

Land Degradation and Soil Conservation in Eastern and Southern Africa: A Research Agenda

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The Problem

Environmental degradation is rampant in the economically and socially strained countries of Sub-Saharan Africa. Some of the critical environmental problems are: deforestation, soil erosion, aridization and loss of genetic diversity of flora and fauna. These problems are not isolated but interlinked in a process known as *desertification*. For example, reduction of vegetation cover as a result of unsustainable exploitation of the land can give rise to loss of biological productivity and exposure of the soil surface to accelerated incidences of water and wind erosion, leading to reduction in soil organic matter and nutrient content. The resulting loss of habitats undermines the very basis of agricultural production and any prospects of developing improved varieties of crops and livestock. Degradation of the vegetation can also affect the climate, locally, regionally and, most probably, also globally.

The widespread environmental degradation in Africa has been largely attributed to the absence of environmental awareness or consciousness among the poor in Africa (Plumpwood and Routley, 1982). How-

ever, our contention is that the foremost causes are human population pressure and outside influences (eg, modernisation) leading to over-exploitation and poor management of resources (forests, soil, water, atmosphere, etc) through over-cultivation, overgrazing, deforestation, poor-irrigation practices, pollution, etc.

Human and livestock pressure often plays a role when the numbers of people and animals surpass sustainable levels in fragile arid, semi-arid and sub-humid ecosystems. These are often exacerbated by other factors such as social and political systems which lead to unequal access to resources; inequitable financial arrangements and terms of trade which force some developing country populations to over-exploit their land merely to survive; developmental conflict between export-based cashcrops and foreign exchange needs on the one hand, and basic food security for the poor on the other. Where cash cropping is important, there is often a tendency for cash crops to take up the best land while subsistence farmers are forced into marginal lands or land unsuitable for cultivation and particularly vulnerable to desertification.

The consequences of poor resources management manifest themselves differently in different countries. But whatever the variations, the impact will eventually be measured in economic and social terms (Brown, 1988, pp.3). For example, demand for household fuel poses a clear threat to economic development in several coun-

tries. It has led to denuded forests near rural villages and round towns and cities. With the loss of tree cover comes increased erosion and lower crop yields. Where dried dung is used in place of scarce fuelwood, the soil is robbed of its natural replenishment. The resulting loss of soil fertility reduces harvests which in turn means poverty for the dependent population.

Fuelwood shortages affect some 25 countries in Sub-Saharan Africa. Commercial lumbering, land clearing to make way for food farms and cattle farms, the peasant use of the forest for fuel and fodder all threaten the remaining natural forest which, in tropical climates, is highly susceptible to damage from human activities. Each year, run off from over 30 million hectares of degraded upland watersheds contributes to soil erosion, declines in agricultural productivity, downstream silting and flooding and destruction of fishing grounds.

For some countries with mounting oil import bills, hydroelectricity is the most promising means of producing power for industrial and residential uses and often water for irrigation as well. But the environmental health and other costs of hydroelectric dams can be high. Accelerated siltation behind dams due to deforestation and soil erosion is the most expensive kind of environmental neglect. If a reservoir designed to function for 80 years silts up in 25, economic calculations of costs and benefits are thrown off completely. The loss of electric output alone runs into billions of dollars.

Nor is siltation the only cost. In 1987, the Food and Agriculture Organization (FAO) estimated that, on a global scale, 20 per cent of irrigated lands are waterlogged, or excessively saline, or both, which means additional costs in lowered agricultural productivity. Health costs for treating malaria and schistosomiasis often climb drastically after dam construction because the mosquitoes and snails that carry these diseases proliferate in the standing waters of irrigation reservoirs and canals. As much at risk as health are the harder to quantify losses associated with species extinction and the dislocation of people whose lands are flooded.

Desertification means a deteriorating spiral of declining production, increasing poverty and diminished potential productivity (Darkoh, 1980, 1989). It exacerbates poverty which in turn exacerbates desertification because, as the pressure increases, the inhabitants are forced to intensify over-exploitation of their land just to survive. In doing so, they cause further diminution of its productivity and so the cycle continues.

