial numbers of stock away from the main camps, the rate of use of pastures surrounding main camps and dry season water-holes is minimised. This dispersal has far-reaching implications in range resource management. Due to variable rainfall and often limited water supplies, each range area is used only for a short period, such that forage plants remain in good condition. It may be speculated that such intermittent use of the land will result in improved forage and increased carrying capacity relative to those areas where yearly production of standing crop biomass remain unexploited and/or those other ranges grazed year long. Such a grazing strategy increases plant vigor and growth. In some cases, especially with coarse grass species, this intermittent use may help to remove dead stalks allowing new shoots to sprout. The new shoots being more nutritious are much more readily grazed. In Amboselli (Kenya), seasonal movements of Masai pastoralists resulted in a 50% increase in the carrying capacity of the area (Western, 1980). This is further supported by studies of migrating wildlife populations in the Serengeti (McNaughton, 1979).
29. In contrast to resource exploitation mobility, escape mobility is undertaken to evade drought. Distances moved are dependent on availability of limiting resources both within and outside the tribal territory, and on the social and political 'climate' shared with the neighbouring groups or nations. For example, Rendille nomads travelled well beyond their tribal territory to Allia-Bay on the north-eastern shores of Lake Turkana. Systematic reconnaissance survey by the UNESCO-Integrated Project on Aridlands (IPAL) of 1976-1979 showed that during those drought years, over 75% of Rendille livestock were outside Rendille country, whereas resident wildlife

populations remained unchanged (Field, 1980). The occupied area had been uninhabited for some time previously due to its location between hostile nomadic groups. It is interesting to observe that during such hard times, security risks become secondary to community survival.

30. International boundaries, created by colonial powers and preserved by independent African countries, have resulted in barring indigenous livestock herds from traditional grazing areas. However, experience shows that during 'regional droughts' nomads disregard these boundaries (Breman *et al.*, 1978; Legesse, 1980; Gilles and Jamgaard, 1982). The timing of these long distance migrations is extremely important. For example, Kenyan Boran sustained high livestock losses (60-70%) before reaching Southern Ethiopia following the 1971-1973 drought because they waited too long (Legesse, 1980).
31. Long distance migration across international borders when undertaken on inadequate information can have serious consequences for the pastoralists. A classical example is when the group, hoping to find water along its route, attempts the long journey only to find on arrival that the water source has dried up, or the borehole engine has broken down or even has been vandalised.
32. As soon as they cross international borders, their status also changes; they lose the independence they had and under certain circumstances may be compelled to accept client status or be forced into refugee camps. Under such conditions, their few surviving animals may perish, leaving them completely dependent on outside assistance.

Non Pastoral Drought-Strategies

33. Whenever they can, pastoralists attempt to diversify their resources by including non-pastoral opportunities to increase their members' survival. Farming and hunting of wild game (Turton, 1977), seeking jobs outside the pastoral system (Dahl and Hjort, 1976; Hogg, 1980) and dependence on relief food (Hogg, 1983) are examples. In some cases, it has been the policy of government to encourage the pastoralists to adopt cultivation of grain crops, in the hope that such

a change in dietary requirements will reduce dependence on livestock and thus the need to keep large herds. However, the reverse may also occur: for example the Ilchamus reinvested money earned from grain sales into livestock (Little, 1983).

34. In recent years, migration from pastoral systems has been on the increase. Many young people and sometimes heads of households having suffered livestock loss, travel to cities to seek employment (Dahl and Hjort, 1979; Hogg, 1980). For example, between 1962-1969 the Boran population in Nairobi jumped by 450% (Hogg, 1980). A majority of these emigrants were employed as watchmen. Many send home some of their earning to keep their families in the pastoral system. This movement of pastoral labour into cities has had serious consequences, creating a labour shortage in the pastoral system. Many pastoral families are now broken up because the husbands are 'lost' in the cities.
35. Relief food, currently a popular form of outside assistance to drought-afflicted pastoralists, has also come to be treated as a form of economic diversification. Turkana pastoralists consider acquiring relief food as a new economic activity. The benefits of relief food, other than relieving hunger, have enabled herd owners to minimise offtake from their herds (Hogg, 1983).
36. Wild fruits, roots and plant tubers are also eaten. Gabra and Boran informants recall that during drought periods of the 1930s, 1940s, and even 1950s, people who fed on meat of starving cattle died of malnutrition (*bukiiti*) while those who fed on wild fruits, roots and plant tubers survived. The most important fruits eaten were those of *Grewia* spp., *Balanites aegyptica*, *Dobera glabra* and *Hypaene crociae*. Of all the root tubers, the most important is that of *Vitovaea pseudosuperlapp*. It is the most important food source during drought periods, particularly when the above tree species are not in season (Oba, 1985b).

