

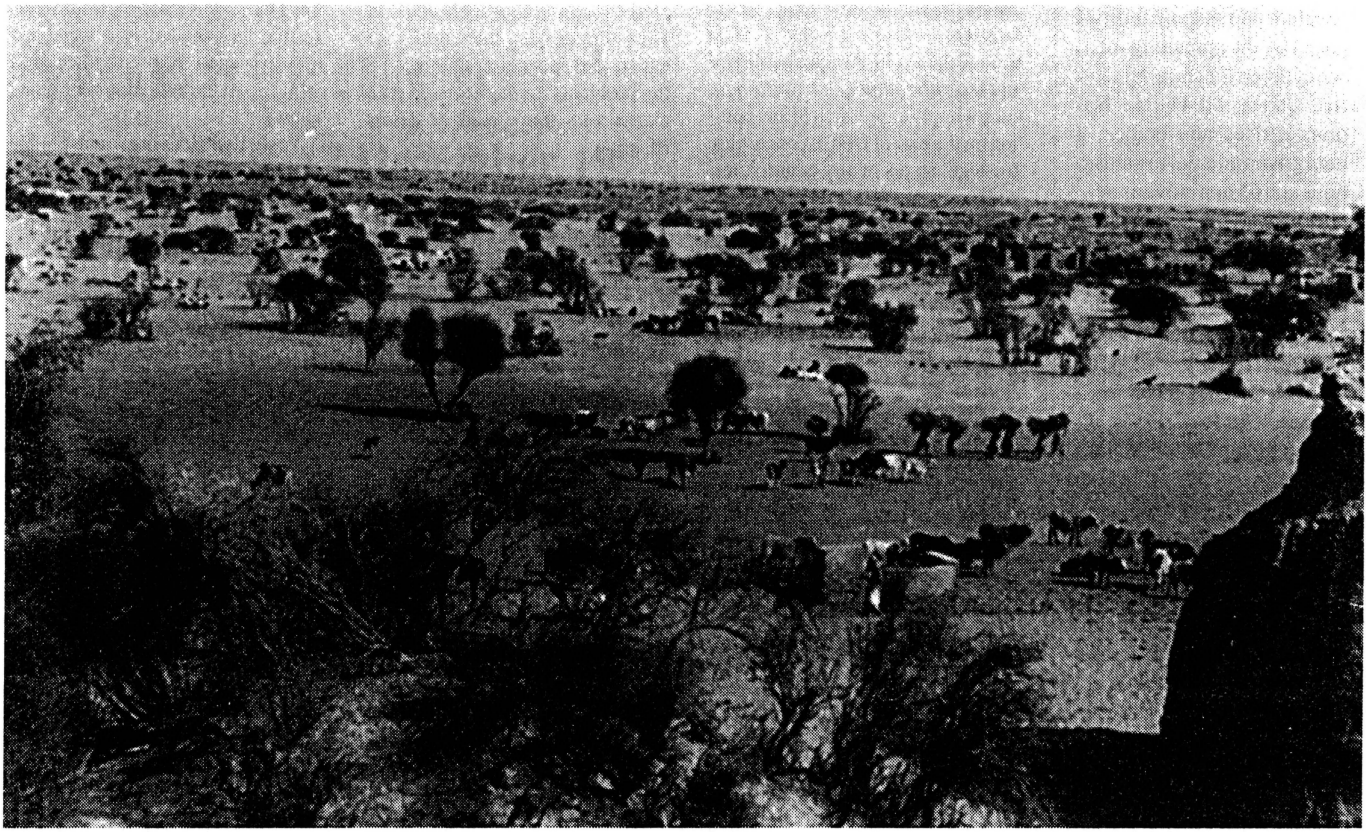
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A semi-permanent settlement inside the desert showing the impact of man and his animals. Cholistan Desert, Pakistan. Photo: M. Arshad.

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Cover: Exodus of Nomads during times of drought in the Cholistan Desert, Pakistan. Photo: M. Arshad.

The Deterioration of the Environment in Africa's Drylands and river Basins¹

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ASAL
deterioration
collaborative
research

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Abstract

⊕ The drylands in Africa are faced with serious environmental deterioration, largely due to rapidly increasing human and animal population pressure. This deterioration is being extended to the river basins within the drylands as people seek a living in these key production areas. This crisis has manifested itself in resource depletion and declining productivity. The development interventions in the drylands and river basins have not helped to alleviate the environmental crisis; in fact, they have aggravated the situation. The plight of millions of people in drylands calls for viable solutions. However, an understanding of the dimensions of the crisis is limited due to a lack of baseline data.

Introduction

⊕ This paper is primarily concerned with the broader issue of environmental degradation in Africa's drylands and river basins. The aim is to highlight the creation, nature, and factors accounting for this deterioration and also to identify some research activities that are needed to plan remedial action programmes to stem this crisis.

African Drylands

⊕ The drylands in Africa, including hyper-arid deserts comprise 1,959 million ha or 65 per cent of the continent and about one third of the world's drylands (UNEP, 1991/92). One third of these African drylands is hyper-arid deserts (672 million ha) which are uninhabited except in oases. The remaining two thirds or 1,278 million ha comprise arid, semi-arid and dry sub-humid areas. The latter is sometimes referred to by the acronym ASAL which denotes arid and semi-arid lands.

⊕ Some 400 million people (about two thirds of all Africans) live in ASAL. This population can be categorized into three broad groups on the basis of their agricultural practices and where they live:

- ⊕ The sedentary farming population found mainly in the river valleys;
- ⊕ The agro-pastoralists with, in some cases, significant rain-fed cultivation found beyond the riverine floodplains in the adjoining interfluvies and upland savannas;
- ⊕ The nomads, engaged almost exclusively with livestock keeping and who are found in areas further away from the rivers in the more arid parts of the ASAL.

⊕ In the ASAL, the dryland vegetation is a fundamental resource which protects and stabilizes the surface of the ground. This vegetation survives by adapting to water deficits in ways which are impor-

⊕ tant because it determines seasonal differences in the usefulness of the dryland pastures.