The social cost of environmental degradation is best illustrated by the experience in the Ethiopian Highlands and all across the Sahel: starvation, death and the forced exodus of millions of environmental refugees moving in a desperate search for survival to urban areas or to other less degraded lands elsewhere.

The human cost of environmental degradation is immense; entire societies and cultures are threatened. The pastoralists are a case in point. For most of them the loss of their livelihood means a life in relief camps or in the shanty towns mushrooming around the major cities in Sub-Saharan Africa.

Our Common Future, the report of the World Commission on Environment and Development (WCED, 1987), underlines the connection between poverty, international policy and environmental degradation. The report emphasises that "poverty itself pollutes the environment... Those who are poor and hungry will often destroy their immediate environment in order to survive" (WCED, 1987, pp 28). They will cut forests, overgraze grasslands, overuse marginal land, and crowd into congested cities. The cumulative effect of these "changes is so far reaching as to make poverty itself a major global scourge" (WCED, *ibid*).

Nowhere is this connection more graphically illustrated than among the famine-ravaged people of Sub-Saharan Africa who have become a familiar sight on European and American television screens in recent years. To quote again from *Our Common Future*, their plight:

...illustrates the ways in which economics and ecology can interact destructively and trip into disaster. Triggered by drought, its real causes lie deeper. They are found in part in national policies that have too little attention, too late, to the needs of small-holder agriculture and to the threats posed by rapidly rising populations. Their roots extend also to a global economic system that takes more out of a poor continent than it puts in. Debts they cannot pay force African nations relying on commodity sales to overuse their fragile soils, thus turning good land to desert. Trade barriers in the wealthy nations... and in many developing ones... make it hard for Africans to sell their goods for reasonable returns, putting yet more pressure on ecological systems. Aid from donor nations has not only been inadequate in scale, but too often has reflected the priorities of the nations giving the aid, rather than the needs of the recipients. (WCED, 1977, pp 6)

Most African countries are trapped in production structures and political systems which make it difficult to envisage real progress for the wider population in the short-term. Political and social conditions in these countries have not been conducive to open debate about environmental problems, nor the establishment of efficient public bodies to deal with the issues. Lack of knowledge, resources and administrative capacity have all contributed to hinder the emergence of an appropriate and effective administration and coordination of environmental matters.

Objectives

Research on land degradation and soil conservation should have as its fundamental aim the promotion of sustainable utilization of resources in the Eastern and Southern African countries. It should enable scholars in the region to study the multifaceted causes of environmental degradation and find solutions to the problem. As a prerequisite to sustainable use of natural resources in these countries, local researchers

must be able to analyse and assess their countries' resources realistically. There is need, therefore, to support endeavours to upgrade environmental considerations, as a pre-condition to embarking on sustainable development.

Most environmental problems are fundamentally socio-economic and political in nature and so research on land degradation and soil conservation should be open to socio-economic studies and special attention given to interdisciplinary research.

Conceptual Framework and Possible Themes for Research

The key issues dealt with in research on environmental degradation can be formulated in general terms as degradation soils, vegetation, water regimes, atmosphere and other natural resources, in which the biological and physical processes are accelerated as a result of human intervention. The overriding problems can also be postulated as conflicts arising from competition for resource utilization between the various production sectors (eg, agriculture, livestock, wildlife, human settlement, etc).

Although science and technology have the potential to improve people's lives, many development programmes have created problems more serious than the original conditions. Third world development efforts typically have begun at the higher levels of government, with the intention that benefits will "trickle down" but unfortunately, this approach has not provided for those whose needs are most urgent. In many such projects, traditional ways of subsistence are slighted, while the programme dictates creation of a western-style, cash-crop economy (McKiernan, 1990, pp 10-12). Precariously committed to a limited number of crops, third world countries become over-dependent on expensive seed, fertilizers, pesticides and technology, and susceptible to fluctuations in the global market.

Such "growth without development" has meant the exploitation of human and natural resources for the primary benefit of outside interests. Many a previous effort to enhance African agriculture have been far from successful even as they have caused environmental damage to entire landscapes



Human settlements along footslopes which have led to the vegetation degradation shown in the foreground, Machakos District, Kenya. Photo: M.B.K. Darkoh.

and displaced local production systems. A case in point is the extension of the monoculture of cotton and groundnuts in the Sahel.