FACTORS CONTRIBUTING TO A GRADUAL BREAKDOWN OF NOMADISM

Effects of Drought on the Livestock-Economy

37. There is increasing concern among administrators and resource managers that nomadism is breaking down due to pressures of droughts (this fear does not apply to the gradual processes of sedentarisation taking place in nomadic communities, (cf. Salzman, 1980). Today more nomads seek outside assistance than ever before. This was demonstrated graphically in Ethiopia, Somalia, and other Sahelian countries following the recent Sahelian 1969-1973 and 1983-1984 droughts.
38. In Ethiopia, Afar pastoralists were among the first groups in the country to face acute problems during the 1972-1973 drought. They lined up along highways in Wallo province to beg for food from passing motorists (Holt and Seaman, 1976). In Niger, the government estimated that 76,000 nomads were dispossessed during the same period (Sutter, 1982). In Somalia, thousands of impoverished nomads sought government assistance in dozens of refugee-cum-famine relief centers (Lewis, 1975; Kaplan *et al.*, 1977; Cahill, 1980, Clark, 1985). In the Turkana district of Kenya over 40% of the population was supported on famine relief following the 1979-1980 drought (Hogg, 1983).. Similarly, other nomadic peoples in Mali, Chad, Mauritania, Niger, Burkina Faso (Upper Volta) and other Sahelian countries were equally affected.
39. The tragedy of African pastoral peoples cannot be measured in terms of human mortality alone, but must also be reckoned in terms of livestock loss, their survival base.
40. The decimation of their herds by drought has frightening implications for the pastoral peoples (Green, 1975). The pastoralists primarily rely on their livestock for protein supply, money and social security. To lose them, therefore, is to lose everything. Such animal losses translated into economic terms is also an economic disaster to many countries of Sub-Saharan Africa where national economies are largely livestock based (Simpson, 1984). For example, in Kajiado District of Kenya, Masai pastoralists lost nearly 30% of their cattle population

following the 1960-1961 drought (Hutchison, 1963). According to Hutchison (reported in Maloiy and Heady, 1975) this cattle loss is evaluated at US\$7m. In Ethiopia, nomadic animal losses were placed at 80% of cattle, 50% of the sheep and 30% of the camels and goats during the 1973-1974 drought (Ayalew, 1980). Similarly, in the Turkana District of Kenya, losses of 80% of the sheep and goats, 40% of the camels and 90% of the cattle was reported during 1979-1980 drought (Hogg, 1983). Furthermore, in the Sahelian countries, millions of animals were reported lost as a result of 1969-1974 drought (Table 1).

Table 1. Cattle losses in Sahelian Countries during 1969-1974 Drought

| <i>Country</i> | <i>Cattle losses (%)</i> |
|----------------------------|--------------------------|
| Mauritania | 80 |
| Senegal | 50 |
| Mali | 50-80 |
| Upper Volta (Burkina Faso) | 80-100 |
| Niger | 80 |
| Chad | 90 |

41. Few economists attempt to estimate drought losses because of the large number of variables involved in such estimations (Campbell, 1968; Lusigi, 1980). To the nomads, this situation is even less comprehensible. Their losses cannot be measured in monetary terms because no one can calculate the value of a broken family, friendship and social bonds which are often cemented through livestock exchanges; or the value of a milk cow that died, the loss of which deprived the family of an immediate food supply and future progeny. Not only do pastoralists suffer a loss, but livestock traders, butchers, and ultimately the whole national economy suffers. The effect of drought on any economy is thus cumulative. This is presently occurring in the Sahel Zone of West Africa, Ethiopia, Somalia and Kenya. The recent drought of 1983-1984 struck these zones exactly a decade after the devastating Sahelian drought of 1969-1973, and preceded full economic recovery.

42. Drought has two dramatic impacts on the nomadic livestock economy. First, there is an increase in livestock mortality due to

starvation and lack of water. Secondly, faced with imminent hunger, the nomads voluntarily increase the offtake for purchase of grain supplies (ILO Report, 1975; Wood, 1976; Brokensha *et al.*, 1977; Sutter, 1982). Such forced sales of livestock have serious consequences on post-drought herd rebuilding strategies (Sutter, 1982).

