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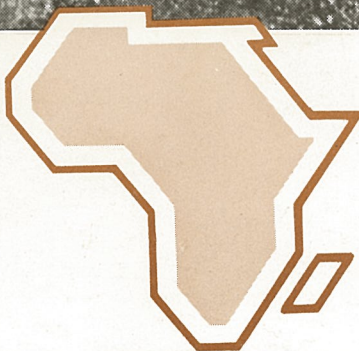
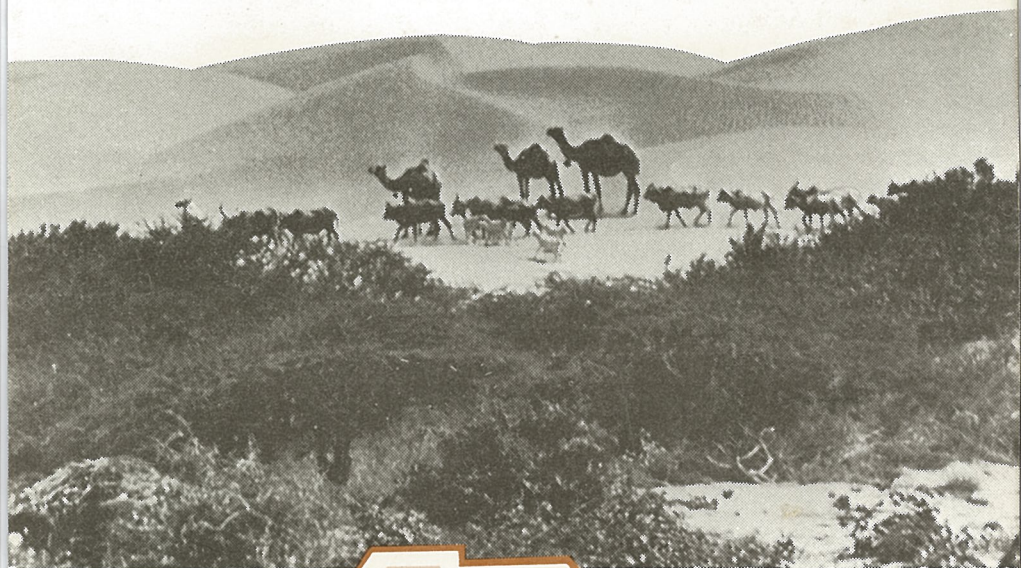
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Africa's Conservation For Development

Botswana, Kenya, Tanzania, and Zimbabwe

by
Rodger Yeager



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Introduction by Norman Miller
African-Caribbean Institute

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Conservation
For Development**

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Preface

This volume presents a combination of materials generated by the African-Caribbean Institute's Natural Resource Project in eastern and southern Africa. It includes a major analytical assessment, an international conference summary, and an extensive resource bibliography, each authored by Rodger Yeager. In addition, papers presented at ACI's 1986 Natural Resource Conference in Nairobi, Kenya have been extracted and summarized.

The project from which these materials originate was initially funded by the Ford Foundation and administratively supported by the International Union for Conservation of Nature and Natural Resources. Additional funding was provided by the United Nations Environment Programme. The countries of focus were Botswana, Kenya, Tanzania, and Zimbabwe.

One objective of the project was to survey the existing "state of the art" in natural resource conservation. A further goal was to find ways of providing African governments and educational institutions with useful, policy-related information in the natural resource field. A key question involved the status of applied research, particularly regarding biological diversity, energy, forestry and agroforestry, soils, water, and wildlife. Another priority was to identify needs in educational and training materials, to be used in the preparation of future African leaders concerned with natural resource conservation and sustainable utilization.

In addition to those who directly participated in the project, the African-Caribbean Institute wishes to acknowledge the contributions of the following: the Honourable E. Mwangale, M.P., Minister for Foreign Affairs, Government of Kenya, who served as conference patron, and the Honourable P. Leakey, M.P., Assistant Minister for Foreign Affairs, who opened the conference.

Several individuals are gratefully acknowledged for their encouragement and assistance in developing the ACI natural resources program and this resulting text report. These include Goran Hyden, University of Florida, William Saint and Dianne Rocheleau, Ford Foundation, Arthur Fell and John Gaudet, USAID, Michael Cockerell and Robert Malpas, IUCN.

At Dartmouth College, The Environmental Studies Program

chaired by James Hornig has provided ongoing support and encouragement for this activity. John Lutz, Bonnie Stone, and Mary Becker of the college's printing services provided highly professional assistance in publishing the text.

In Narobi, Robert Kakuyo, not only participated as a conference delegate, but also provided invaluable administrative support for the entire project. Thanks go also to Elizabeth Davey and Elizabeth Ngyre, who recorded the conference proceedings. Elizabeth Davey contributed further editorial services in the preparation of this volume.

Introduction

Africa's modern dilemma is a "floor of life" issue. Resource loss, environmental degradation, and overpopulation have reduced many people to the lowest subsistence levels in living memory. By all accounts a biologically diverse wonderland, Africa is quite literally the last place on earth for many plant and animal species. Yet the basis of human and nonhuman survival has become threatened in many areas because of soil and water depletion, deforestation, and desertification. Human mistakes are invariably cited as among the basic causes of these tragedies.

The loss of natural resources and of biological diversity represents an African paradox. Environmental destruction takes place, although for generations Africans have been able to avoid it. Food shortages and hunger occur, although farmers and pastoralists have for centuries known ways of forecasting and dealing with drought. Agricultural productivity continues to decline, although new seed varieties and farming techniques have been developed. Soils, water, and forest resources are squandered, although affordable conservation techniques are known. Loss of biological and genetic diversity proceeds, although the consequences of these processes are widely appreciated.

It can be argued that the impending ecological disasters are directly attributable to long-term policy failures in land use and natural resource conservation. Many private and public actions to influence resource use have been taken in isolation, usually with little understanding of their long-term effects. Some issues have been ignored altogether, and very few problems have been resolved in relation to each other. Integrated planning and implementation have taken back seats to disjointed response and erratic crisis intervention. The latter indeed have often become the norm, as the recent food crises in a dozen African states attest.

As Rodger Yeager underscores in the following pages, some of the reasons for these difficulties lie in a paucity of applied research on natural resources and natural resource policy, particularly concerning rural land use in arid and other marginal zones. Another core problem lies in a shortage of trained personnel who can work across the rigid boundaries defining and dividing resource-related bureaucracies. Research and training activities must close these informational and educational gaps in new and integrated ways, if

Africans are to avoid deepening ecological distress and attain even modest developmental goals.

Human population growth is closely associated with many ecological stresses. While their resources are becoming increasingly scarce, eastern and southern Africa experience some of the world's highest national rates of population growth, urbanization, and incipient rural overcrowding. Environmental pressure is relentless. It is entirely possible that under present agrotechnical conditions, the human carrying capacity of the eastern and southern regions will soon be exceeded, yet the aggregate regional population will nearly double within the next 17 years.

As important as such factors are, the African ecological crisis cannot be fully understood only in terms of environmental degradation and population growth. As Goran Hyden has so effectively argued in his writings *Beyond Ujamaa in Tanzania* and *Shortcuts to Progress* (University of California Press, 1980 and 1983), the basic problem extends beyond these immediate manifestations to an accumulation of attempts over a long time to develop eastern and southern Africa from without, first through colonialism and more recently through foreign aid. The effect is continued foreign reliance, a tendency for Africans to consume what they do not produce and to produce what they do not consume, for urban-based governmental structures to float above the rural populace, for technologies to be inappropriate and for rural peoples to remain dependent on subsistence peasant production. Given the current demographic realities, such production is inefficient, wasteful, and usually environmentally destructive.

Although indigenous African values have resurfaced since independence, these have been overshadowed by foreign pressures to use Western solutions and by governments eager to find shortcuts to material progress. As a result, basic African potentials have been ignored, and most tellingly by those who manage Africa's societies and economies. Only recently have African leaders been willing to admit their mistakes and to define their own agendas. The famines and environmental reversals of the mid-1980s have forced this new realization. A consensus is now emerging that if any long-term environmental and productive solutions are to be found, they must be African solutions, articulated and implemented by Africans in the specific socioeconomic, cultural, and political circumstances of their own countries.

From this time onward, the struggle for self-reliance and

development will turn on how Africans gather data, determine policies, and implement new programs in the often politically sensitive areas of natural resource conservation and utilization. Outcomes will vary among countries and regions, but a few basic imperatives must figure centrally to all:

- Biological diversity and the genetic importance of flora and fauna must be recognized as crucial issues.
- The natural resource base must be conserved and sustainably used if African socioeconomic development and political stability are to occur. Simple preservation of endangered species, for example, is no longer (if it ever was) a viable proposition.
- In order to promote the sustainable utilization of natural resources, integrated, cross-sectoral activities will be necessary, especially those which span the traditionally sectoral concerns of agriculture, energy, forestry, indigenous flora and fauna, and water.
- Because aid donors are anxious to see immediate and highly visible results, there is a tendency to channel funds into narrow and frequently large-scale projects without recognizing the need to strengthen local institutions and to develop local African talents. This tendency must be quickly overcome.
- Partly because government-to-government assistance has been so easily available since independence, physically and conceptually remote public sector institutions have grown far out of proportion to other sources of initiative in society. Small, locally flexible organizations that can cut across and soften these institutional rigidities are rare but sorely needed.
- More generally, in situations where many African governments approach insolvency, where their institutional capacities remain underdeveloped, and where donors seem to have more money than they can wisely spend, the grass-roots African perspective on how to achieve sustainable development tends too easily to be forgotten. The temptation among both governments and donor agencies is to try more of the same and hope for the best. If this trend prevails, eastern and southern Africa can only drift into even greater international dependency and human misery than they have experienced in the past.

The countries of eastern and southern Africa are unquestionably at a crossroads. They can grow institutionally more fragile, economically more vulnerable, and ecologically more threatened. Or they can call on the resilience of their peoples and on the untapped potential of their human talent in resolving their "floor of life" dilemmas. Three decades of African independence tell us there is no middle way.

**Norman Miller, President
African-Caribbean Institute**

Conservation for Development: An Analysis

Rodger Yeager

Introduction

This assessment is based on the results of a field survey in eastern and southern Africa, supported by the Ford Foundation and extending from January through April 1986. As part of a larger project in natural resource conservation and utilization, the survey was intended to identify priority areas for further work in the eastern and southern regions, and possibly in other parts of the continent. One goal of this on-going effort is to cooperate with African decision makers in promoting sustainable development through natural resource conservation, by supplying African governments with applied, policy-related information and analysis. Survey investigations were performed in four countries - Botswana, Kenya, Tanzania, and Zimbabwe. These societies each confront serious and growing natural resource problems, and also display striking differences in their political and economic circumstances and in their decision-making structures and processes.

The survey revealed many of the most critical and least resolved natural resource issues in the four countries. Solving these dilemmas depends on a dynamic balancing of sometimes contradictory technical, socioeconomic, and political imperatives. **Botswana's** difficulties center on the highly charged relationship of man and livestock to indigenous flora and fauna, and to the limited carrying capacities of this country's varied but universally fragile ecosystems. **Kenya's** major conservation issues concern more productive and egalitarian resource allocation and land use, in a country where less than 20 percent of the land is naturally arable, and where the human population is growing at the world's fastest rate.

Tanzania is endowed with more abundant natural resources, but is also saddled with a depleted physical infrastructure, with a massive foreign debt, and with a partially reformed but still top-heavy and inefficient governing system that creates economic disincentives and ecological distortions in the subsistence sector, as well as in the commercial farming and wildlife areas of the country. Here the central challenges seem to lie in greater decision-making and managerial effectiveness and in improved patterns of national/lo-

cal and public/private collaboration (for a comparative study of Kenya and Tanzania along these lines, see Yeager and Miller, 1986). Zimbabwe must contend with two legacies of its immediate colonial past. The first entails a sheer lack of recently published research on resource conservation and rural development (see Yeager, 1986, pp. 77-81), probably stemming from 15 years of domesticated colonialism, armed national resistance, and ethnic turmoil persisting into the first decade of independence. A second and related constraint has to do with extending the conservation base from the traditionally European commercial agricultural areas, where natural resources are generally well managed, to the less-arable communal areas, where they were neglected during the period of local white rule and where the bulk of the African population yet lives.