To correct the ingrained problems of poverty and environmental degradation in Africa will not be easy. It will require a new approach to development, one that is based on policies that sustain and expand the environmental resource base. We believe nothing short of sustainable development can relieve the swelling tide of poverty that is taking over much of our continent today.

The term *sustainable development* has been so often used by different people to mean different things that it has become, in the words of one critic, an "intellectual oxymoron" (Lele, 1991, pp 608). The US Agency for International Development (USAID) tends to use it to mean a project can be sustained financially after foreign assistance has been terminated (Brown, 1988, pp 12). Most environmentalists use

the phrase *sustainable development* with "ecologically sustainable or environmentally sound" (Tolba, 1984). The World Commission on Environment and Development (1987, pp 43) defines *sustainable development* as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

By *sustainable development*, we mean development that can operate within the constraints of local ecosystems; and development that help people live in balance with nature. By analogy, therefore, by *sustainable national development* we mean national development strategies that are ecologically sustainable; strategies that take into consideration the existing ecological conditions necessary to support human life at a specified level of well-being through future generations. We envisage in this concept of *sustainable development* a form of societal change that, in addition to tradi-

tional objectives, has the objective or constraint of ecological sustainability. In this ever-changing world, the specific forms of and priorities among objectives, and the requirements for achieving sustainability - as it is understood at each stage - would remain a fundamental concern.

If development is to succeed over the long-term it must not only be ecologically sustainable, it must be for people and by people. It is therefore important that any suggested strategies build on the principle that environmental issues should be considered from the developing countries' viewpoint. As the need for economic development and an increasing population make intensive production necessary, existing production methods and the local population's understanding of environmental realities are sources of valuable information which should be used to formulate a sustainable development strategy.

Some of the significant issues that can

be dealt with by researchers are mentioned below:

General

- * Degradation of natural resources
- * Degradation of key production areas in arid and semi-arid environments
- * Changes in land use and resource utilization
- * Modelling the elements of land degradation
- * Land use conflicts
- * The dynamics and impact of population movement and resettlement on the carrying capacity of arid and semi-arid environments
- * Socio-economic and institutional causes of desertification and land degradation
- * Endangered species: plants and wildlife
- * The connection between poverty and environmental degradation
- * The correlation between economic growth and environmental sustainability
- * Development, sustainability and local peoples' participation
- * Traditional resource management systems and their potential for environmental conservation and sustainable utilization
- * Rehabilitation of degraded ecosystems
- * Land tenure systems and environmental conservation
- * Public policy and environmental conservation
- * Environmental education and sustainable development
- * The extension challenge in dry land development
- * Drought relief and rehabilitation
- * Food security
- * Population expansion and environmental degradation
- * Population control and resource planning
- * Watershed management and conservation
- * Risk assessment of environmental hazards
- * Biodiversity
- * Pastoralism and environmental management

- * Land management planning
- * Wildlife conservation
- * Tourism and sustainable wildlife utilisation and conservation
- * Pests and pest control
- * Toxic terrorism

Forests

- * Socio-economic and institutional factors behind deforestation
- * Environmental impact of commercial lumbering and land clearance for agriculture and ranching
- * Alternatives to shifting cultivation and land rotation agriculture
- * Afforestation
- * Agroforestry
- * Biodiversity
- * Biotechnology

Pastures

- * Pastoralism and environmental issues
- * Displacement and marginalisation of pastoralism
- * Prospects for land privatization and resource management in arid and semi-arid lands
- * Intervention in traditional pastoralist societies
- * Risk spreading and pastoralism
- * Sedentarization and environmental issues
- * Rehabilitation of dry-season grazing areas

Soils

- * Soil erosion
- * Biological soil conservation
- * Ecological effects of agrochemicals, eg. fertilizers and pesticides

Energy

- * The fuelwood crisis
- * Development of alternative and renewable energy sources
- * Conservation through cooking technology
- * Investment in forestry and agroforestry
- * Multipurpose fodder/fuel projects
- * Biomass residue utilization
- * Fuel substitution