⊕ Under natural conditions and through appropriate strategies the dryland ecosystems maintain a balanced exchange of water and energy. The equilibrium is readily disturbed when the meagre vegetation is reduced by man's actions that expose the ground surface. When the surface has been loosened or disturbed, the top soil layer, with the best structure and the bulk of plant food, may be washed away or blown away in dust storms. All these changes mean a more hostile environment for plants. Vegetation will respond less well to rain, produce less biomass and many plants will die at an increasingly early stage of drought. Such stages are typical of desertification.

Mobile Animal Husbandry and River Basin Resources

⊕ In the ASAL good dry season pasturage is characterized not only by a solid fodder base but also by water resources of sufficient quantity and quality (Janzen 1991b). Favourable conditions of this kind are found particularly in the flood plains of the seasonal and permanent rivers which drain into the ASAL from the surrounding highlands and plateaux. This is not only true of the Senegal and Niger with

their tributaries, but also of the rivers flowing into Lake Chad, of the Nile and its tributaries, the Shabeelle, Juba and Tana in eastern Africa and of the Zambezi in southern Africa. As the main settlement areas of the sedentary agricultural population are also concentrated along these rivers, the river basins have been pivotal for the survival of the nomadic population during the dry season. For the nomadic activity of mobile animal husbandry in ASAL areas, river basins have traditionally fulfilled five major functions. First, they have been sources of perennial water, the main lifeline for man and livestock during the dry season. Second, the dry season pastures with their rich growth of grass provide a solid fodder base for animals. Third, these drainage basins are of great importance to the riparian woodlands which contain a major portion of the browse resources of the ASAL. Fourth, the harvest leftovers on the farmers' fields are an important additional source of fodder for the livestock. Fifth, and not least, the larger permanent settlements in the river basins are important market places where lively exchanges take place between settlers and nomads, who can stock up here with the goods they don't produce themselves and in return sell livestock products. (Janzen, 1991a).

The mutual economic and social exchange relationship with the settled elements of the population, and in particular, the unfettered access during the dry season to the water and fodder resources of the river valleys in the drylands have been of crucial importance for the survival of the nomad and his cattle. For example, a district-wide survey carried out in 1982-1984 in Turkana (Eco-systems Ltd. 1985) noted that:

In 23 per cent of the district, woody vegetation is virtually confined to riverine strips. These areas coincide with the driest eastern parts of Turkana and dry season grass cover was found to fall consistently along a gradient of increasing importance in the riverine vegetation. Despite the acute shortage of grass, areas of exclusively riverine woody vegetation supported over 30 per cent of all livestock in the district during the dry season, underlying their extreme importance as a dry season forage reserve.

The Turkana pastoralists realize the importance that this riverine vegetation plays in their lives. They have developed important traditional ownership rights to the extensive riverine forest and vegetation areas (called ekwar) together with traditional watering points. Along the 200 km length of the Turkwell river in Turkana district between 20,000 and 40,000 people depend on their ekwar for food for their livestock (Darkoh, 1990a).

Whereas, generally, the sedentary population in settlements in river basins in the wetter parts of the ASAL hardly practise animal husbandry because of the danger to the animals from the tsetse fly, the agro-pastoralists and particularly the nomads keep large herds. The importance of the mobile livestock economy in the African drylands lies in its dual role of safeguarding the future existence of the individual families that are dependent on livestock rearing and also of preserving the economic potential and ecological balance of the grazing grounds themselves (Janzen, 1991b).

Rapid Changes

Today, because of the rapid changes taking place, the African drylands are undergoing a crisis of unprecedented proportions and this crisis is extending to the river basins within them, with deleterious consequences on both the natural environment and the human condition. Due to the increasing human and livestock population and the effects of drought in these drylands, the available soil, forest, water and grazing resources are under stress. There is a strong wave of migration to the river basins from adjacent drought-hit drylands and from other highly populated and overpopulated humid zones.

Faced with recurrent droughts, inadequate and unreliable rainfall, a rapidly rising population, hunger and famine, African countries have turned to the river basins within their drylands for solutions to the problem of feeding their people, and obtaining foreign exchange. Research by FAO (1984, 1987) and other national and international organizations has revealed that these African river basins have a lot of unused agricultural potential which needs to be tapped. It is because of

this perceived potential that many large-scale mechanized schemes, irrigation projects and resettlement schemes have been initiated and implemented in these zones on the assumption that this underutilized potential can be brought into more productive utilization to solve the food and foreign exchange crisis. African river basins have attracted not only the attention of national governments but also of international capital and individual foreign and local investors (Salih 1992, Darkoh 1992b).

Conflicts

Many large-scale mechanized schemes, irrigation projects, resettlement schemes and big dam projects have taken away lands traditionally used by pastoralists during drought to alleviate pressure on the fragile dryland environment. The food security policies of African nations which see the key to agricultural development as the expansion of large scale projects rather than in improvement of the production conditions for mobile animal husbandry and smallholder farmers are contributing to the insecurity of the herders and small farming communities. The rights or needs of small scale producers and mobile livestock keepers in the river valleys are often given scant attention in development planning, a fact which can and has actually aggravated conflicts (Janzen, 1991a).

Because of their role as key production areas in the drylands, river basins are the source of various land use conflicts. Conflicts arise between the various production sectors, the major contenders being agriculture, livestock, wildlife and urban settlement. These conflicts arise because of the lack of coordinated land use policies for ASAL in several countries. Each sector views the key production areas as the best resource base for their development objectives. What follows is intense competition for the same areas and without a mechanism to prioritize competing uses, the resulting land use is not necessarily the most appropriate to the ecological conditions. In some countries such as Zimbabwe and Kenya, some of these key production areas have been gazetted as National Parks or Forest Reserves, thus resolving the

conflict in favour of wildlife or forest preservation. The recent controversy between Coastal Aquaculture Ltd. on the one hand and the East African Wildlife Society on the other over the use of the Tana Delta in Kenya (see for example, *Sunday Nation* 14/2/93: 14; *Standard* 24/2/93:4) is one example of the conflicting commercial and conservationist interests that characterize competition for river basin resources in African drylands. Other parts of river basins in the drylands of Africa have become farmland or urban centres have developed spontaneously or under government directives. This has caused the marginalization of the weakest sector - pastoralism.