It would be comforting if African natural resource issues could be treated as essentially instrumental problems susceptible to technological solutions - at least to the extent possible in advanced industrial societies with strongly institutionalized public-policy systems. But in Africa, as we know, all such issues are heavily politicized. In particular, the political systems of Botswana, Kenya, Tanzania, and Zimbabwe share at least one trait in common, albeit to varying degrees of importance: they are institutionally weak and dominated by individual personalities in tenuous positions of individualized political power (cf., Jackson and Rosberg, 1982).

African problems of natural resource conservation and sustainable utilization imply certain political factors that must be taken into account if policy reforms are to be effectively undertaken in these and in other component areas of the development process. By examining such factors in the countries selected for study, the following analysis seeks to help counter a disturbing tendency for the current, reform-oriented literature to neglect the question of exactly how to square economic and technical policy requirements with the vicissitudes of how and why African policy decisions are actually made (see Berg and Whitaker, 1986; Lewis and Kallab, 1986; Repetto, 1985, 1986).

African political realities suggest two rather obvious but often overlooked assumptions which guide the following observations and conclusions, and which apply equally to the four study countries:

1. Regardless of their economic and technical rationality, public policies will not be selected by decision makers if these policies threaten unmanageable outcomes in the discrete political

situations in which the decision makers perceive themselves.

2. On the other hand, in the increasingly critical socioeconomic, environmental, and ecological circumstances of modern Africa, decision makers will be influenced as never before toward policy reforms that show promise of working, including reforms that require calculated political risks and may conflict with established structural, ideological, policy, and personal leadership precedents.

If these assumptions are correct, the proper purpose of applied research is to help identify public-choice alternatives that are as politically effective as they are technically and economically efficient. The analysis approaches this goal by summarizing the major findings of the recently completed field survey, and then by relating specific survey outputs to the politics of natural resources in and among Botswana, Kenya, Tanzania, and Zimbabwe.

General Survey Findings

In the most immediate sense, the field survey sought to discover opportunities for further research and training in natural resource conservation and sustainable utilization, both within the four study countries and regionally in eastern and southern Africa. Seven broad questions guided the survey:

1. What is the current state of applied research into natural resource conservation, particularly concerning agricultural land use, energy, forests, soils, water, and indigenous flora and fauna?
2. What are the current trends in natural resource conservation through private initiative and public action?
3. What policy potential exists within the four countries and regionally to adopt a "conservation for development" approach, which makes conservation an integral part of economic modernization and socioeconomic development?
4. How can national and local, public and private institutions best be fostered in their conservation efforts?
5. How can communication among these institutions be enhanced, both nationally and regionally?
6. How can African conservation practitioners best be supported in their work?
7. What types of training and training materials seem most appropriate to this support?

These questions were put to a variety of governmental and non-governmental respondents in the four study countries, and cover future research needs in the policy-analytic, technoeconomic, in-

situation-building, and educational fields of natural resource conservation. The answers they yielded reflect considerable local interest in environmental and natural resource topics, which revolve around the broad issue of preserving Africa's biological diversity while achieving economic self-sufficiency and development:

- The environmental impact of rural land-tenure and land-use systems, particularly in arid and semi-arid lands and including ecologically appropriate crops.
- Woodfuel and alternative energy sources.
- Forestry and agroforestry.
- Water and water-based resource use, including coastal, estuarial, ground, lake, and riverine water resources.
- Soil erosion and desertification.
- Wildlife monitoring, conservation, and utilization, including game ranching, tourism, and other economic uses of wildlife and protected areas.
- Population, human settlement, and agricultural carrying capacities.
- Climate, flooding, drought, and food deficits, including early-warning systems and the role of public policy in creating as well as managing food crises.
- The environmental impact of domesticated livestock.
- Genetic resources contributed by indigenous plants and animals.
- Economic constraints on environmental protection.
- Social and cultural influences over resource use.
- Systems and problems of environmental assessment and ecological monitoring, including the establishment of agroeconomic zones.
- Ecological implications of rural-to-urban migration and industrial development.
- Value and goal conflicts between economic development programs and natural resource conservation.
- The role of women in African resource use.

And, not least,

- Political, administrative, and planning aspects of environmental protection and natural resource conservation, including the negative environmental effects of political and administrative decisions.

This list summarizes the four countries' self-expressed research priorities and related policy and training emphases. The survey also identified several national and regional centers of research and

development activity, suggesting an established institutional capacity for further work in the field. A listing of these organizations is appended to this volume. Their existence and productivity (see Yeager, 1986) imply that issues of natural resource conservation and sustainable utilization have managed to attract high levels of African intellectual concern and official involvement. In order to estimate the *political effectiveness* of this interest, however, it is necessary to examine the actual policy experiences of Botswana, Kenya, Tanzania, and Zimbabwe.

It is tempting to begin by grouping the four countries according to such factors as economic growth and exploitable resource potential; in which case Tanzania might be paired with Zimbabwe as combining a relatively weak recent economic record with relatively strong resource possibilities, while Kenya might join Botswana in the reverse relationship of performance to potential. But any *a priori* classifications could lead us away from the inherent limitations and latent opportunities of resource policy in these countries. They will be avoided in favor of brief case studies, from which more enlightening comparisons may emerge on the art of the politically possible.

Natural Resource Realities in Botswana

Botswana is one of Africa's few Western-styled democracies whose impressive levels of political legitimacy and stability partly result from supplying access to the one resource that most Botswanans want - cattle.

At this the government has been very successful, despite the chronic drought that plagues the country and although actual cattle ownership is skewed in the direction of large land owners and public servants. About 75 percent of the national herd is controlled by 15 percent of the population, with 60 percent of all cattle in the hands of five percent (interview, Dr. Alec Campbell, Director of the National Museum, Gaborone, January 21, 1986).

This inequality has not produced widespread discontent, however, because the majority of Botswanans prefer to join the system instead of opposing it, and because in the absence of alternative rural employment opportunities, even a few livestock offer important economic security. The cattle culture of the majority Batswana people is not traditional in the sense of other African groups like the Maasai. Rather, it is commercialized to the degree economically possible for individual cattle owners. The role of government is to facilitate the provision of bore holes and irrigated

cattle posts, which enable large and small ranchers to increase their stock in the country's arid grazing lands, and which create part-time income alternatives for an urban population which grew from four percent of the total in 1965 to 20 percent by 1984 (World Bank, 1986, p. 240).

Botswana's solution to the problem of political stabilization is financed from two principle sources, the diamond mining industry and multilateral "development" assistance. Whereas in 1966 agriculture accounted for 39 percent of GDP and mining for nil, by 1983 agriculture had sunk to 7 percent and mining had climbed to 29 percent (Botswana, 1985, p. 14). Moreover, the country's economy has grown at an average rate of nearly 11 percent in recent years, the highest national growth rate in the world (World Bank, 1986, p. 182).

The European Economic Community (EEC) and the World Bank have also encouraged cattle production, the EEC through its controversial subsidy (see Owens and Owens, 1980) that - presumably as an attempt at foreign aid - promotes beef exports to Europe at up to four times the world market price. For its part, the World Bank has supported three major livestock projects that, among other things, have provided small private loans to finance new bore holes, cattle posts, and animal purchases (see World Bank, 1983, 1985). Bilateral assistance tends to concentrate at the fringes of these subdivisions. About 80 percent of the \$10 million U.S. aid program for 1986 was devoted to education and human resources development, within the broader context of external support for the Botswanan cattle culture.

Stability and democracy have their price, however, and in Botswana it involves short-term environmental degradation that threatens the country's long-term human carrying capacity. The environment of Botswana is clearly unsuited for a cattle population approaching three million, and for a cattle-oriented human population growing at an average annual rate of 3.4 percent. Significant environmental damage is already evident, especially on the over-grazed ranches and communal ranges of the western Kalahari, and elements of the economically, scientifically, and esthetically valuable wildlife resource may soon face terminal decline (see Kalahari Conservation Society, 1983). The cattle enterprise may itself be approaching a "crash." According to official estimates, several years of sustained drought led to a decrease of 294,000 head between 1982 and 1984 (Botswana, 1985, p. 177). Part of this reduction was caused by a drought-induced increase in animal throughput at the

Lobatse abattoir, but the average weight and quality of carcasses fell, as did the market value of cattle still on the hoof.

An open and popularly responsive political system has helped create Botswana's natural resource problems, but it is also part of the solution to these impending "tragedies of the commons" (Hardin, 1968) if certain of the system's other tendencies can be curtailed. In a purely technical sense, the obvious need is for a socially and culturally viable diversification of the rural economy, together with land-use reforms that conserve and extend the land's limited arability. Botswanan intellectuals, politicians, and administrators have acknowledged the high priority of these innovations by sponsoring an unusually large amount of research and public discussion (Yeager, 1986, pp. 29-64; Silitshena, 1986), by maintaining no fewer than 35 statutes on the books which relate to natural resources and their conservation (Mishkin, 1985; Dipholo, 1986), and by initiating well-intentioned administrative actions such as the Tribal Grazing Lands Policy, the Arable Lands Development Programme, a National Settlement Policy, a conservation-sensitive National Policy on Land Tenure, and an evolving National Conservation Strategy (Dipholo, 1986; Liphuko, 1986; Botswana, 1983; Butterfield, 1985).

The UN Environment Programme has followed suit by recommending 15 far-reaching reforms, including comprehensive utilization and conservation surveys for the Kalahari ecosystem (UN Environment Programme, 1984). These recommendations were widely debated between 1984 and 1986 (see, for example, Campbell and Cooke, 1984), with four approved by government and donor funded, five rejected for technical and unspecified reasons, and six still pending.

The problem with all of these efforts is that none has escaped the overarching political necessity of supporting the Botswanan cattle culture, and therefore none has been sufficiently promoted, domestically or internationally, to prevent its being either rejected, coopted, or ignored by the powerful social, economic, and cultural forces preserving the status quo. Many of the country's mining revenues must be allocated to purchase food from abroad, upon which 90 percent of the population depends at least to some extent.¹ Senior private and public-sector elites remain the largest land and cattle owners. Bilateral and multilateral aid programs have avoided the short-term risks and long-term commitments required for an ultimate solution to Botswana's current resource dilemmas, a labor-intensive mixed economy in the rural areas.

Cattle represent the sensitive nerve endings of the Botswanan

political economy. And yet the approaching ecological crisis provides a powerful incentive toward reform, in a public-policy setting that displays much consensus on what should be accomplished if not on the means selected for its achievement. What will not work became readily apparent in the recent field survey - either a further and ecologically suicidal expansion of cattle production, toward some illusory nirvana of diversified economic activity, or an equally unacceptable destocking program, that would attempt to strip the powerful of their wealth and status while robbing the powerless of their livelihood. On the other hand, it also became apparent that Botswanan decision makers seem sincerely eager to approach the sustainable development issue in operational, problem-solving terms, albeit very cautiously and with assistance but not management from the outside. The key to moving in this direction lies in finding research and development options that sustain local initiative and political legitimacy, as well as the environment, its resources, and their productive capacities.

In order to help arrive at such options, the survey recruited two senior government officials and one academic researcher to develop position papers, and to present these papers at an international working conference that ended the fieldwork portion of the study (Dipholo, 1986; Liphuiko, 1986; Silitshena, 1986. These and the other country working papers are summarized in a later section of this volume). These associates represented three leading institutions concerned with Botswanan natural resource problems - the Ministry of Agriculture, the Ministry of Local Government and Lands, and the Environmental Science Department of the University of Botswana.