Water

- * Water pollution
- * Water supply, health and diseases

- * Ecological impact of dam construction
- * Importance of water resources, settlement of people and siting of production
- * Irrigation and the environmental challenge
- * Water harvesting

Human Settlement

- * Major environmental issues stemming from overpopulation and rapid urbanization
- * Industrial pollution
- * Air and noise pollution
- * Safe disposal of sanitary and industrial wastes

Wildlife

- * Ecological factors contributing to extinction of wildlife
- * The impact of commercial, sport and subsistence hunting on wildlife
- * Wildlife dispersal corridor conflicts
- * Tourism and environmental issues
- * Integrated species management
- * Wildlife conservation policies

This list of suggested topics is by no means complete. These examples have been cited here just to illustrate the wide range of environmental issues that research can tackle in the region. Apart from topical issues, research can also focus on area-specific and regional studies that address environmental issues.

Literary Review: Land Degradation and Desertification

There is a growing body of general literature on the problems of land degradation and especially desertification. UNEP has recently published a *World Desertification Bibliography* (UNEP, 1991). However, with specific regard to Africa, the only comprehensive bibliographic documentation on environmental degradation or desertification was compiled a decade ago by Gunter Leng (1982). There is currently no comprehensive bibliography on land degradation or desertification in the Eastern and Southern African region. Neither are there adequate studies of these problems. While a few countries such as Tanzania, Zimbabwe and Botswana have ben-



Loss of tree cover leading to soil erosion and gulleys in the Dodoma district of Tanzania. Photo: M.B.K. Darkoh.

elited from fairly comprehensive studies of certain aspects of the problem, the majority of countries in the Eastern and Southern African region have not.

Although a distinction can be made between the terms *land degradation* and *desertification*, for the purpose of this brief review we will use both terms interchangeably. The term *desertification* is a fairly recent addition to scientific vocabulary, designating "a process of ecological degradation in arid, semi-arid and dry sub-humid lands by which the productivity of the land is lost or substantially diminished (Tolba, 1979, pp 6). UNEP's current definition of *desertification* is "land degradation in arid, semi-arid and dry sub-humid areas resulting mainly from adverse human impact" (UNEP, 1992, pp 1-2). The term was used for the first time by Aubreville in 1949 (Paylore and Mabbutt 1980, pp iii), but it has been widely adopted and applied only during and after the 1968-73 drought disaster in the Sahelian region of Sub-Saharan Africa.

The tragic events in the Sahel of Africa gained the attention not only of the media all over the world but also of scientists who carried out large number of scientific investigations of the phenomenon. The problem of ecological degradation was soon perceived as a serious threat in many parts of the earth and, in response, in 1977 the UN convened a conference on desertification in Nairobi, Kenya. For this meeting scientific knowledge of the problem from many countries was gathered and reviewed. At the conference various papers and documents were presented and discussed and a Plan of Action to Combat Desertification (PACD) was drawn up and adopted.

The conference had a clarifying effect: since then, this definition of *desertification* as "land degradation resulting primarily from adverse human impact" has been generally accepted among scientists. It was agreed that there was little evidence to support the view that desertification results from a long-term climatic change. Instead,

man's destructive activities - his bad management of land resources through overcultivation, overgrazing, deforestation, wood cutting, etc - were recognised as the main causal elements in the process of desertification. Consequently a solution to the problem was expected to come mainly from "an improved and ecologically adapted management of soil, water and vegetation" (Rapp and Hellden, 1979, pp 115). But in spite of the rather optimistic estimations that "the main bulk of scientific knowledge and technological means necessary for combating desertification and developing the resources of arid lands are available" (Tolba, 1979, pp 21), the practical results so far have been rather poor. This unsatisfactory situation must be accounted for. Could it be that the knowledge of the problem and the solutions derived from it are still inadequate?