Because of the endemic marginalization, the pastoralists have had little alternative but to utilise more intensively and at times over exploit the range and water resources available to them. The decrease in available pasturage with simultaneous increases in livestock results in overgrazing. The consequent overgrazing causes the destruction of vegetation, soil erosion, desertification etc. and thus the destabilization of the ecological balance in the river valleys and their adjoining upland savannas (Janzen, 1991a, b).

In some countries mobility of wildlife outside National Parks and Forest Reserves creates further conflicts with agriculture and pastoralism. Increased fencing of privatised farmland blocks movement corridors between wet season and dry season pastures and wildlife ranges. The disruption of migratory routes is contributing to situations where certain migrating species of wildlife have missed migration or migrated and not returned because their routes have been interfered with.

Mohamed Salih (1992) has noted the diverse socio-economic conflicts caused as a result of the polarised population interests over river basin resources - the inherent conflicts between different systems of land use (traditional vs modern), economic interests (landlords vs tenants) and even between the same subsectors (pastoralists vs peasants). Salih notes that the victims of drought and famine who seek refuge in river basins are often confronted by well-established old-tim-

ers and long standing landed property rights which in many cases exclude others. Recent calls for land reform by the progressive political elites have fallen on the deaf ears of the wealthy and powerful whose political and economic interests are threatened by those of the poor. River basins are examples of areas where such conflicts can transcend ecological considerations to trigger into major social and political disasters (Darkoh, 1992b). Witness, for example, the recent interstate conflicts between Senegal and Mauritania over the utilization of the resources of the Senegal basin.

The Consequences of Rapid Urbanization

The effects of uncontrolled population growth are often compounded by the consequences of rapid urbanization, which lead to widespread destruction of vegetation, soil loss and a decline in productivity of the land-base. All the countries of the Sudano-Sahelian regions of Africa have experienced strong migration to towns (UNSO, 1992: 10). Satellite data on both small and large urban centres in the drylands and river basins of Africa provide clear evidence of continued ecological degradation.

Urbanization itself is increasingly giving rise to other environmental problems. The cities of African drylands are growing so fast that water, waste and power facilities cannot keep up. Vast squatter communities are springing up in the peri-urban fringes of most of these cities. The health problems in such cities are truly environmental in origin. They result from a lack of clean water and sanitation, compounded by emissions from poorly maintained vehicles and uncontrolled industrial pollution. The lack of waste treatment regulations and control cannot be blamed wholly on migration and population growth. However, spontaneous unplanned and uncontrolled growth of the urban areas makes dealing with the problems that much more difficult.

The exploitation of resources around dryland towns is leading to deforestation, increased soil erosion and sand dune encroachment. The rapidly growing demand for charcoal among urban populations is leading to severe

desertification within a 40-50 km radius of many urban centres in eastern Africa and the Sahel. According to some reports, rising charcoal consumption in the Sudanese capital, Khartoum, has caused the area of charcoal production to shift to the south by an average of 15 - 20 kms per year. The charcoal supplies for Khartoum now come from as far away as 400 kms.

Commercialization of Nomadic Pastoralism

In recent years large sections of the nomadic livestock economy in the ASAL have experienced rapid commercialization. This has occurred mainly in the Kalahari region states such as Botswana (Cooke 1983, 1985) and the states of north east Africa, though, to a lesser extent, the same trend is also apparent in all the countries of the Sahel (Janzen, 1991a; Stern 1988; Reusse, 1982). The main causes are the explosive growth in the size of the urban population and an associated steady increase in the levels of meat consumption, coupled with the new opportunities for export now offered by more developed and affluent neighbouring countries. In the case of Somalia and Kenya, this means the Arab oil states. The combination of the dynamic new market forces and the reduced distances of pastoral migration, because of their more settled lifestyle and the economy, has initiated a process of structural change in the course of the past two decades throughout all the ASAL lands of Africa. In almost every country, this process is now gathering further momentum and increasing its scope, due in no small part to the State's direct and indirect development measures being offered to nomadic herdsmen to adopt a sedentary way of life. The most serious repercussion is the increased pressure on natural resources in many areas. As a result of the fragility of the traditional economic system in these countries, there has been severe ecological damage in a large number of places. The main causes are the reduced distances which livestock now roam and the heavy concentrations of men and animals around new, high capacity watering places (Janzen 1991a:8).

Civil Strife, Inequitable Financial Arrangements and Terms of Trade

The effects of population pressure, urbanisation and commercialization on the pastoral economy and land resources in African drylands are exacerbated by other factors such as civil strife which influences resource systems and availability of food, jeopardizing both environmental and human security; social and political systems which lead to unequal access to resources; inequitable financial arrangements and terms of trade which force dryland countries in Africa to overexploit their limited resources for survival; and developmental conflict between export-based cash crops and foreign exchange needs on the one side and basic food security for the poor on the other side (Darkoh, 1989: 53). Where cash-cropping is important, there is often a tendency for cash crops to take up the best land while subsistence farmers are forced on to marginal lands or lands unsuitable for cultivation and particularly vulnerable to desertification.

Ill-conceived Development Interventions

Another dimension of the crisis in African drylands arises from the hasty and ill-conceived developmental interventions that have been attempted in these zones. These interventions have several shortcomings. The models which have been adopted have been derived from the experience of European nations and the rest of the Western world. These models have frequently served primarily the interests of a few privileged Africans and the economic interests of the highly industrialized nations. The technology utilized is advanced, resulting in large-scale borrowing. In most cases hasty and ill-conceived aid projects are initiated in the drylands. Most of these projects have been designed by foreign consultants with little or no knowledge of the specific technology that is appropriate nor have

the skills, experience and knowledge that African people have about their environment been adequately addressed. Many of these projects have attempted to drastically alter the traditional systems and offer alternatives which are not competitive enough. Development interventions in African drylands have had a false start, hence their failure and the low positive impacts they have had on the recipient communities.