The associates' recommendations were debated and refined at the conference, and were finally presented as likely opportunities for preliminary work that government would approve, and that Botswanans could perform with some assurance of their contributions leading to meaningful conservation reforms at grass-roots level. Six suggestions involve applied economic and technical research, seven pertain to training and educational materials development, and three bear upon legal and public-policy analysis. Rather than composing just shopping lists, the following inventories reflect Botswanan conceptions of what is presently necessary and possible on behalf of laying the groundwork for natural resource conservation through sustainable utilization.

Applied Research

1. Investigations of drought-resistant crops and appropriate semi-arid farming systems.
2. Investigations of multiple land-use opportunities, including agroforestry techniques, livestock winter feeding strategies, and wildlife utilization programs in officially designated but as yet unadministered Wildlife Management Areas.
3. Investigations of agroecological zones, including their characteristics and dynamics, to guide further research and resource utilization policies.
4. Investigations of woodland management, including appropriate felling and thinning techniques for indigenous woodlands and effective management of the trade-wood industry.
5. Investigations of groundwater resources and sustainable management practices for these resources.
6. Investigations of sustainable grazing management practices in communal grazing areas.

Training and Educational Materials Development

1. Provision of special training mechanisms to upgrade entry-level qualifications of government staff in the natural resource sector.
2. Provision of Botswana-specific training materials, including visuals, for inservice natural resource training programs.
3. Provision of expanded and coordinated curricula and training materials in the fields of agricultural development and wildlife conservation, to enable training institutions cooperatively to accomodate Botswana's relatively small number of trainees in these fields.
4. Provision of international fellowship opportunities to enable Botswanan governmental and educational institutions to enhance the number and qualifications of research personnel in natural resource conservation.
5. Provision of curricula and educational materials for government staff concerned with community environmental education.
6. Provision of an international consultancy, to help establish a Botswanan nongovernmental organization responsible for the development of public educational materials, in English and in Setswana, for resource users in the villages, on the communal ranges, and at the cattle posts.

7. Provision of film and video materials to support the public educational components of the National Conservation Strategy.

Law and Policy Analysis

1. Performance evaluations of legislation on pollution, including that concerned with the management of toxic and hazardous wastes from the mining industry.
2. Performance evaluations of statute and policy implementation across the entire natural resource sector, and estimates of the need for amended legislative and/or administrative policy in the sector.
3. Assessments of the institutional and manpower requirements for effective extension and enforcement in the natural resource sector, focusing on conservation through the sustainable utilization of resources.

These proposals embody several advantages that should enhance their political acceptability and practical applicability. First, they were developed by Botswanans and, for the most part, can be implemented by Botswanans. The recommended activities also emphasize the concept of conservation through the utilization of existing resources, not through their simple preservation (e.g., wildlife) or their planned abandonment (e.g., cattle). The focus is very much on providing incentives for voluntary compliance, thus reducing the political liabilities of placing government solely in the role of policeman.

The proposals are likewise oriented toward multiple resource-use alternatives to current agricultural practices, which are dangerously monocultural in livestock. The training and educational recommendations place a heavy emphasis on institution building and badly needed human-resource development, both at the professional and technical levels and in society at large.

Implicitly and explicitly, the proposals recognize the importance of private as well as public leadership in resource conservation. Insofar as government is concerned, the stress is on improvements in laws and administrative directives that have already passed through the policy-making process, and probably stand a better chance of being implemented than may others which still face this hurdle. In the up-coming National Conservation Strategy, with its own emphasis on conservation through sustainable utilization of resources, these improvements will find additional legitimacy and sense of coordinated purpose.

In summary, proposals such as these represent some of the poten-

tially most efficient mechanisms for resolving Botswana's natural resource (and therefore food production) problems, not only because of their economic and technical rationality, but also because of their sensitivity to Botswanan political reality. Indeed, the current drought which has exacerbated these problems may also be moving this reality toward greater popular support for conservation through rural economic diversification. The drought has accelerated environmental degradation, especially in the communal grazing areas where 86 percent of the national cattle herd is kept, and has also increased the total number of cattleless people. At present, more than 30 percent of all rural families own no cattle and depend wholly on farming and other activities for their subsistence (World Bank, 1983). The needs and demands of this expanding clientele will generate growing pressure for conservation-oriented reforms like those emerging from the Botswana field survey, in one African society whose political system is highly susceptible to such pressure.³ For this reason, the next step in the survey-initiated natural resource project is to assist these reforms in whatever ways seem necessary and proper.

NATURAL RESOURCE REALITIES IN KENYA

The key to understanding the natural resource problems of Kenya lies in the same relationship of developmental needs to political constraints. As in Botswana, the latter constitute sensitive nerve endings to be respected if not always accepted as inevitable, while the former offer important pressure points for workable policy reform.

From this perspective, Kenya shares much in common with Zimbabwe. Unlike Botswana and Tanzania, Kenya and Zimbabwe must contend with historical legacies of intense competition among small numbers of large ethnic and sectional groups. Both countries have attained relatively high levels of cash-crop production, but at the expense of subsistence populations living in the marginal and rapidly deteriorating agricultural zones that claim most of their land areas. Both remain under the strong influences of resident non-African communities, and exhibit marked contrasts between the stated egalitarian purposes of their governments and their societies' widening class disparities.

Here again, the essential question is not how to promote rational policy decisions over the personal goals of those in charge and the situational factors affecting them as policy elites, but rather how to recognize and encourage decisions that contribute to long-term

political stability through more even and sustainable distributions of social and economic benefits. Worsening environmental and ecological conditions serve likewise to worsen elite insecurities, but also provide unusual opportunities to help reduce both sets of dangers.

In Kenya, a chief concern must be with that 82 percent of the country unable to absorb even moderate population densities under conditions of unassisted rain-fed agriculture. Such a large proportion of arid and semiarid land, combined with drought and consistently high population growth, contributed to the food emergency of 1983-1984 when Kenya was forced to import 560,000 metric tons of purchased cereal grains and 122,000 metric tons of cereal food aid.⁴ Imported supplements to the domestic food supply failed to prevent a per capita 17 percent deficiency in available food calories, which fell particularly hard on people in remote rural areas. Also affected were urban dwellers who compose 18 percent of the population and whose ranks are swelling at an average annual rate of eight percent (World Bank, 1986, pp. 190, 234, 240). Despite the dubious escape-valve benefits of urbanization, population densities continue to rise in Kenya's vast "agricultural periphery" (cf., Kjekshus, 1977; 1977a) with predictably negative consequences for its soils, water, trees, and other vegetative cover.

Kenyan natural resource problems relate not only to the less-arable four-fifths of the country. Of even greater immediate significance is the impact of mounting demographic pressure on the remaining one-fifth, 25 percent of which forested, where 80 percent of the rural population already lives, where most of the food and export crops are grown, and where natural increases and mass migrations from low-potential areas will result in a minimum addition of 10 million Kenyans (50 percent of the current national population) by the year 2000 (Kamau, 1986, p. 1; Omo-Fadaka, 1986, p. 3).⁵ Also to be considered is the seven percent of agriculturally marginal lands set aside for wildlife. Although other forms of wildlife utilization are still nascent, game animals are vital to about half of Kenya's thriving tourist industry - which generated 20 percent of total foreign-exchange earnings in 1984 (Kenya, 1985a, pp. 8, 13, 86). Population pressure is now taxing the carrying capacities of buffer zones formerly separating national parks and game reserves from human and livestock concentrations, and providing migratory opportunities for wild ungulates and their predators (Yeager and Miller, 1986, pp. 70-72, ff.). There is no reason

to expect that this pressure will simply cease at the park and reserve boundaries, casting into serious doubt the future of valuable wildlife resources and the natural ecosystems upon which they depend.

As in the case of Botswana, solutions to Kenyan natural resource dilemmas appear fairly simple from a purely technical perspective. In the words of a recent UN Development Programme (UNDP) estimate:

With its rapidly increasing population, pressure has begun already to mount on Kenya's limited arable land, less than 20 percent of the land having good arable potential. The possibilities of expanding the area under cultivation to increase agricultural production is limited, and future growth would have to depend on the more intensive use of existing land through improved yields, more efficient land use and the intensification of small farm and pastoral production (UN Environment Programme, 1985, p. 11).

This orientation is also reflected in official Kenyan pronouncements (e.g., Kenya, 1982, *passim*).

Of the total amount of available land, about 10 percent lies in the Kenyan highlands and will at some point reach the limits of agricultural intensification. This means that in order to implement the UNDP recommendations, attention must be directed toward the other eight percent of relatively arable land, and toward the least-arid portions of the remaining 75 percent not reserved for wildlife. Until very recently at least, the Kenya government has shown little inclination to move concertedly in this direction.

From the time of independence, Kenyan versions of state-managed capitalism, unbalanced economic growth, and patrimonial elitism have combined to retard agricultural development and to freeze it in those areas not in the fertile highlands. From his study of agricultural extension in the somewhat less-fertile Western Province, David Leonard (1977, pp. 193, 194) concluded that

there is a substantial bias in the distribution of agricultural extension services in Western Kenya, in favor of the wealthier and more progressive farmers. This favoritism accentuates rural inequality and probably prevents the maximum possible acceptance of agricultural innovations . . . Although the skew in services does not even make good economic sense, it is consistent with the general pattern of benefit distribution in the Kenyan political system. Decision makers probably will not feel any urgency about

ameliorating the imbalance in extension until poor farmers emerge as a distinct and noticeable political force and are able to campaign for their own rights.

This emergence has not yet occurred, and the ecological effects of its absence led William Murdoch (1980, p. 304) more generally to observe:

The independent Kenyan government since 1964 has simply extended [colonial] policies by "Africanizing" previously white areas without altering the basic policy of concentrating development on a restricted land-owning class in the areas with high-potential farmland. Thus a continuing stream of landless migrants has been forced to leave high-potential areas, which receive almost all the government investment in agriculture. These migrants exert ever greater pressure on the marginal area of the [central] Plateau, which has received virtually no investment to help deal with this influx. In the meantime, land farther east has been accumulated by large commercial enterprises involved in ranching, tourism, irrigated horticulture for export, and the stripping of scrubland to produce charcoal for export. The displaced dryland farmers are thus pushed westward toward ecologically vulnerable land they must inevitably overexploit.

Similar migrations are forced to the east, from the densely settled Nyanza and Western provinces.

On the more positive side it can be argued that if an organized peasantry has not caused Kenyan political elites to rethink their ecological responsibilities, events of the past few years have influenced some sort of reappraisal. Beginning in the colonial period and continuing over the first decade of independence, and demographic, climatic, and developmental imbalances placed an increasing strain on Kenya's natural resources and environment. From the late 1970s, when the Malthusian-like trend became impossible any longer to ignore, a series of organizational and policy reforms have been instituted. If brought to fruition, these responses bear important implications for the conservation of resources through their more equitable and sustainable utilization.

From the standpoint of organizational commitment to natural resource conservation, Kenya is well endowed with governmental and nongovernmental bodies concerned with conservation and development. Indeed, because the country offers a convenient regional location, good support and communication services, and a relatively open political climate, Nairobi has become a kind of

"Hong Kong of Africa" for environmental organizations and experts. According to a survey sponsored by the International Union for Conservation of Nature and Natural Resources (IUCN), no fewer than 12 (of a total of 20) ministries and five development authorities are assigned conservation responsibilities (Aveling, 1984, pp. 17-21). Each of the three national universities also specializes in an academic area of significance to natural resource conservation - basic and applied research at the University of Nairobi (see Institute for Development Studies, n.d.), environmental education at Kenyatta University, and wildlife management at Moi University.