This is the view held by us (Darkoh, 1989) with regard to the Southern African Region. Similar views have also been

expressed by Baker (1981) on Kenya. We have noted (Darkoh 1989, pp 48) that in recent research on and discussion of desertification or land degradation, there has been a general tendency to attribute the causes "simplistically or mechanistically" to either physical factors such as soil erosion, sedimentation, salinization and alkalinization, or human factors such as overcultivation, overgrazing, poor irrigation practices and deforestation. While "these factors are real, and do indeed give rise to desertification, the tendency has been to simply accept them *per se* and not to question the historical, socio-economic and institutional factors that are behind them. Often such propulsive factors are ignored". We pointed out that the end result is "a problem of mistaken identity" as secondary or dependent variables are accepted and treated as basic or fundamental causes of the problem and conclude that "this, in a large measure, accounts for why most development schemes intended as solutions to the desertification problem in Africa do not work". We illustrated these perspectives by citing examples from Lesotho, Madagascar, Tanzania, Zimbabwe and Botswana. A further thrust of our work on the region has been to make a national and regional assessment of desertification and its combat. Our findings largely show that the record gives little indication that the struggle against desertification is being won in the region (Darkoh 1989, pp 61).

Baker (1981) launches a scathing attack on what he calls the "conventional" or "technocratic" approach. In his opinion this approach is totally misconceived since it treats the environmental issue as the problem and seeks a technical solution, thereby excluding the socio-economic system as a causal element. "If we step back one pace and pull the policy-and decision-making system itself into the array of variables, then the environmental "problem" fairly rapidly demotes itself into a set of symptoms of a malaise within the broader issue of the political economy. This, at least, is the conclusion drawn from the various studies of desertification or land degradation in the semi-arid areas of the Third World examined by the author" (Baker 1981, pp 1).

Thus the conventional approach is regarded as inadequate because it places environment over people: it identifies "secondary and dependent phenomena as basic

or fundamental problems" and, therefore, merely tackles symptoms (1981, pp 3). *Mismanagement*, in Baker's view, is not the principal cause of desertification but the manifestation of more fundamental problems inherent in the structures of society, eg, political, social and economic inequalities.

Baker proposes an alternative approach in which the issue of environmental degradation is conceived as part of a dynamic historical process. The focal question of analysis should be: "what brought about the human behaviour which, in turn, initiated or accentuated the physical process" (1981, pp 2). Explanations for environmental malaise must therefore be sought in the political economy of the societies in question. In his view, the phenomenon of land degradation is not a physical but a societal problem; only the symptoms are physical. An environmental management approach which concentrates essentially on technical solutions (eg, land use control) does not therefore approach the root of the problem. A real solution presupposes a socio-economic framework offering real alternatives to those degrading the environment. For many countries this may necessitate "a radical re-appraisal of basic policy; the model of development" (1981, pp 24).

Elements of Baker's position can also be found in Darkoh (1980). Other recent works which have articulated this viewpoint on a global basis are Blaikie (1989, 1985) and Blaikie and Brookfield (1987). These studies pursue a chain of explanation from the on-site symptoms of land degradation, via land-use practices, to land users, the agrarian society, the state and the world economy (figure 1).

The chain of explanation of land degradation links a series of ever-widening frames of reference, moving away from attempts at a location-based explanation of physical symptoms towards an examination first of local, then national, and finally international, political economy-based explanations. As Blaikie (1989) points out, there are theoretical advantages in this approach but also problems in relating it to practical policy, because the more radical the deep-seated explanation of degradation becomes, the more difficult it is to formulate a policy which is also politically feasible.

The explanation of the problem of land degradation on which any soil and water

conservation policy must be based is one of the crucial areas in which the existing literature in the Eastern and Southern African region, and indeed, in the rest of Sub-Saharan Africa, appears to be highly deficient.

Sustainable Development

When we review the literature on our suggested soil conservation strategy that posits *sustainable development* as our principal operational objective, we encounter a parallel lacuna in the existing literature on the sub-Saharan region. Here again, in examining the concept, we have seen that the manner in which *sustainable development* is viewed varies so much that, while some call it "a contradiction in terms" (O'Riordan, 1985), others suggest that it "may be just another truism" (Redcliff, 1987, pp 1). These interpretational problems, though ultimately conceptual, have some semantic roots and in a critical review of the concept, Lele (1991, pp 607-621) discusses at length the major problems associated with the different interpretations. The lack of consistency in its interpretation is a major weakness of the concept.