Many development assistance projects have been introduced in the drylands of Africa on the presumption that pastoralism is archaic and no longer a viable way of life. They have attempted to change the economic base by offering agriculture and fisheries as alternatives to pastoralism. Some of these projects have not been adequately thought through and have offered "quick fix" solutions such as the sinking of boreholes, planting maize, cotton and other cash crops. This intervening strategy of developing alternative economics has not been successful largely because the alternatives to pastoralism have not offered competitive solutions and also because they have worked to the detriment of the pastoralists as well as the natural environment (Darkoh, 1990, 1992a and c). An example of this is the attempt at sedentarization of the Turkana of northern Kenya. The Government of Kenya and donors have sunk colossal sums of money into the development of fisheries and irrigated farming in Turkana. Both the fisheries and irrigation projects were highly mechanized and some reports have calculated that about US\$ 65,000 per hectare have been invested in irrigation schemes at Katilu and at other smaller centres in Turkana (Darkoh 1990a).

The Turkana irrigation schemes have been a dismal failure. There is damning evidence of the adverse impact of the schemes on the lives of the local people involved. Helland (1987) notes: "there is now the sobering realization that after 20 years of development the population on the irrigation schemes have lower incomes, are worse fed and worse off than the pastoralists". Besides, the irrigation schemes have impeded access to river fronts and water points and have removed valuable browse and grazing resources from pastoral use. They have tended to

conflict with existing land use systems through competition for key areas and have taken lands necessary for survival by pastoralists in dry years (Darkoh 1990b).

In Somalia, the great Dhabaadheer drought of 1974 led the Somalia Government to establish permanent settlements for a large part of the nomadic population. More than 100,000 nomads previously from the northern part of the country who had lost their basic source of livelihood were relocated in 1975 with the help of Soviet aid by a process of "voluntary compulsion" into six settlement projects, three based on agriculture and three on fishing. Despite considerable effort on the part of the State, all these projects must now be classified as failures due to the hasty way in which they were implemented, the serious mistakes that occurred in the planning process, and most of all, the nomads' aversion to the State taking decisions for them and State control in general. Subsequently, there have been no new settlement projects proposed by the State (Janzen, 1991a: 13).

Elsewhere in African drylands, there have been attempts to channel development funds into livestock and range improvement projects. The major objective in this case has been an attempt to develop a strategy of resource exploitation that would be as efficient as traditional pastoralism and yet have a chance of coping adequately with the greatly changed conditions of the twentieth century African life. In Botswana, modern ranches with exclusive rights under leasehold tenure were introduced and they have been a failure as well due to, among other things, design and management problems and the fact that the majority of the tenants were absentee farmers who visited their herds occasionally (Hitchcock 1982). In the last two decades or so some US\$600 million in international development funds has been invested in modern ranches and other rangeland improvement projects in the drylands of Africa (Skoupy 1988: 32). To date, however, there is very little to show for this investment.

The repeated failures of development interventions point to the need for a careful reassessment of the potential of African drylands and their possible development prospects and strategies. As Kenya's

experience with development interventions has shown many of the ASAL countries in Africa cannot become areas of production which can prosper agriculturally beyond mere self-sufficiency of the population because they lack the natural resources to do so. One must be very clear about this fact.

Other Factors

It is estimated that Africa has 57 out of the 200 major river basins in the world. Twelve of these river basins are shared by four or more countries, with the Nile, for example, shared by ten African nations, Niger ten, Zambia eight and the Volta six (Timberlake), 1985: 197). African river basins have an international character and as such many countries cannot embark on large scale river basin projects without affecting the interests of other countries. The construction of dams for irrigation and hydro-power upstream usually impedes similar developments downstream, and as illustrated by the Khashm el Girba Dam in the Sudan could have had serious ecological repercussions on the area downstream (Abdel Ati, 1992). Some cases have shown that such projects may precipitate interstate conflicts as has happened between the Niger and Nigeria over the two dams on the river Lamido and river Maggiya, and between Nigeria and Cameroon over the Ladoo Dam on the Benue river (Salih, 1992: 16). River basin development is currently leading to undesirable negative effects. The Gerado Basin Project in Ethiopia reveals the effects that result from poor spatial planning and lack of an integrative framework in river basin development. Although the resettlement and land reform programme introduced by the Mengistu regime has had positive effects, spatial planning in the Geraldo River Basin has failed to view river basin development in a comprehensive and integrated framework, with the consequence that resettlement is creating ecological pressure in river valleys and increasing social and economic differentiation between the latter and the adjoining highland areas (Melasuo and Worku, 1992). This points to the need for an appropriate spatial policy that should deal with the diverse problems of river basin and adjoining

highland development as a comprehensive system of interdependencies.

Among the other conspicuous undesirable impacts of river basin schemes are water-borne diseases, diseases associated with excessive use of chemicals and fertilizers and their impact on health. It is also observed that resettlement schemes are expensive to maintain and that in most cases they do not recover their cost as fast as their cost-benefit may suggest. River damming has been shown to have negative impacts on riverine and/or floodplain forests. It has been observed that the construction of the Turkwel Dam in Kenya is likely to negatively affect the downstream forest and communities (Darkoh, 1990a). Evidence from the Bura irrigation scheme (Hughes, 1985, Johansson 1992) points to the deleterious effects resettlement is having on the forest resources in that part of the Tana basin because of the increasing demand for wood resources. The Bura scheme included a forestry component, but planting started five years after the first settlers had arrived at Bura. About 15,000 to 20,000 people moved in and began creating new pressures on the forest resources with the result that by 1987, they had removed an estimated 100,000m³ of wood.

To summarise, the harsh truth emerging out of this discussion is that African drylands are facing environmental deterioration and this deterioration is extending to the river basins, largely because of the rapidly increasing population, recurrent droughts, food shortages and the continuous movement of people from overpopulated high potential areas and adjoining drought-prone drylands. UNEP's latest (1991) assessment shows that 18 per cent of irrigated croplands, 61 per cent of rainfed croplands and 75 per cent of rangelands in the drylands of Africa are affected by desertification and land degradation of a moderate or high degree. Although there are no directly measured data on environmental deterioration and its social and economic consequences for the drylands as a whole, certain case studies and unpublished statistical data for some countries in the drylands indicate that the situation is getting worse rather than better. With the unprecedented and continuing movement

of people and competition for river basin resources, it is clear that we can no longer assume that the environmental crisis in African drylands will not repeat itself in one form or another in the river basins. The dilemma is that ecological degradation in the drylands has the potential of furthering ecological degradation in the river basins and enhancing hostilities between various groups of users, ranging from small producers to states and interstate conflicts. My fears are that if left unchecked, these conflicts and the degradation of river basins may become a source of local and regional instability in the future. This stark reality challenges all social and physical scientists to find ways and means of mitigating the crisis.