Not including the World Bank and other multilateral organizations, nine conservation-oriented specialized agencies and programs of the United Nations maintain national and regional offices in Nairobi. For two of them, the UN Centre for Human Settlements (HABITAT) and the UN Environment Programme (UNEP), Nairobi serves as world headquarters. The city also hosts a multitude of nongovernmental voluntary organizations (NGOs) and consulting groups, together with more than 20 international NGOs,⁶ all working directly or indirectly in the conservation field. This is in addition to 25 bilateral aid offices (Kenya, 1985, pp. 5:6-5:7), most of them administering development projects with environmental and/or ecological components. In 1977 the government established a National Environment and Human Settlements Secretariat, located first in the President's Office and later transferred to the Ministry of Environment and Natural Resources, in recognition of UNEP's and HABITAT's world-headquarters status in the country. Presently, one of the Secretariat's more daunting missions is to monitor the entire welter of organizations concerned with natural resource conservation.

Natural resource funding reflects the organizational tendency to internationalize work in the sector. By mid-1984, a total of K£73,643,900 (US\$ 50,788,896) was committed in foreign grants and loans to natural resource activities,⁷ representing 26 percent of the entire development budget. The money was assigned to 89 projects from 25 bilateral donors, 20 UN and other multilateral agencies, and three international NGOs (Kenya, 1985, *passim*; Kenya, 1983, p. 88). The government also encourages donor-financed meetings and workshops which recommend a continuous stream of new projects (see, for example, Kenya, 1984). Obviously, one way to gain political support for conservation reforms is to have them funded from abroad.

The commitment is more ambiguous in terms of maximizing donor effectiveness, and also at the level of domestic policy making and implementation. National elites choose among donors partly on the basis of their projects' patronage potential for individual politicians, government agencies, and their constituent groups. In order to preserve this leverage, the government actively discourages attempts at donor coordination.

Domestically, a "district focus" approach to development has been adopted to encourage "greater involvement of the people in planning, organizing, constructing and operating their own facilities" (Kenya, 1983, p. 46) throughout Kenya. To help guide these local efforts in the area of natural resource conservation, a series of district environmental assessments has been completed (Yeager, 1986, p. 52) with more studies to follow. A National Population Policy was outlined in 1984 (Kenya, 1984a), which recognizes the environmental and ecological necessity of managing population growth and distribution. In 1982, the government endorsed a comprehensive review of environmental policies and policy requirements (Kenya, 1982). A ten-year hunting ban is still in effect, which has sacrificed the lucrative trophy-hunting industry for the protection of game animals from poaching. Compensation schemes have been devised to protect farmers against crop and property damage by wild animals. Much discussion takes place about the sustainable utilization of wildlife through game ranching cooperatives and mixed game/livestock enterprises.

Nevertheless, major planning, decision-making, and appropriations processes remain highly centralized and still discriminate against the peripheral agricultural locations where environmental dislocations are among the most acute, and where political influence over Nairobi is weakest (Yeager and Miller, 1986, pp. 112-114, 140-141). This neglect is reflected in a statement of priorities set forth in the current development plan:

The main concern with environment at this stage of our development is to control human behaviour so as to achieve a balance between the development needs of the nation and the enhancement and protection of the environment. Since the economic environment during the Plan will be characterised by shortages of financial resources, resources will not be available on a large enough scale to rehabilitate areas that have already suffered damage. Instead, the thrust will be to strengthen the institutions necessary for the assessment and monitoring of environmental changes that are likely to be harmful in the

future (Kenya, 1983, p. 137).

In the Kenyan context this means that if a center-periphery choice has to be made in natural resource conservation, it will continue to favor the commercialized and politically influential highlands center.

This same bias applies to the enforcement of conservation laws and administrative policies. At the field survey's wind-up conference, the director of the National Environment and Human Settlements Secretariat made an important historical observation regarding soil conservation:

Concern over soil loss from water and wind erosion started as early as the 1930s. Before Kenya's independence in 1963 the existing laws and regulations on proper land use were strictly enforced. There was however general dissatisfaction with enforcement methods on the part of Africans, and the coming of independence made enforcement almost impossible. Good farm planning and management for the purposes of soil conservation now depend on extension services to farmers and demonstration projects on soil conservation measures . . . (Kamau, 1986, pp. 2-3).

The concentration of these extension services has not significantly shifted from the time when David Leonard encountered it among the patronage-sensitive "wealthier and more progressive farmers" of south-central Kenya and in parts of the west.

The situation is not far different for other natural resources such as wildlife. Commercial experiments in game ranching are critical to the conservation of this resource through its sustainable utilization, and yet they have been delayed if not completely prevented by elite insistence that game animals are state property and thus not available for commercial use. Patronage payoffs may have to precede special dispensations to allow medium to large-scale ranching of wild ungulates.⁸

Near the national parks and game reserves, group cattle ranches and compensation for wildlife-related losses are employed to lessen conflict between indigenous animals and humans with their livestock. The key to making both policies work involves financial transfers from Nairobi to the needful yet politically weak agricultural periphery, but often these subsidies are either not forthcoming or insufficient to afford local incentives for wildlife protection. As the director of the National Environment Secretariat concluded about compensation: "Competition in land use between wildlife, agriculture and livestock is recognized and in order to minimize antagonism towards wildlife and reduce private costs of maintain-

ing wildlife, provisions are made for compensation for the loss of human life, injury or damage to crops and property. In practice the machinery for assessment and payment has proven to be slow and cumbersome, and the amount of funds set aside for compensation is inadequate" (Kamanu, 1986, pp. 9-10).⁹

The examples could be extended, but enough has been said to raise the question of how best to introduce conservation reforms into a political milieu less than wholly receptive to their requirements and, in some respects, to their intended outcomes. Possible answers were suggested by the Kenyan delegation to the natural resource conference that ended the four-country field survey. As in the case of Botswana, research associates were recruited to represent Kenya from indigenous institutions seriously concerned with natural resource conservation. These include the National Environment and Human Settlements Secretariat, the Environment-tal Education Programme at Kenyatta University, the Wildlife Management Department of Moi University, and the private African NGOs Environment Network. Conference discussions emerging from the associates' position papers (Kamanu, 1986; Koiri-Koech, 1986; Gakahu, 1986; Omo-Fadaka, 1986) and subsequent conference recommendations were framed by a general charge from the senior governmental representative:

Conservation policies on the various natural resources should contain strong components of education to the general public. In a country with limited transport facilities and public media, it is difficult to be able to reach, communicate with and influence public opinion on matters which are often not of immediate concern to members of the public. Another area of concern in the formulation of policy and regulations to carry out policy is lack of adequate knowledge on the state of the various resources, and on effective and appropriate techniques for managing these resources. To fill this gap, more applied research is required and, as of now, there is an apparent need to increase manpower, funds, and the motivation of personnel already employed so that the necessary knowledge can be obtained (Kamanu, 1986, pp. 11-12).

The final conference recommendations share these nation-wide emphases. Viewed from the standpoint of political feasibility, reforms that stand the best chance of being implemented should not openly challenge the status quo of resource use, but rather work within it through public education, specialized training, and applied research that equally benefit the highyield rural areas,

where ethnic, resource, and patronage politics are the most intense, and environmentally threatened low-yield areas where the political problem is more one of peasant withdrawal (cf. Hyden, 1983) than active competition and shifting alliances. Insofar as public-policy reforms are concerned, research and development should be well-integrated within the existing decision-making structure which has already reached accommodation with the political realities of modern Kenya. Most obviously, educational and research activities should be directly relevant to Kenya's particular resource problems and, to the extent possible, should be managed by Kenyans. It is suggested that the Kenyan conference recommendations fulfill these criteria of political acceptability.

Applied Research

1. Investigations concerning crop production, including arid and semi-arid land utilization, multiple cropping systems, soil fertility maintenance, use of natural fertilizers and leguminous plants, water harvesting and management through canal systems, small dams, and lakes, reduction of postharvest losses, agroforestry, aquaculture to increase fish yields, alternative livestock feeds, livestock disease control, and improved farm credit and crop-marketing systems in the food sector.
2. Investigations concerning land management, including improved soil conservation measures, reforestation, land-use/conservation conflicts in marginal agricultural areas, commercial utilization of protected lands (especially wildlife areas), and irrigation technology.

Training and Educational Materials Development

1. Provision of Kenya-specific educational and training materials on natural resource conservation, for various levels and various types of educational and training institution.
2. Provision of annotated bibliographies and lists of on-going natural resource research and development activities, for training and educational purposes.
3. Provision of selected natural resource graduate training fellowships, preferably to doctoral level and preferably at Kenyan higher educational institutions.
4. Provision of locally produced film, video, and other graphic training materials, for formal and public educational programs.
5. Initiation of an integrated and easily accessible data base on Kenyan natural resources, in support of further training and

Natural Resource Realities in Tanzania

The Tanzanian policy process has come under much criticism, usually in terms of its being either insufficiently or excessively "socialist." It can be questioned, of course, whether the differentiation of socialism from capitalism carries much meaning in Africa, where national political economies are all inherently statist. Nevertheless, Tanzanian political decision making has been faulted primarily on the basis of Julius Nyerere's socialist philosophy put into practice.

In reality, Nyerere's orientation to government, economy, and society represents but one of three policy directions that have influenced Tanzania since independence, and Nyerere's has held sway for the shortest time. The three conceptions include:

1. A conservative "reorganizational strategy" introduced by the departing colonial regime and today favored by many of the country's educated bureaucrats and technocrats. In the interpretation of Rothchild and Curry (1978, p. 118), elites who accept

1. Evaluations of the coverage and implementation of existing environmental laws and public policies, including analyses of major loopholes and recommendations for reform (cf., Ooko-Ombaka, 1984, pp. 25-40). These studies should be performed in consultation with the Kenya Law Reform Commission, and should cut across all aspects of natural resource conservation including forestry, wildlife, soils, water, and land use.

Follow-up work to the natural resource conference is directed toward operationalizing and securing financial support for these proposals, and toward coordinating them with activities already underway in Kenyan natural resource conservation.

Law and Policy Analysis

6. Development of a comprehensive directory of international training opportunities (including content) and funding sources for such training in natural resource conservation.
7. Development of an effective interlibrary exchange system, nationally and regionally, for natural resource conservation training and educational materials.
8. Provision of curricula and educational materials in the specific area of irrigation technology.
9. Design of an integrated approach to vocational training in resource management, emphasizing sustainable utilization.

this approach also "accept their structural dependency on the Western capitalist economy; [but] at the same time, they manifest a predilection for reformist policies that attempt to humanize and rationalize the existing domestic and international orders."

2. A patronage-based political vanguardism that emerged in the ruling Tanganyika African National Union (TANU) party shortly after independence and today flourishes in leading Chama Cha Mapinduzi (CCM) party circles. Patronage aside, Joel Samoff (1980, p. 1121) captures the policy tactic preferred by this oligarchy, "in which an impossible goal is announced for achievement tomorrow, and from which [allegedly] results not the full accomplishment of the stated aims but probably more progress than would have been possible had the implementation process been much more bureaucratic and orderly."
3. Nyerere's own notions, stressing rather romanticized views on socioeconomic equality (as the only way to overcome poverty while seeking economic growth), one-party democracy (as the only way to reduce factionalism and build national unity), and party-led mass socialism (as the only vehicle for attaining the other two goals). Nyerere acquiesced in the first orientation during the early years of independence, and increasingly endorsed the second when it later became evident that his objectives were not going to be realized through voluntary elite/mass cooperation (see Yeager, 1982, pp. 41-91).

The first two predispositions neatly divide the Tanzanian policy elite and are well-represented on Zanzibar, while the third once received considerable international recognition and Tanzanian grass-roots approval, was never terribly popular on Zanzibar, and has lately fallen into disfavor in and outside the country because of its apparent failures when translated into operational public policies. From their constant interactions and clashes since 1961, these approaches to the purposes and methods of government help explain the vagaries of Tanzanian postindependence politics and a policy performance that has created serious threats to the country's resource base and environment. Realistic policy reforms will have to acknowledge each of these influences, as well as the objective socioeconomic, environmental, and ecological situations in which Tanzania finds itself.

Until fairly recently in Tanzanian history, a demographic consistency prevailed from the time when eastern Africa was first settled. The highest population densities were established in the more arable northern and southern highlands, near Lakes Victoria and

Tanganyika, along parts of the Indian Ocean coast, and on the islands of Zanzibar and Pemba. Few people inhabited other areas, including the dry interior steppe extending between the eastern and western branches of the Great Rift Valley.