The term *sustainable development* came into prominence in 1980, when the International Union for the Conservation of Nature and Natural Resources (IUCN) presented the *World Conservation Strategy* (WCS) with the overall aim of "achieving sustainable development through the conservation of living resources" (IUCN, 1980). Critically acknowledged that "by identifying sustainable development as the basic goal of society the WCS was able to make a profound contribution toward reconciling the interests of the development community with those of the environmental movement" (Kholosa, 1987). However, they pointed out that the strategy was "essentially supply-sided, in that it assumed the level and structure of demand to be an independent and autonomous variable" and "ignored the fact that if a sustainable style of development is to be pursued, then both the level and particularly the structure of demand must be fundamentally changed" (Sunkel, 1987). In short, the WCS had really addressed only the issue of ecological sustainability, rather than sustainable development.

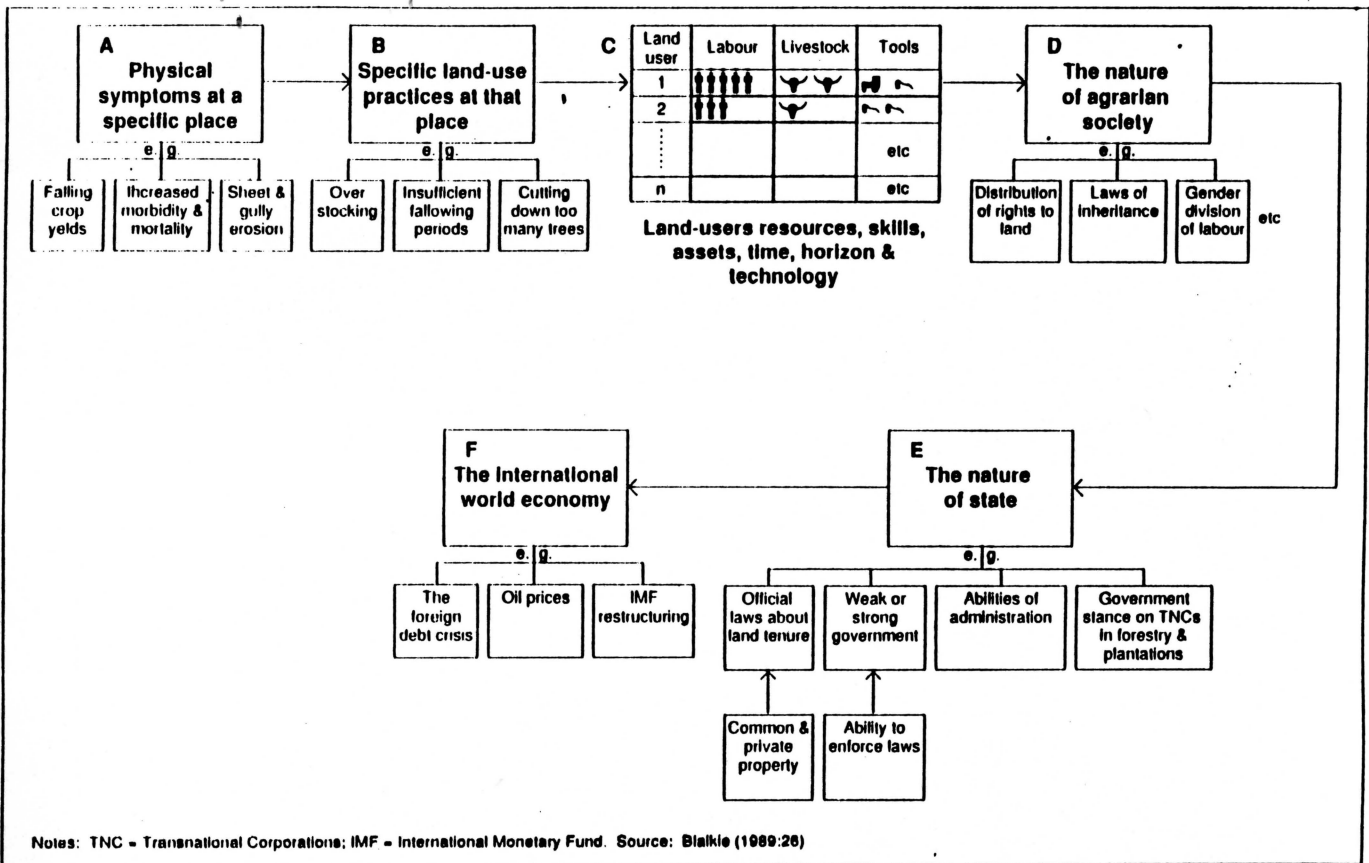


Figure 1. Explanation of causes of soil erosion: The "Chain of explanation"