Research Fronts

It would appear that there is an urgent need for concerted and comprehensive research to investigate the multiple array of issues involved in the environmental deterioration of African drylands and river basins. The nature, magnitude and extent of environmental degradation needs to be accurately assessed. Empirical investigations are required to determine the specific agents involved, the areas affected and the magnitude of the damage caused and its impact on households and communities.

The pastoral subsistence economy is highly vulnerable to drought. Drought when it occurs creates a shortage of available moisture for plant growth and limits rangeland productivity. Since the use of supplementary feeds is limited, lack of nutritious forage results in high livestock mortality. As a result of livestock loss and total impoverishment of nomadic families, dependence on famine relief food by a population which traditionally has been self-reliant has increased. Research is needed into the effects of drought on pastoralism.

Another important area of research is the rehabilitation of degraded arid lands. Research and experiments like the one carried out by IPAL/KALRES in Kenya (UNESCO, 1988) need to be designed to study the phenomenon of rehabilitation of degraded lands around settlement modes and other areas in African drylands and river basins as well as finding an-

swers to several questions (Darkoh 1992a), such as:

- Is it possible to halt the process of desertification around these centres through management intervention?
- Is it possible for these degraded centres to be rehabilitated through full participation by the pastoralists and without the need for costly external inputs?
- What are the stages involved in this rehabilitation and how long does it take (secondary succession)?
- What are the costs and benefits of rehabilitation?
- What is the opportunity cost of capital in such ventures?
- To what extent can ecological principles be applied to degraded areas to restore ecological stability?
- What kind of managerial expertise is needed to achieve the objectives of restoration of degraded arid and semi-arid ecosystems?

Another theme worthy of investigation is the question of dryland pastoral resources, survival and coping strategies and development planning interventions. It would be useful to understand the dynamics of pastoral economies, resource distribution, ecological potentials/constraints, and the effects of development interventions on accessibility to pastoral resources on the communities concerned.

⊕ It is currently argued that the pastoralists have a wealth of indigenous technical knowledge (ITK) that can be tapped to enhance the development of these drylands. However, we need to know from research the nature of this ITK and at what point in ITK and pastoral economies outside intervention should come in. The failure of development interventions in Africa's drylands needs investigation.

African drylands are witnessing a rapid increase in human population and it is worth investigating the changing demographic patterns and their impact on resource utilization. Another issue is the changing land tenure and utilization systems and their effects on access to pastoral resources.

⊕ The socio-economic and land use conflicts and their effects on different sectors

of the economy, environment and population in river basins and possible ways of resolving these conflicts constitute another important area of social science research. Also important are the performance and impact of small and large scale development projects especially on small producers, pastoral and agro-pastoral communities.

⊕ Finally, it has been shown that deforestation is rampant in African drylands and river basins. There is a need to carry out forestry research into aspects such as natural forestry conservation and management. Research in this field can lead to a better understanding of ecological processes, of diversity and of economically useful lesser known wood and non-wood products. Also essential is research on silvicultural practices that will permit sustainable extraction of wood and wood products not otherwise preserved as protected areas. Such research should aim at developing strategies for protection and sustainable management of natural forests. Other areas of forestry that require research include trees in farming and pastoral systems, investigations into tree breeding and intensive forestry, improved utilization - including improved recovery and processing of traditional wood products, better use of wood in housing and improved cooking stoves and charcoal kilns (Buckman, 1990/3)

⊕ Research on policy and socio-economic analysis also needs to be undertaken inside as well as outside the forestry sector as it addresses questions that foster or hinder sound forestry practices. Examples of possible socio-economic and policy-related research concerned with forestry include studies of property rights and land tenure, culture and gender issues involved in conservation and land use, marketing and the effects of tariff and pricing policies and forest products, institutional capacities to carry forestry programmes and the legal and regulatory setting for forestry. Properly done, these studies could have a rapid and profound impacts on forestry. They can also provide an important avenue for forestry to link up with other land-use/economic and institutional sectors in the search for intersectoral solutions to problems affecting the sustainable utilization of tropical forest resources.

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Learning from the Nomads: Resource and Risk Management of Nomadic Pastoralists

The East-Pokot in Kenya

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Introduction

Nomadic pastoralists have been living in dryland areas all over the world for many years. These areas are mostly open grassland called savannas or steppes. The steppes are situated outside the tropics and cover a greater area than the tropical savannas. Typical to both dryland types is the semi-arid or arid climate which is characterized by low annual precipitation rates and by the occurrence of rainy and dry seasons during the year.

Nomadic pastoralism is prevalent in these drylands because nomads are able to adapt to changing environmental conditions through migration. This response to such situations is the most important traditional survival strategy in risky environments where dry years and droughts are common scourges. The nomads' mobility is indicative of the flexibility found in every aspect of their lives.

However, prior discussions about the causes of desertification in Africa's drylands used to focus on nomadic pastoralists. Nomads continue to be accused of destroying their own living space by unnecessary herd accumulation and uncontrolled range management. But why should a productive system which has proved to be efficient and economic for

centuries turn out to be irrational and useless today? The real problem lies in the changed conditions which decrease the efficiency of traditional strategies (Baum and Reckers 1992).

This article contributes concise arguments for traditional range management using the example of the East-Pokot in northwest Kenya. I spent eight months in the Pokot area to study their way of life, their environmental and economic behaviour, their migration circles as well as their ecological setting. My studies in 1989/1990 comprised vegetation assessments and interviews with elders and women as well as the mapping of diverse geographical aspects (water sources, soils, vegetation, climate etc.).