Because of population growth and deliberate policy interventions, this ecologically sensitive balance has now changed so that the eight most arid rural regions (totaling 51 percent of Tanzania's land area) contain about 37 percent of the national population. The average density is a low 18 people per square kilometer, but actual residence patterns feature densely settled nucleated villages. Conversely, the seven best-watered regions account for only 14 percent of the population at an average density of 119 people per square kilometer, which is also high in real terms (Yeager, 1982a, p. 496).

Given that only about 35 percent of the country is well-suited for agricultural production under low-input subsistence methods, this kind of population distribution portends inevitable environmental problems unless it is mitigated by innovations to promote sustainable agricultural intensification through the conservation of land and water resources. Public policy has failed to achieve this effect in Tanzania, and indeed has further lowered agricultural carrying capacities through its socially and politically motivated impact on rural settlement configurations.

Colonial and postcolonial governments enclosed land for commercial agriculture in the wetter and more fertile rural areas, and for wildlife protection in the drier hinterland. Public health programs and educational campaigns were also mounted, which quickly reduced infant and child mortality. The long-term consequences of these policies included, as elsewhere in Africa, not only a rapid growth in population and population density, but likewise a steady increase in the rates of this growth. By the time of the most recent national census in 1978, a pattern had emerged in which administrative regions of greater annual rainfall experienced high annual growth rates and densities, while regions of lesser rainfall displayed lower densities but growth rates either equaling or exceeding the national average of 3.3 percent.

The colonial government had not matched its public health initiatives with effective measures to raise agricultural productivity and food sufficiency on lands that remained unenclosed. Following independence in 1961, African policy elites announced their determination to reverse the production losses and environmental deterioration that were exacerbated by overcrowding and a lack of agricultural development inputs. Following Julius Nyerere's long-

standing preference, they reasoned that if these goals were to be reached, large numbers of peasants would have to be moved from scattered homesteads and isolated villages into consolidated and easily accessible farming centers.

An early attempt at highly capitalized villages failed. In 1967, after the Arusha Declaration had committed Tanzania to rural socialism and self-reliance, the party-government adopted a policy of relocating peasants into self-help socialist communities. The regime underestimated the difficulty of achieving voluntary compliance with this policy, especially as it combined resettlement with an immediate transition to communal land ownership, production, and income distribution. In 1973, physical force was added as an implementation device and the *ujamaa vijijini* (socialism in the villages) policy was amended to emphasize the speedy villagization and longer-range communalization of virtually the entire rural society.

By 1977, when the campaign had spent its force, more than 90 percent of the peasantry reportedly resided in more than 7,000 villages at an average occupancy of over 1,000 people per village (Yeager and Miller, 1986, p. 25). The impact of this huge exercise in directed migration was not felt evenly in all parts of the country, and today about 60 percent of the resettled population lives in areas of low rainfall prone to density-related ecological problems. Here too are situated some of the largest and most impressive wildlife areas, which are vital to Tanzania's underdeveloped but potentially wealth-generating tourist industry.

Tanzanian ideological, political, and bureaucratic elites were far more successful in resettling rural dwellers than in providing for their basic productive needs. Between 1967 and 1982, neither the nationalization of major economic activities nor an administrative deconcentration of government compensated for an absence of producer price incentives, rural credit, fertilizers, and extension services. Also absent were improvements in agricultural marketing, transport, and storage, as well as mechanisms to restore and maintain soil fertility such as small-scale irrigation, crop rotation, and reforestation. In fact, the now all-encompassing public sector not only failed to deliver these essentials, it also prevented them from being obtained from other sources. By 1980-1982, per capita food output had fallen to about 88 percent of its 1969-1971 level (World Bank, 1984, p. 228).

Although adverse weather and international economic recession played some part, responsibility for these lapses cannot be assigned

to the pressures of population growth. The real reasons for Tanzania's flagging agricultural performance and its impending ecological crises lie in a record of inadequate investment in the rural areas (see Yeager and Miller, 1986, pp. 28-29), together with ideologically and politically mandated land-use practices that are economically irrational and environmentally destructive.

Concerning land use, the villagization program was centered on subsistence areas of low potential for widespread cash cropping. Several factors help to explain this bias, including extreme political and bureaucratic pressure placed on regional and district authorities to create new villages, an official reluctance to disrupt export production in already densely settled locations, and a greater willingness of some poorer farmers to be moved. Accordingly, local resettlement officers often took the course of least resistance and filled their quotas with farmers who had employed a shifting land-use strategy as a necessary environmental adaptation. An upshot of this special attention paid to the agricultural periphery was that immovable and densely populated villages now dotted the landscapes of semi-arid pastoral and farming areas adjoining Tanzania's national parks and game reserves.

The speed and scope of villagization meant that villages were hastily and often poorly sited, so that they lacked access to basic amenities such as water and fuelwood. Given the available agricultural technologies, moreover, many were too large for the carrying capacity of the land. The French agronomist René Dumont visited the rural areas in 1979. He observed a phenomenon that other specialists had more generally warned about. Under subsistence conditions, there is always a tendency for the best lands (which are nearest to the settlement) to be overexploited. Shifting cultivation normally protects these lands from permanent environmental damage, but "where the cultivators are sedentary, soil exhaustion, leading to erosion, may become a real menace on the nearer lands, threatening the whole economy of the settlement" (Christholm, 1962, p. 43). Dumont discovered extensive soil exhaustion and erosion barely two years after the completion of villagization.

Writing two years earlier, Kjekshus (1977a, p. 282) described the crisis then facing Tanzanian agricultural systems and environment: Unless villagization can be coupled with infrastructural inputs to create a novel technology to master the environment, the nucleated settlement pattern may, by itself, be counter-productive in economic terms and destructive of the ecological balance maintained under the traditional settlement pattern. Nucleated settlement will mean over-

crowding of restricted areas with people and domestic animals and the accompanying soil erosion, gully formation and dust-bowls which are all common features in situations where the human initiative has suddenly overtaxed the carrying capacity of the land without compensatory inputs to increase the quality of cultivation. Centralized settlements will mean time wasted in long walks between the new dwellings and the productive fields and will result in the almost certain falling into disuse of the peripheral shambas [farming plots] and their gradual takeover by bush and vermin.

These predictions have since materialized in large parts of the country (Yeager and Miller, 1986, pp. 39-67), and represent an equal tragedy of the commons for man, livestock, and wild animals that are not vermin but rather valuable assets to Tanzanian development (see Kurji, 1981; 1985; 1986).

Tanzanian policy efforts to rationalize agricultural land use have been meagre, ideologically driven, and developmentally dysfunctional. As a result, many of Tanzania's human and nonhuman inhabitants face immediate challenges to their well-being. In recognition of these perils, national policy elites have undertaken recent policy reforms, including a planned decentralization of economic and political decision making through the reestablishment of cooperative societies and district councils abolished during the heyday of *ujamaa vijijini*. Semiprivatization of resource use and increased investment in agriculture are also much stressed, in order to meet the requirements of comprehensive national agricultural and livestock policies (Tanzania, 1982; 1983) that were adopted in the early 1980s and still await funds for implementation.

From this financial perspective, Tanzania's basic problem involves cash flow and not human or natural resource potential. The export base is unable to generate enough foreign exchange to cover necessary imports, and the export base is import-dependent. The only short-term hope lies in strict Tanzanian adherence to economic policy reforms demanded by the International Monetary Fund (IMF), the World Bank, and bilateral donors¹⁰ in return for their assistance. In the expressed view of Julius Nyerere, some of these reforms would lead to severe urban unrest and to a further rural withdrawal from the formal economy. According to Nyerere, they would also increase inequality, harm the rural and urban "poorest of the poor," and thus erase the social achievements of the past 20 years. For its part, the party vanguard has opposed externally mandated reforms because of their negative impact on a patronage-

based elite structure that depends on a continuous supply of public-sector jobs.

On the brighter side, an emerging consensus can be detected in Tanzania, and one that can be used by external resource suppliers to foster policy improvements that raise productivity, protect the environment, and avoid political destabilization. This agreement arises from a practical - if not always rhetorical - questioning of six previously held assumptions affecting the Tanzanian policy process (cf. Ergas 1980):

1. That peasants will freely and universally communalize their land holdings and work.
2. That private farming enterprises do not produce powerful incentives for peasants to emulate.
3. That mass participation in centrally planned development programs can be easily and cheaply obtained.
4. That party and government functionaries are readily committed to self-sacrifice and to building a socialist society.
5. That peasants can reasonably be expected to become completely self-reliant and, at the same time, to produce sufficient surplus food and export crops to support a growing urban population.
6. That, because of their righteous leadership, the national executive, civil service, and party are immune to pressures exerted by an aroused public.

Although they might not represent as dramatic a set of mea culpa as some may want, herein lies the real opening in Tanzanian political decision making, and the best opportunity for sustainable development through natural resource conservation. Whether this will happen is an open question, but recent events reveal some interesting possibilities.

After several years of bickering with the donor community, in July 1986 Tanzania concluded an agreement with the IMF on a standby credit of about \$200 million. The government also effected a second major devaluation of the Tanzanian shilling in the last five years. Soon after reaching the IMF agreement, an official delegation was sent to Paris in search of a further \$3.7 billion to support a proposed three-year economic recovery program. The World Bank responded by promising a \$100 million structural adjustment loan and by dispatching teams to Dar es Salaam in connection with individual sector loans. Bilateral donors pledged another \$130 million, in addition to \$400 million in frozen past commitments. These developments infer that the bureaucratic/technocratic leadership group is again in ascendancy following the retirement

from government of President Nyerere, and that with properly framed development policies, this faction will find the necessary wherewithal to promote environmental recovery and natural resource conservation. The IMF agreement and currency devaluation also presage some kind of public and/or party backlash that must be appreciated in further attempts to aid and influence Tanzanian policy making.¹¹

In short, future reforms must avoid a narrow focus on production and deficit removal, and concentrate also on long-term infrastructural and human ecological improvements which are largely self-defined and administered - that is, if Nyerere's egalitarian vision is to be preserved, if the agents of economic and technical reform are to be protected against those patronage elites who are wholly self-centered, and if the natural resources of Tanzania are to be nurtured by a healthy and enlightened rural society that can afford the luxuries of conservation and sustainable utilization. The natural resource field survey approached Tanzania with these thoughts in mind.

Although a national conservation policy is currently under discussion, the official intention is to treat natural resource issues¹² in the context of the national agricultural and livestock policies. The Ministries of Agriculture and Livestock Development were recently consolidated to further integrate work in the rural sector, and more specifically to create a single lead ministry with responsibility for implementing these omnibus rural development policies. The new ministry is also the designated administering agency for externally originated natural resource projects (e.g., International Union for Conservation of Nature and Natural Resources, 1985). The Ministry of Natural Resources and Tourism is also active in this respect. After several years of languishing in Tanzania's foreign aid hiatus, it is now eagerly soliciting funds for conservation reforms in wildlife and ecological management (see Tanzania, 1986). In addition to the Institute of Resource Assessment, the Wildlife Ecology Section of the Department of Zoology is one of the University of Dar es Salaam's most heavily committed academic programs to conservation research and education.

The field survey recruited Tanzanian research associates in light of these institutional emphases, and also to reflect the major concerns of Tanzanian natural resource policy. One associate represented the Research and Training Division of the Ministry of Agriculture and Livestock Development, and prepared a position paper on research, training, and policy issues in the agricultural land-use

field. Another associate was drawn from the Ministry of Natural Resources and Tourism, and focused his attention on forestry and agroforestry, wildlife, and fisheries. A third associate from the University of Dar es Salaam documented the principle needs of academic research and training in wildlife ecology, marine biology, human settlement and land-use practices, and forestry (see Ruzika, 1986; Muheto, 1986; Kiwia, 1986).