43. The long-term effects of droughts on pastoral herds have been simulated by Dahl and Hjort (1976, 1979). They showed that apart from an immediate reduction of herd size after catastrophic drought, the number of female animals continued to fluctuate even many years later. This, they report, had a drastic effect on herd Production and milk supply to the households. In the case of a three-year drought, they postulated that not until 10 years after the beginning of the drought does the growth rate from the total female herd catch up with the normal growth rate. Even then, there will be fluctuations in the number of animals and their yearly growth rate for years to come.

Man's Role in Environmental Degradation, and the Pastoral Crisis

44. There is consensus in some quarters that recent climatic changes in the Sahel and Sudano-Sahel region of Africa suggest that man has induced rainfall decline by mis-management of the land. (MacLeod (1974) and Eckholm (1975) claim increased atmospheric dust over these zones, produced by overcultivation, overgrazing and burning of rangelands reduces local rainfall or has encouraged a shift in climate. It is unclear whether effects such as this are a result of outside influences or, as often claimed, caused by nomads (Baker, 1974; Franke and Chasin, 1980). These propositions represent contrasting viewpoints. The most popular of the two, supported by administrators and development agencies, consider the nomads responsible for aggravating drought conditions through deterioration of their vegetation resources. The second, less popular approach, views recent changes in the pastoral environment not as the cause, but rather as an effect resulting from outside pressures instituted by the displacement of nomads from vital resources (ie. traditional dry season grazing areas) and exposing them to more brittle environments; where increasing pressure generates environmental degradation and drought severity.
45. Baker (1974), for example, hypothesises that in unpopulated areas

less severe conditions are experienced during drought years. In his example of Sukuma District (Tanzania), he reports 1.5m cattle out of the 2.5m died during the 1949 drought. He proposes that heavy overstocking set up the conditions for a drought even before drought was reported.

46. The tendency to overgraze communal rangelands is explicitly recognised in Hardin's (1968) paradigm of the 'Tragedy of the Commons'. This thesis presupposes that, because land is communally owned, there are a few incentives to reduce stocking levels. Furthermore, for any individual, the benefits always exceed the cost of overgrazing. The individual owner sees the pasture essentially as a free resource, which, if he fails to fully exploit, will be exploited by somebody else. In an effort to maximise utilisation of such communal resources, overgrazing results (Stryker, 1984). The 'Tragedy of the Commons' has also been used to explain the severe effects of drought in the Sahel (Picardi and Seifert, 1976).
47. Other workers attribute the problems to development policies in pastoral areas (Darling and Farvar, 1969; Wood and Knight, 1975; Perry, 1975; Lamprey and Yusuf, 1981). They see land degradation and hence drought severity as a consequence of ecologically unsound water development programmes and resettlement of nomadic populations. For instance, the area surrounding Khartoum and Omdurman in Sudan was reduced to barren soils and scattered annual grasses because of the need for charcoal and the grazing of city-kept goats. Exclosure and historical records suggest the former existence of more luxuriant vegetation (Perry, 1975). In Northern Kenya, human concentrations create nuclei of denuded land spreading out year after year as people are compelled to travel further for grazing kraal materials (Lamprey and Yusuf, 1981).

Loss of Traditional Grazing Lands and its Effects

48. The root cause of current problems in pastoral Africa is largely attributed to encroachment of cultivators on nomadic grazing lands (Spencer, 1974; O'Keefe and Wisner, 1975; Widstrand, 1975; Swift, 1977; Dahl and Hjort, 1979; Garcia, 1981, Sutter, 1982). When this happens, pastoralists are forced from their dependable grasslands onto more fragile areas where increased grazing pressure generates

the desertification processes.