The results of my studies demonstrate the fact that people living traditional lives are indeed aware of their environment and adapt very well to the prevailing ecological conditions. Their behaviour is not irrational at all. In fact, they have a great interest in conserving their environment. And if the carrying capacity of their living space is overstressed the reason for that arises from externally caused changes (like an increase in population numbers, migration from high potential areas to low potential areas etc.).

The Pokot Area

The East-Pokot are nomadic pastoralists living in the northern part of the Rift Valley in Kenya. The area is a young

volcanic zone with fertile soils. While this fact has a bearing on the carrying capacity of the area, lack of water is the restrictive factor for the growth of vegetation (Reckers 1990). The semi-arid climate with a mean annual rainfall of about 600mm per year is characterized by highly variable rainfall patterns. The vegetation typical of the area is thorn-savanna with drought-resistant plants prevailing. (Kumu and Reckers 1990).

The East-Pokot live in an area comprising approximately 4,400 km². But they migrate much further afield in dry years and transgress borders to other pastoral areas. This has already resulted in ethnic conflicts (Bollig 1992).

Economy of Pastoralism

The East-Pokot's lifestyle is very traditional. Their most important income source and form of economy is extensive livestock breeding. In some places this is supplemented by a little rainfed agriculture or honey production. But these activities are of little significance when compared with animal production.

Their production basis is the natural pasture which can be divided into two quite differently composed rangeland areas: the rainy-season grazing grounds in the lowlands (800-1000m above sea level) and the dry-season pastures of the highlands (1000-2500m above sea level). (Reckers 1991).

⊕ Their basis for subsistence is the herd which is composed of cattle, goats, sheep, donkeys and sometimes camels. The average Pokot household owns 15 to 30 head of cattle, 30 to 50 goats and sheep and 2 to 3 camels (if any). The animals are not only very important for maintaining their social network (e.g. bride-price, livestock presents, livestock loans and ritual slaughter for festive occasions). ⊕ Livestock also contributes to their relative economical independence. For a few years now livestock markets have been set up in the region where herd owners can sell livestock.

The East-Pokot rely on the herds' products. Milk plays the most important role and very often it is the only food during the rainy season. During the dry season the milk production especially of the cattle decreases considerably. At this time the main milk sources are the camels and goats. Maize which is exchanged for livestock before the dry season now represents the most important food, sometimes complemented by goats' meat. ⊕ Cattle and camels are rarely slaughtered. Normally they only leave the household for the payment of the bride price, livestock offerings to relatives or as sacrifices for ceremonies or rituals (Bollig and Reckers 1991).

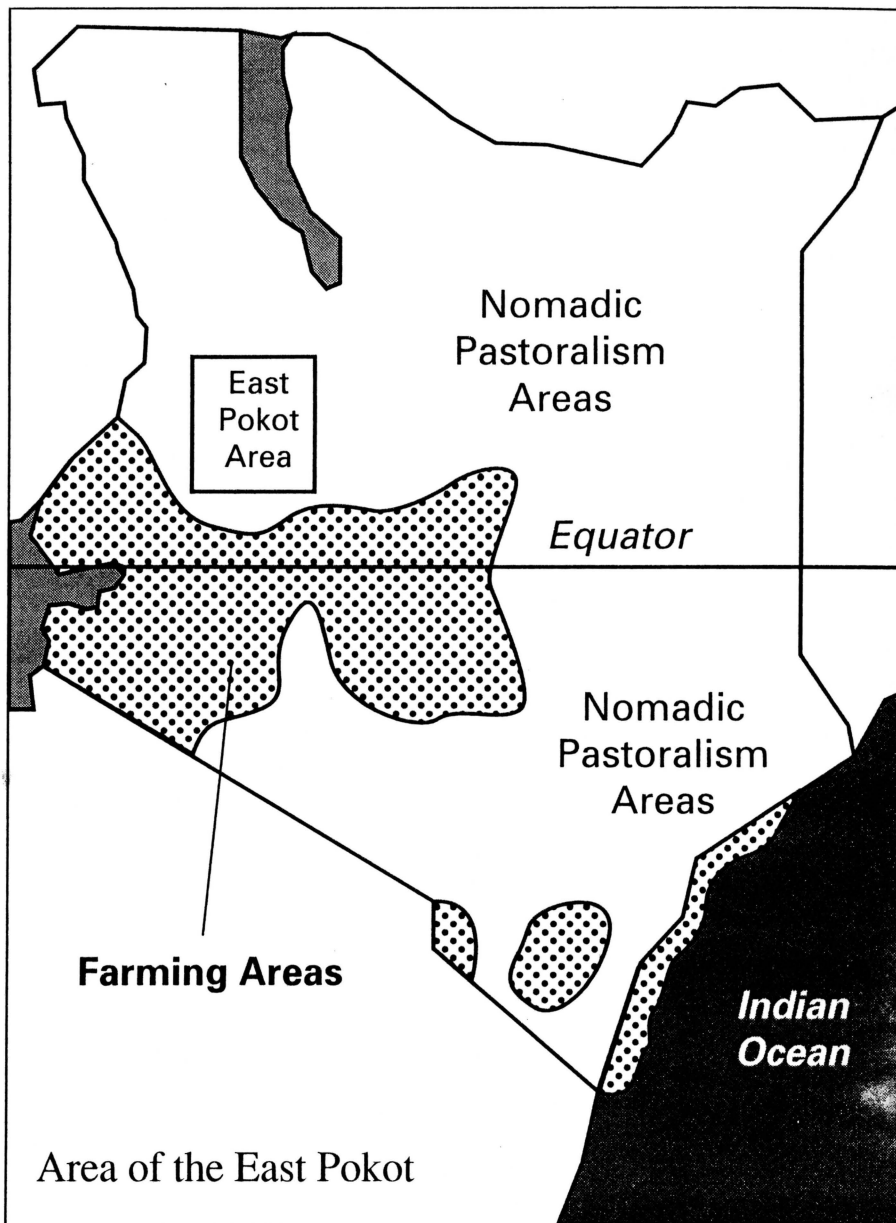
Mobility as survival strategy

The following are some survival strategies practised by the East-Pokot. (compare Reckers 1992b & 1993b).