Like their colleagues from Botswana, Kenya, and Zimbabwe, the Tanzanian associates presented their findings at the survey's concluding natural resource conference, and in ensuing discussions developed three sets of recommendations for further research, training, and policy analysis. These proposals differ from the other country recommendations in that most are highly specific as to type of activity proposed and in some cases as to the institutional locus of work. This degree of specificity attests to the serious thinking Tanzanians have given to natural resource conservation over the last several years, to the organizational infrastructure already in place that can be employed to support conservation-for-development innovations, and also to Tanzania's great need for short-term financial assistance at even the most minute level of effort. In microcosm, the recommendations portray a Tanzania ready to reverse the environmental and ecological mistakes of the past. This bodes well not only for the national economy, but also for political stability and the social equity that has long characterized the most laudable aspects of Tanzania's approach to development.

Applied Research

1. Investigations of the ecological status and future requirements of Maswa Game Reserve as an effective buffer zone for the Serengeti National Park.
2. Investigations of appropriate land-use systems for the Tarangire and Manyara ecosystems, with a focus on providing for migratory animal corridors.
3. Agroforestry investigations especially aimed at strengthening Tanzania's Resources Efficient Farming Methods approach, at developing community agroforestry programs, and at determining suitable tree species in heavily depleted Shinyanga District.
4. Investigations to support research programs at Njiro Beekeeping Research Centre.
5. Investigations of small-scale fish farming, and assessments of the economic viability of small-scale fishing enterprises on Lake Victoria.

6. Investigations to support on-going programs in range ecology research.

Training and Educational Materials Development

1. Provision of public educational materials for the Malihai (Wildlife) Club of Tanzania.
2. Provision of expanded natural resources curricula and training materials for the Game Scout Training School, Mwanza, and the College of African Wildlife Management, Mweka.
3. Provision of educational materials for the beekeeping extension program at Tabora Beekeeping Institute.
4. Provision of selected natural resource graduate training fellowships for University of Dar es Salaam staff, including fellowships for training outside Tanzania in fields for which training opportunities are not locally available.
5. Provision of written and illustrated educational materials on natural resource conservation suitable for use in primary schools and village libraries.
6. Provision of natural resource curricula and training materials for use in Ministry of Agriculture Training Institutes (MATIs).
7. Provision of selected natural resource graduate training fellowships in support of government staff development in research planning, policy evaluation, and soil and water management.
8. Provision of film and video materials on natural resource conservation and utilization, for use by the Farmer Education and Publicity Section of the Ministry of Agriculture and Livestock Development.

Law and Policy Analysis

1. Evaluations of law and policy enforcement in the areas of anti-poaching and marine resource conservation, including suggestions for more effective enforcement and, where necessary, for additional legislation and/or administrative policy.
2. Planning for the initiation of a program emphasis in natural resource conservation in the Ministry of Agriculture and Livestock Development.

Like other proposals emerging from the field survey, the Tanzanian recommendations are developmentally defensible, locally endorsed, and politically nonthreatening in part because they embody relatively modest individual goals and input requirements. In light of their political neutrality and/or acceptability (e.g., law and policy analysis recommendation 1) and their likely synergistic effects, the recommendations offer a good place to begin on the long

road back to environmental protection through sustainable resource utilization.

Most importantly, the research and training activities identified in the Tanzanian field survey afford considerable payoff opportunities to each of the country's ideological, patrimonial, and bureaucratic elite groups, in terms of the potential of these activities for human resource development and their ultimate benefits for Tanzanian land users. As David Leonard (1986, p. 205) has maintained on a theme of general relevance to the four study countries, "positive acts of support for farmers bring gratitude and can be directed to the clients of a politician or civil servant, thereby bolstering the legitimacy of the regime and strengthening the patronage networks of those who work with it." The comparative implications of this important observation are considered in the conclusion to this paper.

Natural Resource Realities in Zimbabwe

Zimbabwe's most critical natural resource issues stem from a maldistribution of land in relation to population densities and the carrying capacities of the country's five natural agroecological regions. Seventy percent of the population lives under traditional tenure arrangements on 42 percent of the land, 74 percent of which at present only fit for range-extensive livestock production and game ranching. The remaining 30 percent of the population is settled on the commercialized 43 percent of the land, including much of the 27 percent urban segment residing mostly in Harare and Bulawayo. Forty-eight percent of the commercialized rural area is also unadaptable to rain-fed cropping (Cumming, 1984, pp. 12-13; World Bank, 1986, p. 180).

Although Zimbabwe normally satisfies all of its food requirements and exports farm surpluses, the negative impact of this demographic pattern on food production is both immediate and devastating under drought conditions. During the most recent period of dry weather in the early 1980s, maize output fell to its 1958 level. The country required 52,000 hectares (130,000 acres) of wheat for domestic consumption, and yet only 22,000 hectares (55,000 acres) were under cultivation. Drought-related cattle losses were projected to exceed 200,000 head (U.S. Congress, 1984, p. 26). Between 1982 and 1984, overall food output reached only 69 percent of that attained between 1974 and 1976. The daily per capita supply of food calories failed to meet more than 82 percent of the national need (World Bank, 1986, pp. 190, 234).

Dangerous as they are, these reversals are countered by Zimbabwe's considerable natural resource potential and managerial capability. The country is presently using only about 12 percent of its available water for agriculture. The commercial farming and livestock sectors are highly productive because they are favored with efficient services including finance, input supply, and marketing. Following independence, some of these advantages were readily transferred to the communal locations. In 1980, for example, 80,000 tons of maize were sold by peasant farmers. After a price incentive was introduced, peasants sold 280,000 tons of maize in 1981. In the last predrought year of 1982, 400,000 tons were officially marketed with no additional change in the price paid to peasant producers (U.S. Congress, 1984, p. 26). Following the drought, the government increased maize producer prices by another 28.5 percent (Eicher, 1986, p. 261).

Attempts are now being made further to integrate the communal lands into the national economy, and to rationalize rural settlement on behalf of labor-intensive rural development and natural resource conservation. An overarching goal is to double food production over the next decade by providing subsistence and small-scale commercial farmers with local marketing depots, credit, irrigation, animal health centers, and improved extension based on much-needed applied research. Sixty rural "growth points" are being established to organize such services and to discourage further urbanization. Over 1,000 local cooperative societies have been registered since 1980. Environmental rehabilitation is also assigned high priority, especially in the western Sebungwe region and in ethnically troubled Matabeleland South.

Regarding environmentally sensitive resettlement, policy makers are very specific as to their intentions. In the words of a senior ecologist in the Ministry of Natural Resources and Tourism, the government "will adopt measures to reduce existing unjustified differentials in physical infrastructure between commercial and peasant agriculture and will accelerate land resettlement schemes." It will also "restructure the scale, character and spatial order of agricultural production to make better use of natural endowments" (Cumming, 1984, p. 14). To help realize these objectives, a target was set of resettling 162,000 families by 1985, on land purchased from commercial farmers. To avoid the mistakes of Tanzania, no land would be nationalized¹³ and the settlements would be carefully planned in relation to local environmental and ecological variations. Four models were selected to guide resettlement:

Model A: Intensive village settlements with individual allocations of arable land and communal grazing.

Model B: Intensive settlement with communal living and cooperative farming.

Model C: Intensive resettlement combined with a centralised estate farm.

Model D: The use of state ranching land for grazing livestock and harvesting wildlife by neighbouring communities with a concurrent rehabilitation of communal grazing land, the introduction of grazing schemes and infrastructural development. Neighbouring communities have access to state ranches on a rotational basis. The model was developed for the low rainfall areas suited only to extensive ranching (Cumming, 1984, p. 16).

Only about 36,000 families were resettled by 1985 for two essential reasons. It is fully recognized that in order to be successfully carried out without a loss of economic confidence and also without serious production decreases and environmental deterioration, the act of moving people must be preceded by land purchases at fair market value and must be accompanied by the provision of services to make the resettled communities socially and economically productive from the outset. These requirements imply a level of capitalization that Zimbabwe has been unable to reach. Drought and world economic recession lowered export supply and demand and the British have failed to honor their pledge - made at the Lancaster House negotiations that resulted in independence - to supply capital for the purchase of land on a "willing seller, willing buyer" basis.

Despite this cash-flow problem, Zimbabwe has amassed an unusually sophisticated array of economic and technical policies linking rural development with resource conservation. The organizational infrastructure to operationalize and administer these policies is likewise impressive. Communal lands development and resettlement are led by the Ministry of Agriculture and Lands, through its Departments of Agricultural and Technical Services (Agritex), Research and Specialist Services, and Veterinary Services. Also involved is the Ministry of Resettlement and Rural Development and its Agricultural and Rural Development Authority (ARDA), Department of Co-Operative Development, and Department of Rural Development. Strong supporting services are provided by the

Ministries of Health and Water Resources and Development.

The Ministry of Natural Resources and Tourism is directly responsible for the conservation of forests, wildlife, and other resources through its Forestry Commission, Department of National Parks and Wild Life, and Department of Natural Resources. Through such units as the Centre for Applied Social Sciences and the Department of Land Management, the University of Zimbabwe plays an active research and public service role in environmental rehabilitation and resource utilization. Its training activities are supplemented at subdegree level by the fledgling Natural Resources College at Masvingo and by the expanding Zimbabwe College of Forestry at Nyabara. Although the top national leadership has declared its ultimate dedication to one-party socialism, Zimbabwe boasts a wide range of nongovernmental organizations, including four consulting companies and 24 private voluntary groups at least partly committed to environmental and natural resource conservation. Preeminent among the latter is the National Conservation Trust, which seeks to coordinate the others and to help find funding for their educational, research, and public advocacy endeavors.

Notwithstanding these demonstrations of concern, Zimbabwe faces a series of problems that endanger society and the environment in which it lives.

Communal and commercial smallholders continue to suffer from low productivity and poverty worsened by the damage to the rural infrastructure caused during the national liberation war and subsequent disturbances in Matabeleland.

There is also a growing landlessness in what remains a dual agrarian economy subjected to relentless population growth and recurrent drought. Land redistribution still confronts the financial and administrative dilemmas of how to implement the program widely and quickly without ruining commercial incentives and production. Not least are the mounting natural resource depletions and ecological dislocations affecting livestock and wildlife, soils, forests, and water.

Zimbabwe is a leader in wildlife utilization through tourism, trophy hunting, and game ranching. But in view of the large proportion of land environmentally best suited to this kind of economic use, and also in light of the fact that less than half of the investment flowing into beef and tobacco production is allocated to wildlife and fisheries, this level of attention is not nearly enough. As the senior ecologist in the Department of National Parks and

Wild Life put it, "the key is the extent to which we are prepared to forego short term gains in favour of the long term gains to be derived from sustainable systems of land use" (Cumming, 1985, p. 3). And as in other parts of Africa, short-term gains often take precedence regardless of their destructive long-term effects - in this case involving grazing lands, livestock, and wildlife resources that instead of being sustainably utilized are subjected to the devastations of overcrowding and poaching.¹⁴

The same sort of future awaits forest resources unless remedial measures are soon intensified. The Zimbabwe Forestry Commission has undertaken a major rural afforestation project that aims to improve the infrastructure for producing and distributing tree seedlings and planting woodlots in communal areas. The project embodies educational and extension components to promote tree planting and management by communal land users as an integral part of overall farm management. It also sponsors applied research in afforestation and fuelwood use, and monitors physical, social, and environmental changes influencing the sustainability of wood resources. These efforts are laudable, but with inadequate funds and personnel at the field level (interview, Ian MacLennan, Forestry Commission, Harare, January 17, 1986), they are failing even to slow a trend which the Commission is attempting to reverse:

Zimbabwe is currently moving towards an energy and environmental crisis in some of its communal lands, caused by the demand for wood being in excess of the long-term supply potential of the forests in these areas and the lack of alternative sources of energy and construction materials. It is estimated that 85 percent of the country's population use wood as their main source of energy for cooking and heating, with fuelwood accounting for at least 28 percent of the energy used in the country. The importance of wood as an energy and construction materials source, and the situation of excess and increasing demand, indicate the need to undertake measures to ensure adequate wood supplies in the future and to ameliorate the existing situation as far as possible (Zimbabwe, 1982, p. 2).