49. In Niger, one of the major concerns of Wo'daa'be pastoralists is the extension of cultivation into their historic grazing lands. This process of land encroachment not only deprives herders of dry seasonal pasturage, but also pushes them into regions of more erratic rainfall where drought is more common and severe (Sutter, 1982). In northeastern Ethiopia Afar nomads have been displaced from pastures adjacent the Awash river by massive irrigation schemes. The lost pastures previously supplied critical dry season grazing for the 'Afar livestock herds (Flood, 1976). This is a clear example of the potential conflict between national policies and the indigenous land-use system; current practices promote cash crop production at the expense of pastoral nomads.
50. In Kenya too, contemporary government policy encourages cultivation of pockets of high potential areas in the arid and semi-arid rangelands (Dahl and Hjort, 1979; Campbell, 1981). These areas are traditionally used by pastoralists. This policy has accelerated the migration of cultivators onto these marginal lands, depriving pastoralists of access to their dry season retreat areas making them more vulnerable to drought (Dahl and Hjort, 1979; Campbell, 1981). Exclusion of pastoralists from drought reserves (as a consequence of such areas being set aside for wildlife and tourism) has drastically altered the pattern of pastoral land-use. The loss of such important dry season ranges results in increased deterioration of the remaining more fragile lands (Dahl and Hjort, 1979; Hogg, 1980).
51. Perhaps the most dangerous current development in some pastoral areas is militarisation of tribal conflicts and cattle rustling. This causes the compression of tribal groups into a fraction of their former ranges (Lusigi, 1981) In Marsabit District, northern Kenya, 40% of the grazing land has been abandoned because of poor security (Marsabit Development Plan 1979-1980), while more secure areas are grossly over-exploited (Lamprey and Yusuf, 1981). Similarly in Pokot northwestern Kenya traditional wet season grazing lands have been abandoned because of poor security (Francis, 1982).

Current Drought Policies in the Pastoral Areas

52. Impacts of drought on pastoral system are long lasting. Drought creates long term economic and ecological disaster, causes widespread migration to urban centers (Caldwell, 1975; Schissel, 1983; *World Vision*, Sep-Aug. 1984), and diverts scarce resources to relief schemes (Bunting *et al.*, 1975; Lewis, 1975). Although these problems are increasingly apparent, many countries lack clearly-defined long-term drought plans especially for rangeland areas where generally speaking, development has not been a national priority.
53. To date, government drought emergency programs are limited to provisioning of relief food, resettlement of destitute pastoralists and sometimes, a livestock salvage exercise. These programmes are often planned on an *ad hoc* basis and thus lack long-term outlook. Despite this, these practices have drastically impacted the fledgling economies of many African nations, not to mention the associated social problems that have been created (Lewis, 1975; Hussein, 1976; Garcia, 1981; *Africa Res. Bull.* 1984). Huge sums are being spent on imported relief food to feed drought-afflicted pastoral peoples and other rural communities.
54. There is evidence to support the thesis that excessive use of relief food creates dependency and erodes people's initiative to support themselves. A case in point is the Turkana District where, because of recurrent drought, famine relief food has come to be treated as a dependable resource by pastoralists (Hogg, 1983).
55. But provision of relief food is a self-perpetuating 'solution' that, once started, is difficult to abandon. This realisation explains why long term rehabilitation and redeployment of destitute nomads have gained wide support in recent years (Widstrand, 1975; Thomas, 1984). Current policies have one thing in common: they assume that destitute nomads have no chance of resuming nomadism in the light of environmental deterioration and the apparent threat from continued drought conditions. Therefore, 'new ways of living' must be found for the pastoralists. Emphasis has been on resettling destitute pastoral families in irrigation schemes, dryland farming and fishery projects (Kaplan, 1977; Dahl and Hjort, 1979; Helland, 1980;

Kovda, 1980; Hogg, 1983).

56. Evaluation of some of these projects reveals some unanticipated adverse effects on the environment. In Turkana district, north-western Kenya, irrigation schemes along the banks of the Turkwell River have resulted in the clearing of riparian vegetation to pave way for gardens, while in the process, considerable environmental deterioration occurs (Hogg, 1983). Similarly, when subsistence needs of destitute Turkana households were met by relief and fishing, people's dependence on livestock was reduced; in some cases, money earned from fishing was used to import cattle on the very range the deterioration of which had forced people into the project in the first place (Helland, 1980).
57. These new developments have posed challenging problems to land use planners and policy makers. But one thing is already clear, the future of the pastoral peoples does not depend on farming schemes, for the simple reason that their marginal environment lacks farming potential. Cultivation of these lands will only lead to severe environmental deterioration. Livestock production thus remains the only viable and feasible enterprise which drought contingency measures should emphasise.
58. In Africa, however, range/livestock projects have been highly dependent on foreign aid. The major funding sources have been the World Bank, FAO, UNDP, USAID, CIDA, and many others. Between 1973-1984 for example US aid alone funded range/livestock projects in thirteen African countries at an estimated cost of US\$1,724,000 (Oxley, 1983). Range/livestock projects are high risk projects with high failure rates which, even with good management, require longer periods to pay off. As a result of this experience, aid agencies are no longer hasty in getting involved in range/livestock projects (Fischer, 1983). Individual African countries are even much more cautious about risking high interest foreign loans on development of range/livestock projects (although these loans are often diverted to high-cost relief programmes).
59. Sectoral approaches to development of range resources are also to blame for failure of range projects. A classic example was water development in the absence of proper range planning which was