Herd Accumulation

In connection with herd accumulation the term "cattle complex" (Herskovits 1926) is often applied to explain the alleged over large herds. However, from the point of view of a nomad it is understandable and reasonable to strive for a huge herd. ⊕ The nomad's herd is more than capital. Far more important is its role as "risk capital" when it is used in times of need like droughts or epidemics of livestock diseases which can decrease the herd size considerably in a short time.

⊕ Despite the prevailing opinion that traditional herd management leads to over-aged herds this cannot be said of the East-



Pokot. Bulls run with the herd for no longer than six years, cows only as long as they are reproductive.

Herd Diversity

The diversity of herd stocks allows a more efficient use of the rangelands and facilitates a more reliable supply of food. ⊕ Mixed stock do not compete over fodder. While cattle mainly depend on grass, camels and goats prefer bushes especially the thorny acacias which are available all the year round in the lowlands in contrast to grasses.

⊕ Other advantages are the diverse attributes of the animals: camels and goats for example are more drought resistant,

than cattle and give milk even in dry periods. The long lactation period of camels translates into a year long milk source. ⊕ A cow on the other hand can produce ten times more milk on good grazing grounds than a goat. Another advantage of cattle compared with camels is their higher reproduction rate. While camels can have calves every two years cattle are able to reproduce every year, and goats twice a year. Every species has its advantages and disadvantages. A decisive survival factor of diversified herd stocks is the difference in their food and water demands (Reckers 1991a).

⊕ The goat is of particular importance. Despite the fact that goats are accused of being the main damaging factor for the

ecology of drylands they can save a nomadic family from economic ruin when droughts or epidemics have caused drastic cattle losses. Their faster reproduction rates relative to camels and cattle permit quick cash sales or livestock exchanges which can be used to acquire large stock, thus rehabilitating the cattle herd (Schwartz 1986).

That is why despite the cultural preference for cattle, goats and sheep are numerically more important.

Herd Dispersion

Dispersion means the temporary or long-term scattering of herd stocks. The system of "cattle friendships" facilitates a permanent exchange of parts of the herd through livestock loans. Livestock loans strengthen relationships among nomadic pastoralists and insure their social security system. The East-Pokot disperse their herds among herd owners who live great distances from each other. Another form of dispersion is the distribution of parts of the herd to different dry season rangelands.

All these different forms of dispersion reduce the risk of losing the whole herd at any one time through droughts, epidemics or cattle raids, e.g. by the neighboring and traditionally hostile Turkana nomads (Bollig 1992).

Seasonal Mobility

The rangelands of the East-Pokot are communal. The grazing system is characterized by seasonal migration of cattle herds to the dry-season grazing grounds. During the dry period from October to April the young herdsmen guide their herds to the grasslands in the highlands which are conserved for the dry-season. The herdsmen aged 12 to 16 years are extensively mobile. At the end of the dry season they move their cattle camp every five days. Every two days the cattle herd has to walk to a water site in the lowlands. A few weeks after the first rains the herds return home to the stationary manyattas (family villages) which are situated in the lowlands. The other livestock species do not need to migrate to the dry season rangelands because their fodder demands are less than those of cattle. The grazing areas in the highlands are restricted and



Cattle herding close to a dam. Photo: Heinz Müller, outtec.

preserved during the whole rainy season to let the grass regenerate (Reckers 1993a).

The seasonal mobility is a form of adaptivity to harmonize the fodder demands of the different livestock species.

Drought-Related Mobility

The comparison between the migration patterns of the East-Pokot under different climatic conditions shows further adaptive strategies:

- With increasing dryness the migration circles get longer.
- With increasing dryness several grazing areas have to be visited or the herd will be divided into smaller groups.
- The longer the drought the longer the herdsmen stay on the dry-season rangelands, sometimes up to two years. In exceptional cases the small stock accompanies the cattle on their migration to the dry-season grazing grounds, when there is not enough fodder left on the lowland pastures.

Daily Mobility

Every morning the herd owner decides upon a new route for the daily livestock migration. The migration cycle of cattle is longer than the one for the goat and sheep herds. The permanent change of

grazing routes is the most ecologically sustainable land use pattern.

Household Shifting

Total household shifting which took place every two to three months in the early part of this century (Beech 1911) are nowadays undertaken about every five years. The reasons are - inter alia - mostly the reduction of rangeland quality or the availability of water in the vicinity of the manyatta.

Range Management

The range management of nomadic pastoralists is closely related to environmental management because their environment consists mainly of natural pastures. Certain measures serve as resource control and intentional environment management (Reckers 1992a and 1992b, Schwartz 1986, Walther 1987).

Pastoralists have often been accused of mismanaging their environment. This reproach can be disproved.

Range management among the East-Pokot means the regulation of rangeland use on a regional and neighboring level. The determination of rainy-season and dry-season grazing grounds as well as of those rangelands limited to certain animals of a herd (e.g. lactating cows and calves) are the most important rules in this regard. In times of need the migration

routes are expanded respectively. This kind of strategy strives to ensure an even use of pastures. The dry season pastures get time to regenerate. Regulated grazing prevents land degradation ("desertification") and excessive re-growth of bushes ("green desertification") which makes pastures impassable (Conant 1982).

Bush control as a means of conserving grazing grounds may also be a result of regulated burning. But this occurs rarely nowadays due to the official prohibition and due to lack of grass. The reasons for burning (with positive effect) are elimination of bushes, promotion of fresh grass and the fight against tse-tse flies and ticks.

The elders of each community are the controlling institution concerning all range management affairs. Under a large shady tree, the daily meeting place of the elders ("kokwo"), all important communal grazing regulations are decided. Certain "unwritten" rules are valid for the whole East-Pokot area, e.g. the restriction to migrate to the dry-season grazing grounds during the rainy-season (Reckers 1992a & 1993a).

Water Management

Water resource control is also a measure to conserve an important resource. Restriction on water use is stricter when water availability is scarce. In general, the East-Pokot do not prohibit the use of water from dams, rivers, springs or wells. They even tolerate the use of their dams by outsiders like the Tugen, the Chamus or Turkana as long as they comply with certain rules: they first have to ask the elders for permission and finally sacrifice an oxen which will be commonly consumed. Sometimes an additional contribution is due.