The United Nations Environment Programme (UNEP) was at the forefront of the effort to modify, articulate and popularise the concept. UNEP's concept of *sustainable development* was based on:

- * help for the very poor, because they are left with no options but to destroy their environment
- * the idea of self-reliant development
- * the idea of cost effective development using non-traditional economic criteria
- * the great issues of health control, appropriate technology, food, self-reliance, clean water and shelter for all; and
- * the notion that people-centred initiatives are needed (Tolba, 1984a).

Lele (1991, pp 611) points out that UNEP's conceptualisation of *sustainable development* "epitomises the mixing of goals and means of more precisely, of fundamental objectives and operational ones that has burdened much of the *sustainable development* literature". According to Lele (*ibid*) it is not clear whether self reliance, cost effectiveness, appropriate technology and people-centredness are additional ob-

jectives or the operational requirements for achieving the traditional ones of meeting basic needs.

A similar proliferation of objectives was also noticeable at the 1986 conference on Conservation and Development, sponsored by the IUCN, UNEP and the World Wildlife Fund (Ottawa, Canada), which recognised "that sustainable development seeks... to respond to five broad requirements:

- * integration of conservation and development
- * satisfaction of basic human needs
- * achievement of equity and social justice
- * provision of social self-determination and cultural diversity; and
- * maintenance of ecological integrity" (Jacobs *et al*, 1987).

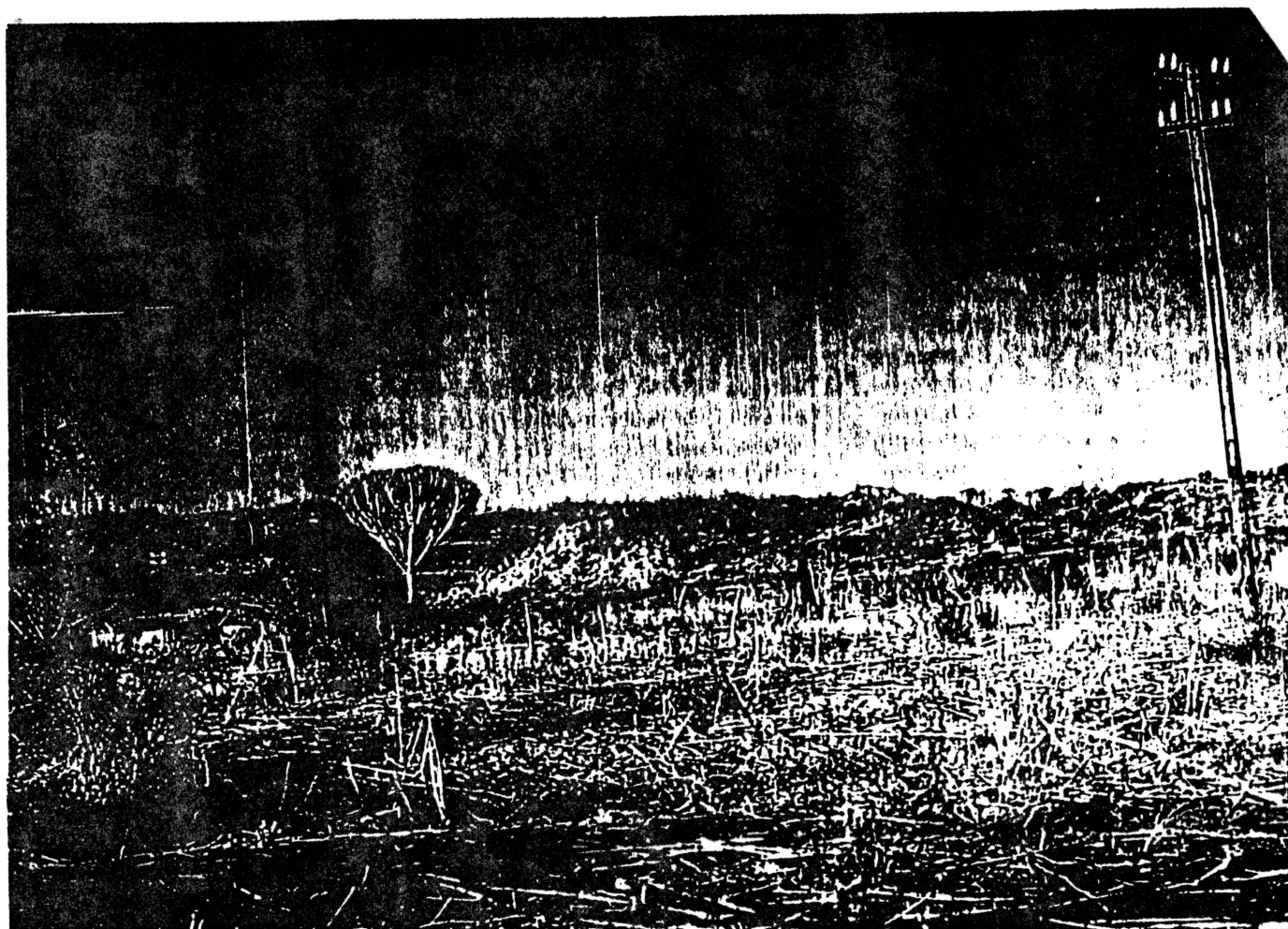
The all-encompassing nature of the first requirement and the repetitions and redundancies between some of the others were acknowledged by the conference rapporteurs (Jacobs *et al*, 1987), but no better framework was suggested.