largely responsible for the Sahelian disaster of the 1970s. The first consideration in water development should be the provision of adequate watering points for domestic use so situated to reduce unnecessary stress; and, secondly, to provide adequate water for livestock, well-distributed to facilitate even grazing of the range. Boreholes are unsuitable, except in critical areas of the Sahelian zone. Hand-dug wells which are cheap to build and maintain may prove more suitable. Many traditional wells are of this type. People could dig such wells themselves, and would take care of them better than boreholes dug for them by sophisticated machinery. Hand-dug wells also dry up when the water table gets low during the dry season, thus relieving pressure on the surrounding grazing land. They should be fitted with animal driven pumps and machinery that is within the technological and economic servicing capacity of the pastoralists.

PROPOSALS FOR THE FUTURE

60. As yet, although the problems of recurrent drought and environmental degradation in the arid and semi-arid lands of the continent are recognised by concerned governments, a number of administrative, political and economic constraints militate against the institution of appropriate actions. Among the most important have been lack of funds available for the development of these 'low potential' areas and lack of information on human and other resources that are essential for rational development (Lusigi, 1984).
61. Development of these lands must take a form more suitable to the sociological, political and ecological system to which these areas are best adapted. In the absence of oil or other minerals of economic importance, and owing to variable climate and forage availability, the greater part of land in these zones must remain under grazing. Effective utilisation of these rangelands does however depend on maintaining the mobility of livestock herds. Here, an advantage might be gained by building onto the traditional forms of land use.
62. In the past, range development programmes in pastoral Africa followed lines similar to those in the USA or Australia, where commercialisation is the major objective. Despite such efforts, conventional range management techniques known to work

elsewhere have had no success owing to unreliable and erratic rainfall with consequent irregular forage production. This means that in most cases it is not possible to devise a definite and regularly prescribed grazing rotation. Even more important is the people's attitude towards development programmes. Many such plans are ill-suited to people's needs, and are therefore rejected. An example would be where development programmes emphasise cattle production in areas where camels and small stock are environmentally the best adapted species.

63. Additionally, any developmental and environmental programme which seeks the welfare of the local pastoralists must first of all strengthen the present pastoral economy. Once the pastoral economy has been placed on a firmer and less vulnerable basis there is no reason why it cannot produce a surplus of livestock and meat for the wider economy as well as enriching the local community. This means relaxing the constraints under which producers operate.
64. Development plans designed for marginal lands must also have provision for drought years. We have discussed how pastoral communities once maintained drought reserves. Present day conflicts in the use of these traditional drought reserves have also been highlighted. Drought contingency measures must therefore set aside at least one or two drought reserves for each pastoral group or community. In later stages of drought, when all the forage resources are exhausted, livestock could be moved onto the drought reserve. If this policy can be maintained and the drought reserve areas remain unused in normal years, the high standing crop of grasses and dwarf shrubs which exist in these areas will temporarily support a high stocking level. Since the length of future droughts is unpredictable, contingency plans should provide for a succession of fall-back areas. Since such reserves will only be used during drought periods and will be able to recover in normal years, stocking rates during drought can be set at relatively high levels. However, current development policies have alienated these areas from traditional use. A long-term solution to the problem depends on resolving this land use conflict.
65. Another solution is to sell off stock rapidly when drought threatens. This has two aspects. First, pastoralists should be encouraged to sell mature male stock in good years and to save money so earned in

savings accounts (where such facilities are available) for use in drought years. Second, when drought threatens auctions should be organised promptly, before livestock lose condition. Pastoralists are often blamed for withholding livestock from markets until drought condition become so severe that they are forced to rush dying animals to markets and abattoirs. During such periods livestock prices fall drastically, becoming only a fraction of what would be needed to buy grain on the local market. What is often overlooked, however, is that marketing facilities are so irregular and far between that even during normal years pastoral nomads are not able to sell animals readily.

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