Soil erosion is closely associated with tree loss, and again especially in the communal areas where the soils are least resilient, where sound management practices are historically lacking, and where erosion is most advanced. Here too, independent Zimbabwe has initiated imaginative and potentially effective reforms that seek to conserve soil and other resources within the framework of exist-

ing communal land-tenure arrangements (see Martin, 1984; Murphree, 1985). The problem is that such attempts to reform the commons have failed to attract significant domestic and foreign-assistance investments, which are usually predicated on the local accountability presumed to result from individual as opposed to community land ownership.

As an example of this difficulty, after several years of preliminary research supported by a tiny operating budget (see Elwell, 1983; Elwell, 1984; Elwell and Stocking, 1982; Elwell and Stocking, 1984), by early 1986 a senior engineer in the Ministry of Agriculture was still unable to find funding for a project to measure soil erosion from new tillage systems randomly introduced on communal lands. In his frustration, the engineer prefaced the 1985 version of his proposal with the following warning:

I believe that we will be doing a great disservice to the communal areas by promoting the minimum tillage (and variations) called tine planting. The method was developed specifically for planting into dense mulch and was never intended to be used on bare soils. In my opinion soil loss and runoff from the treatment will be especially high, certainly a lot higher than from conventionally tilled lands.

We all know that soil loss and runoff in communal areas has reached dangerously high levels. We all agree that lands are deteriorating year by year and agriculture will eventually collapse. We are now on a downward spiral of accelerating deterioration and destruction which can be halted by only the most effective measures so far devised by man. Compromises are merely going to delay the evil day and divert valuable resources away from more effective measures (Elwell, 1985, p. 1).

Concerning water resources, one of Zimbabwe's developmental successes lies in commercial energy production from the Kariba Dam and thermal plant adjacent to the Wankie coalfield. Only 20 percent of the country's commercial energy requirements have to be met by imported petroleum, and this consumer of scarce foreign exchange is managed by price controls, by the use of gasohol, and by the substitution of diesel-electric for diesel locomotives. Other dams have been constructed for irrigation purposes (e.g., Kyle) and to augment urban water supplies (e.g., McIlwaine). While helping to address these needs, however, dammed lakes have also helped to create serious problems for people living in their vicinity. According to a recent study of Lakes Kyle and McIlwaine (Roggeri, 1985), these problems include unsafe drinking water and sanitation,

water-borne and water-related diseases, and the inevitable long-term hardships suffered by local communities displaced by lake formation without compensation or planned resettlement. Quoting another noted environmentalist (de Vos, 1975), the author of this study concludes: "It is realised that economic development can hardly be achieved without disruption of the environment, but such development should aim at minimizing the harmful effects upon the environment itself, upon public health and the welfare of mankind." Unfortunately in Zimbabwean water-resource development, this dictum is frequently not honored.

At root all of these environmental and ecological dilemmas relate to severe imbalances in the distribution of land, investment, and human productivity between the commercial and communal rural areas. These inequalities are not the products of nature, but rather of social, economic, and political decisions. Because of what Holmquist (1986, p. 1055) has called "the overwhelming dominance of state over society" in Zimbabwe, they can only be redressed through public-policy reforms that are made compatible with a series of political realities constraining natural resource conservation and sustainable development.

One of these realities has to do with the immediacy and brutality of Zimbabwe's colonial past, combined with the surviving white minority's attempted continuing influence over environmental protection and resource conservation. The fifteen-year period of guerrilla resistance to the former UDI regime left a residue of mistrust and animosity between blacks and whites, and among blacks themselves, persisting to this day. In the words of an observant journalist:

Paranoia is still a prominent feature of political life here. 'The tendency to characterize political opponents as 'enemies', the use of detention without trial and other emergency powers inherited from the white-rule days of Prime Minister Ian Smith, the frequent rights abuses - all can be seen as legacies of a war that should never have been fought, and went on far too long (Frankel, July 28, 1986, p. 19).

The seemingly endless conflict between the majority Mashona and minority Ndebele ethnic groups carries its own environmental consequences, in that some of the ecologically beleaguered communal areas lie in politically beleaguered Matabelerland. In the much less agitated sphere of resource politics per se, mutual wariness if not outright hostility is still present in relations between African policy makers and administrators and their white col-

leagues in government. Tension is even more pronounced when African public servants deal with white environmentalists and conservationists in the private sector. Domestic voluntary organizations (e.g., the National Conservation Trust) and international NGOs (e.g., Environment, Development Activities - ENDA) tend to be led by white Zimbabweans or expatriates, who often isolate themselves and are kept isolated from the African mainstream.¹⁵ The overall effect is a considerable dilution of what could be useful marriages of technical competence to political strength.

Stress and alienation appear in African ruling circles as well. On one side are elites deeply rooted in the Zimbabwe African National Union (ZANU), who participated in the independence war and are committed to a kind of populist rural socialism that features massive land reform, possibly on the Tanzanian model. They confront a better-educated and younger cadre of technocrats and bureaucrats who were generally not involved in the war, find natural allies in the business community and among larger farmers, and favor the same type of state-managed capitalism preferred by their Kenyan and Tanzanian counterparts.

The one thing upon which both groups agree is the need for an organizational and functional expansion of the state apparatus; but with either strategy, this outcome would likely further remove government from the society it seeks to influence in areas such as natural resource management. In Holmquist's judgment, "one or another development strategy may be adopted by the executive core without much of a popular base [of support]. The result could be 'reform' or 'revolution' from above, with the majority progressively distanced from the state" (1986, p. 1055). Thus far the regime has managed to balance the two policy approaches, but whichever finally prevails may find expression in a repetition of the recent Tanzanian and Kenyan experiences with highly centralized and popularly unresponsive governance.

From each of Zimbabwe's racial, ethnic, and ideological perspectives, the pitfalls of perceived expatriate intervention are wider and deeper than in any of the other countries studied in the natural resource field survey. For this reason the survey leaned especially heavily on the analyses and recommendations of its three Zimbabwean research associates and other key respondents. Nearly three times as many local generalists and specialists were interviewed in the latter category as were contacted in Botswana, Kenya, and Tanzania, and the associates were carefully selected by their own supe-

Training and Educational Materials Development

riors in national institutions chosen for their centrality to the policy process. One associate is a field researcher attached to the Department of Land Management at the University of Zimbabwe. Another is an assistant to the Director of Natural Resources, and the third is a research officer with the Ministry of Justice, Legal and Parliamentary Affairs.

In the same manner as for the other country proposals emerging from the survey's concluding natural resource conference, the Zimbabwe recommendations are based on the research associates' position papers (Hungwe, 1986; Gumbo, 1986; Thomas, 1986) and subsequent conference discussions. As might be expected given the political uncertainties of the moment, these recommendations are comparatively few and cautiously phrased. In applied research, the goals are to facilitate quick improvements in the natural resource knowledge base on communal lands, to find ways of strengthening institutional links between national research personnel and communal land users, and to synthesize ecologically optimal land-tenure policies by exploring the successes and failures of other African countries with longer records of post-independence policy making and administration.

The training and educational materials suggestions are directed toward evaluating and upgrading existing programs, with a view to adding natural resource emphases in communal lands policy making, law enforcement, and extension. Likewise, law and policy analysts recommendations seek improvements rather than transformations and aim toward transferring much of what has been successfully implemented in the commercial agricultural areas to the communal areas. These proposals follow in their entirety.

Applied Research

1. Investigations to develop district-level environmental and natural resource utilization profiles, especially for districts located in the communal lands.
2. Pilot investigations to find ways of improving communication between natural resource researchers and extension personnel, for example, by conducting discrete agricultural land-use experiments in situ, on farmers' lands.
3. Comparative evaluations of the effects on environment and natural resources of various land-tenure systems found in different African countries and agroecological zones.

1. Provision of inservice training materials and curricula for law-enforcement officers and economic development planners in areas having to do with natural resource conservation and sustainable utilization.
2. Evaluations of the content and effectiveness of extension education programs, in order to assess and increase the extent to which natural resource use and conservation are linked in these programs.

Law and Policy Analysis

1. Policy evaluations of Zimbabwean land-tenure systems, toward developing a legally enfranchised land-tenure system for communal areas that encourages natural resource conservation.
2. Investigations of how conservation strategies can be built into individual agricultural and rural development projects.
3. Assessments of how to improve interministerial and interagency coordination in the development of communal lands, recognizing that such development must necessarily involve all facets of the communal lands environment.
4. Topically specialized investigations of how the Communal Land Development Plan of 1985 can be revised more fully to incorporate resource conservation goals and strategies.
5. Investigations of how district-level environmental and natural resource profiles can be most effectively employed in village planning exercises and development projects.

To a very large extent, Zimbabwe already possesses the necessary skills and political motivation to undertake these ground-breaking activities, and thus to clear the way for an integrated approach to natural resource conservation applied throughout the country. What it lacks is a reliable means to initiate new programs of this type. In addition to the problems of periodic drought and uncertain international markets, national security and the economy are both dependent on South Africa. Prime Minister Mugabe's support for the South African resistance movement and his demand for economic sanctions against the white minority regime have resulted in mounting retaliations in kind.¹⁶ Zimbabwe's position on South Africa has also disrupted relations with the United States, which until recently provided the country's largest single share of bilateral foreign aid.

These political and economic threats have prompted a renewed attempt by the ZANU government to reach a domestic reconciliation with the dissident Joshua Nkomo and his Ndebele followers.

For reasons that are negative economically but increasingly positive on the local political scene, the time now seems right for assisting Zimbabwe in establishing a conservation-for-development tradition among all its people. This estimate encourages the further work planned for the natural resource conservation project, which will begin with helping to operationalize the recommendations developed by the initial field survey's Zimbabwean research as-sociates.

Regional Realities

Efforts at regional economic and political cooperation have produced mixed but generally disappointing results in post-independence Africa, and no less so in eastern Africa following the 1977 collapse of the East African Community. The recent creation of the Southern African Development Coordinating Conference (SADCC) brings fresh hope for a regionalization of selected development processes, including some of those associated with natural resource conservation. In terms of environment and resources, eastern and southern Africa are no more separate entities than are the countries located here, countries which share ecological zones and enjoy potential comparative advantages in resource availability and use. SADCC is now establishing regional offices to deal with important resource problems such as soil erosion and tsetse-fly control, and with the exception of Kenya, all of the countries surveyed for this study belong to SADCC. For its part, Kenya is already a regional economic hub and is thus well placed to cooperate less formally with its close and more-distant neighbors.

These possibilities remain nascent, however. Institutionally weak at home, national elites are very reluctant to transfer even limited domestic policy prerogatives to regional organizations. The colonial experience also introduced regional economic and infrastructural inequalities that became progressively more structured, so that cooperation among countries is perceived mostly to benefit some (e.g., Kenya) at the expense of others (e.g., Tanzania). Another constraint is present in border-related hostilities, as occurred among Kenya, Tanzania, and Uganda during the late 1970s and early 1980s and quite recently between Zambia and Zimbabwe over cross-border raids by Zambian poachers.

Bilateral foreign assistance agencies respond to these problems, and to their own foreign policy imperatives, by framing virtually all of their development projects in national terms.¹⁷ Multilateral public and nongovernmental programs are likewise biased in this

direction; and when they attempt to support regional institution-building activities that would promote regional economies of scale through international diversifications of effort, the realities of African nationalism often intervene to thwart these initiatives. For example, the United Nations and private organizations have long endorsed the establishment of regionalized research and training in the conservation and management of wildlife. Their attention is focused on the College of African Wildlife Management at Mweka, Tanzania, which is among the most comprehensive and sophisticated wildlife centers in eastern and southern Africa, and which received a steady flow of students from other African countries when economic conditions were better. The idea is formally to coordinate Mweka's work with the more limited activities of other national wildlife centers, thereby achieving free and permanent exchanges of information and students within a rationally differentiated system of institutions.