In contrast, the currently popular definition of *sustainable development* - the one

adopted by the World Commission on Environment and Development - is simple and brief: *sustainable development* is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, pp 43).

The WCED's statement on the *fundamental* objectives of *sustainable development* is brief but the Commission is much more elaborate about its *operational* objectives. It states that "the critical objectives which follow from the concept of *sustainable development*" are:

- * reviving growth;
- * changing the quality of growth;
- * meeting essential needs for jobs, food, energy, water and sanitation;
- * ensuring a sustainable level of population;
- * conserving and enhancing the resource base;
- * reorienting technology and managing risk;
- * merging environment and economics in decision-making; and
- * re-orienting international economic relations (WCED, 1987, pp 49).



Deforestation along the Dodoma-Iringa road, Tanzania. Photo: M.B.K. Darkoh.

Most international organisations and agencies actively promoting the concept of *sustainable development* subscribe to some or all of these objectives with, however, the notable addition of a ninth operational goal, viz:

- * making development more participatory.

This formulation can therefore be said to represent the mainstream of thinking on *sustainable development*. "The logical connection between the brief definition of fundamental *sustainable development* objectives and the list of operational ones is not completely obvious - mainly because many of the operational goals are not independent of others" (Lele, 1991, pp 611).

Conclusion

Obviously we have witnessed only the beginning of a controversial debate on the *conventional* (technocratic) versus *radical* approach to the explanation of the problem

of land degradation and the conceptual devices for clarifying our thinking on the notion of *sustainable development* as a tool for planning human activities within the context of environmental constraints. Considering the seriousness of the problem of land degradation, and the lack of success of the strategies and methods applied so far, there is need for research and open debate about the *principles* of sustainable development even in as much as our ideas seem to fall in line with mainstream thought. As Lele (1991) has noted, mainstream formulation of *sustainable development* suffers from three significant weaknesses:

- * its characterisation of the problems of poverty and environmental degradation;
- * its conceptualisation of the objectives of development, sustainability and participation;
- * the strategy it has adopted in the face of incomplete knowledge and uncertainty.

Through both theoretical and empirical insights into these problems, research in the region should help policy and planning make headway in the solution of soil and water conservation problems.

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