Under certain circumstances the East-Pokot lay down a temporary restriction on the use of dams or a restriction specific to certain livestock species. If there are other water sources like rivers nearby, some communities will close their dams. In case of water scarcity towards the end of the dry season (often in January or February) the use of dams is limited to small stock and family members. The cattle and camels are moved to distant water sources (Reckers 1992a & 1993a).

Both rules are preventative measures to extend the time of sufficient water availability. Again the council of elders decides all the relevant rules in the kokwo.

Plant Use

The East-Pokot possess an immense plant knowledge. Every child is able to term and identify plants and knows their value in terms of human and animal consumption. The different possibilities of plant usage in this area are described in detail in Timberlake (1987).

In times of need and on the dry season grazing grounds this knowledge on plant usage is used. Certain leaves are collected as a substitute for tea, other plants serve as vegetables. Fruits of wild plants are also part of the diet but they are rarely collected systematically.

The East-Pokot know a lot of medicinal plants. Some of them are used for veterinary purposes.

Wood is selected specifically for a certain purpose. The East-Pokot, for example, prefer the hard wood of the *Boscia coriacea* or the termite resistant wood of the *Terminalia spinosa* for the main post of their huts. For the hut frame they use the branches of different *Acacia* species and certain grass species for thatching. The fence of a *kraal* consists of densely arranged *Acacia* bushes. Firewood - preferably the prevailing *Acacia* wood - is collected not cut (Reckers 1992a).

Livestock Marketing

The seasonality of the life of the East-Pokot is reflected in livestock marketing. During the dry season the supply of livestock on the market increases. The increased supply and the simultaneously shrinking demand lead to very low prices.

This market response has a serious effect in times of drought. The drier the season the weaker and more prone to disease the livestock will be. Purchasers are hardly interested in livestock of such low quality, perhaps only for a dumping price. Exactly at the moment when the pastoralists' willingness to sell is highest the market is overstocked with low quality livestock and selling livestock becomes barely profitable. However, the East-Pokot sell more livestock during the

dry season than during the wet season. During the dry season the sale of hides and skins increases as well because more meat is consumed as a compensation for the sparse milk supply and more debilitated animals have to be slaughtered (Reckers 1992a).

Another reason for forced sale are epidemics among livestock. An outbreak of an epidemic, causing a sudden oversupply of a certain species, can adversely affect livestock prices, especially when it occurs during the dry season.

The Present Crisis of the Nomads

The enumeration of all the survival strategies might not be complete but at least it gives us a rough idea of how the East-Pokot cope with the risks of their environment. Their strategies are in the first place determined by the climate. The strategies are in harmony with the yearly cycle of rainy and dry seasons and are modified when needed: e.g. by expansion or shifting. In this way menacing situations are controlled.

Up to now the mechanisms to manage crises and minimize risks have functioned reliably. But in the recent past the East-Pokots' traditional survival strategies have become less effective which they were made to realize for the first time during the last extreme drought in 1984. They suffered from a serious shortage of food and livestock losses were high. Since then the problem of over-grazed areas has become apparent and shifting to grazing areas adjacent to their territory becomes more and more impossible due to the expansion of agricultural activities in neighbouring districts. Only towards West Pokot district are there possibilities of expanding migration routes without fear of violent conflicts. As the East and West Pokot belong to the same ethnic group the West Pokot tolerate the presence of the East-Pokot during times of need.

Traditional nomadic pastoralism has apparently reached its limit. The difficulties, however, are neither due to the traditional nomadic system itself nor to environmental changes or climatic fluctuations. The problems have been caused by external factors which the East-



Women talk under a shady tree in a manyatta. Photo: Heinz Müller, outtec.

Pokot did not cause and cannot influence.

⊕ The biggest problem is possibly population pressure from the southern regions and central regions into the semi-arid areas of Kenya. This causes land scarcity followed by over-exploitation and degradation of the natural resources. Consequently, the traditional strategies cannot be applied to the fullest and necessary extent. For example, a flexible expansion of grazing grounds is no longer possible. A further external factor is the national economy of Kenya. It does not offer much incentive for the nomads to sell livestock and therefore fails to halt the process of their economic marginalization. Additionally, in connection with the overall changes a transformation of the socio-cultural structure and values among the East-Pokot is inevitable. As soon as the present hierarchical social structure according to age-sets will adjust itself more to the principle of power and education, the council of elders, for instance, will lose its traditional controlling function.

Measures for the Future

1. The rangeland scarcity resulting from population pressure urgently demands measures to improve rangeland productivity. This means optimizing and enhancing the economic use of a particular area with respect to the ecological balance. Fixing barriers across the upper reaches of rivers to slow down run-off could be an efficient water catchment measure. Dam sites should be well discussed with elders and dams in dry season grazing areas should be avoided because they promote overgrazing. At the same time a sufficiently large area of communal rangeland should be guaranteed and, if necessary, an institutional frame established accordingly. Organizations are challenged to tackle the issue of communal land tenure with policy makers.
2. To reinforce the nomadic system

it is necessary to generally improve the supply service in the area. For instance, during the dry season, a reliable supply of grain should be guaranteed. The veterinary service must be intensified. Through the establishment of a functional market system under efficient management and incentives for the sale of livestock a full integration of the nomads into the national economy could take place.

3. If development aid would encourage and support the position of the nomadic pastoralists the socio-economic collapse accompanied by its negative consequences of unemployment and impoverishment could be halted. In this context more participation of the nomads in the planning and implementation process of projects would be desirable. Education policy in this respect needs a change and curricula for schools in pastoral areas should be ad-

justed to nomads' needs, e.g. supplemented by lessons on rangeland ecology and veterinary sciences. As long as there are no alternatives to the nomadic system in a semi-arid environment, the development agencies are required to reinvest in the existing traditional nomadic system. But this effort should not just support the romantic imagination of the traditional living nomads. Whether and how an investment into the traditional system is desirable or not very much depends on how viable the system is without any external input. One of the most important questions in this respect is: how seriously do the pastoralists take their adaptive strategies, and last but not least are they themselves willing to retain this lifestyle?

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