Mweka is currently experiencing severe financial difficulties and is operating at less than half its student capacity (interview with Dr. Hugh Lamprey, Regional Director, World Wildlife Fund, Nairobi, March 10, 1986). Increased international support and a greater supply of students would almost certainly be made available if Mweka were to be officially declared a regional institution (see Hutagalung, 1983; African Wildlife Foundation, n.d.). And yet the Tanzanian government continues to insist that while the college is deeply imbued with a regional character, it must remain nationally chartered. The effect is that other countries must try to duplicate Mweka if they desire reliable access to all of what this center offers (with diminishing resources and demand) in support of wildlife conservation and management. Among the countries discussed earlier, this means expanding the Wildlife Training Centre at Maun, Botswana, the Wildlife and Fisheries Training Institute at Naivasha, Kenya, the Natural Resources College at Masvingo, Zimbabwe, and additional research and training institutions at degree and sub-degree levels.

Under these kinds of circumstances, the field survey and its research associates approached the regional linkages question with great caution. The associates were able to agree on three regional recommendations for natural resource research and one omnibus proposal on training, but with less assurance of official support than for their national recommendations. Over the broader range of resource issues, all but one of these suggestions parallel the regional institution-building initiatives still underway on behalf of

What, then, can be concluded about conservation for development in eastern and southern Africa? It can first be said that the most critical arenas of natural resource policy extend between the capitals and rural peripheries of countries such as Botswana, Kenya, Tanzania, and Zimbabwe. Regional attempts at natural resource problem definition and policy solution face obstacles for which there is simply not enough time to overcome. At the national level, however, the environmental and ecological reversals of the past two decades have expanded the realm of the politically and developmentally possible by compelling African policy makers and intellectuals to think pragmatically about their societies. And here as elsewhere, it is this kind of elite pragmatism that will finally result in political stability and sustainable economic development - so that we may ultimately speak of a genuinely African public policy emerging from the present confusion of political decision making about natural resources and their use. The external role should now be to understand the specific workings of this trend in its discrete national settings and without fanfare to support it, regardless of its occasional rhetorical contradictions and even its short-term failures. The alternatives are simply not acceptable to the long-term interests of Africa and of humanity in general.

Conclusions

Training and Educational Materials Development

1. Projects that, by providing training opportunities, curricula, and teaching materials, further reinforce and develop existing national centers of educational excellence and also maximize regional comparative advantages in the various aspects of natural resource training and education.

Applied Research

1. Projects to facilitate systematic exchanges of research expertise and information on natural resource conservation and sustainable utilization.
2. Projects for the development of regional data banks on resource conservation in eastern and southern Africa.
3. Regional investigations of inherently international natural resource issues - for instance, problems of natural ecosystem management in border areas, including migratory game-animal requirements.

wildlife conservation and utilization.

If they are to help African countries restore their ecological balances, international centers of technical and economic assistance will have to abide by a principle acknowledged in the natural resource conservation project - of letting Africa speak for itself on such issues and of listening carefully to what is said and why. Returning to a theme raised earlier, it is decisively important to appreciate the extreme institutional fragility of African leadership and its need for distributional benefits to dispense as patronage. In order to make the policy process politically as well as economically rational, that which is distributed should be widely regarded as essential and should also be self-sustaining. As David Leonard has again observed, "one way to raise political returns while lowering economic costs is for benefits to be provided in such a way that they can be given again rather than constituting a permanent drain on resources" (1986, p. 206).

In the countries surveyed, patronage benefits in the latter category include guaranteed access to cattle, public sector jobs (some of which allocated in such a way as to reinforce class and ethnic divisions), subsidized food prices for urban dwellers, ideologically motivated but technically and economically unassisted land-tenure and land-use policies, and highly unbalanced economic growth strategies encouraged by foreign aid and prompted by a concern over short-term commercial gains that is excessive from a human ecological standpoint. Sustainable patronage rewards, on the other hand, are those which produce multiplier effects in terms of human welfare and productivity. They include grass-roots improvements in public health and social services (e.g., clean water and education), physical infrastructure (e.g., feeder roads and marketing facilities), and productive capacity (e.g., rural credit and extension). Because many of these innovations are small-scale and labor-intensive, they can be designed to afford widespread if temporary employment opportunities in addition to more permanent material advantages. Underlying and complementing them are similar field measures, such as most of those proposed in this study, to promote environmental recovery and sustainable resource use. These, it can be argued, form the ultimate in self-regenerating patronage benefits for society, and thus embody the ultimate in political rationality for national elites and international development sponsors whose other goals depend on political stability and social harmony. Since one would like to think that they comprise the majority of influentials holding sway in countries like those studied here, the way should be clear toward

changing African natural resource realities in an environmentally and ecologically more balanced direction - that is, once the latent political will to accomplish these purposes is supported in its inclination to become manifest.

Notes

¹According to World Bank estimates, average per capita food production for 1982-1984 fell to 61 percent of its average for 1974-1976. This represents the world's largest drop in production for the same period. On the other hand, Botswanans managed to satisfy 93 percent of their daily food calorie requirements in 1983, an average not good but 4 percent higher than for other middle-income African countries (World Bank, 1986, pp. 190, 234).

²Heretofore, most resource-related research and development work has been performed by expatriates (see, for example, Yeager, 1986, pp. 29-46).

³In all likelihood, the growing number of cattleless urban dwellers will further intensify the demand for social and economic alternatives to cattle.

⁴This 682,000-ton total for 1983-1984 was exceeded only in Mozambique, Sudan, and Nigeria, the latter's imports consisting entirely of purchases from oil revenues. By the end of its own emergency in 1985, Kenya had imported more than 850,000 metric tons of food.

⁵As one indicator of Kenya's emerging resource crisis, it has been estimated that if the present rate of deforestation continues, the country will lose all of its forests outside specially protected areas by the end of this century (Kenya, 1984, p. 3). Seventy-five percent of Kenya's fuel is derived from trees and other woody plant materials.

⁶One of these international NGOs (Environment Liaison Centre, 1982, pp. 5-10) reported that in 1982 fully 29 Kenyan NGOs were engaged in the promotion of renewable energy resources. Official sources indicate that more than 20 such organizations are committed to forestry and agroforestry (Kenya, n.d., Appendix II, pp. iv-vii).

⁷Involving, for example, forestry, fisheries, mining reclamation, environmental surveys and training, renewable energy resources, irrigation and water supplies, dryland farming, and multisectoral rural development.

⁸Obstacles to this kind of wildlife utilization are not entirely patronage-based. South Africa and Zimbabwe (formerly Rhodesia) are the only countries in former British Africa encouraging such use, having first amended statutes forbidding it that were applied throughout British Africa, originate deeply in Anglo-Saxon law, and are elsewhere still on the books. Pressure to change these laws in South Africa and Rhodesia arose in these countries' substantial white farming communities - larger and more influential than their Kenyan counterparts - which recognized yet another opportunity for profit in game ranching and commercial hunting.

⁹Kenya has recorded notable success with one multifaceted compensation scheme for Maasai herders in the vicinity of Amboseli National Park. To encourage conservation of Amboseli's grazing land and game animals, the government shares some of the park's tourist revenues with the Maasai, and also compensates them for cattle lost to wild predators. Government has also established watering points outside the park to lessen livestock pressures within. According to Lloyd Timberlake (in Berg and Whitaker, 1986, p. 124), these measures contributed to a doubling of the Amboseli rhinoceros population between 1977 and 1983, and to further increases in elephant, buffalo, and migratory ungulates.

- ¹⁰ Including drastic reductions in Tanzania's \$3 billion debt, strict limitations on any further expansion of the money supply, currency devaluation, elimination of producer price controls, rationalization and reduction of parastatal and government employment, higher producer prices for export crops, and greater investment in the export sector together with a guaranteed privatization of production and services functions.
- ¹¹ An early example occurred in late July 1986, when workers rioted at the Kilombero Sugar Company in protest against low wages and fringe benefits, which were further reduced by the most recent currency devaluation. Minister for Finance Cleopa Msuya promised higher wages and benefits for the sugar workers, but the source and timing of these increments remained unclear - as did the potential of this incident to form a precedent for similar actions by other employee groups.
- ¹² Primarily involving land-use planning, soil and water conservation, environmentally sound crop and animal husbandry, afforestation and agroforestry, and assistance to migrants from overpopulated areas.
- ¹³ In spite of strong political pressure to give land to people who had supported Zimbabwe's liberation war.
- ¹⁴ Countermeasures like "Operation Windfall" offer hopeful alternatives to these prospects. Concentrating on Chizaria National Park and Chirisa Safari Area, this anti-poaching program contributed the proceeds from official elephant culling to two local government councils for investment in whatever development projects they determined were most needed. The councils received almost \$1 million between 1981 and mid-1982, and as a result, elephant poaching dropped to the extent that game wardens were no longer considered necessary in Chizaria and Chirisa (Timberlake in Berg and Whitaker, 1986, p. 123).
- ¹⁵ An example is provided by the great difficulty experienced in developing a national conservation strategy for Zimbabwe. As in Botswana and other African countries, the effort was initiated by the Swiss-based International Union for Conservation of Nature and Natural Resources. Responsibility for arriving at a Botswanan conservation strategy was firmly lodged in the Ministry of Local Government and Lands, but in Zimbabwe IUCN selected a local NGO, the European-led National Conservation Trust, to coordinate the input of official and private agencies concerned with natural resource conservation. Except for token membership on the task force assembled by the Trust, official Africans remained uninvolved as the largely white membership debated the strategy through six preliminary drafts. By early 1986, the document had still not been reviewed, approved, or even requested by government, and the Department of Natural Resources was planning to evolve its own strategy proposal which might or might not incorporate elements of the final IUCN/Conservation Trust draft.
- ¹⁶ These reprisals may be more seriously felt than similar punishments meted out against Botswana. Botswanan President Quett Masire has been much more cautious in his government's anti-apartheid statements and actions, and South Africa is apparently somewhat reluctant to destabilize its principle source of diamonds.

¹⁷ The U.S. Agency for International Development (USAID) does maintain two regional offices in Nairobi, the Regional Economic Development Services Office for Eastern and Southern Africa, and the Regional Housing and Urban Development Office for Eastern and Southern Africa, but the work of these organizations is mostly confined to providing analytical, financial, and administrative support services for USAID country missions in the eastern and southern regions.

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Natural Resource Conference Summary

Rodger Yeager

This section reports on the African-Caribbean Institute's Natural Resource Conference, which completed the fieldwork portion of the Natural Resource Project. The conference was held in Nairobi, Kenya from April 1 to 5, 1986. As indicated earlier, 14 African research associates were recruited in the months preceding, to develop natural resource-related inventories and priority needs assessments in applied research, training and educational materials development, and law and public-policy analysis. The research associates were asked to seek informal official approval of these position papers, and to deliver them at the conference. Summarized in the next section, these documents set the conference agenda and provided a basis for the recommendations outlined in the preceding country and regional analyses.

The conference had three major objectives:

1. To develop national and regional recommendations for further research and educational work that promise immediate conservation and developmental payoffs and can be implemented by African professionals with only modest infusions of external financial and technical assistance.
2. To bring these recommendations to the attention of bilateral donor agencies, multilateral development institutions, and non-governmental organizations whose programs feature a heavy emphasis on one or more aspects of African natural resource conservation.
3. To initiate a dialog with these bilateral, multilateral, and non-governmental bodies, toward the development of an African fellowship program that would provide small amounts of financial assistance in the implementation of the conference recommendations and others that will probably emerge in the future.

A full listing of conference participants is appended to this volume. The meetings were opened by the Honourable Phillip Leakey, Kenyan Assistant Minister for Foreign Affairs, who delivered an address for his minister and conference patron, the Honourable Elijah Mwangale. This speech captured the essence of the gathering's purposes and goals:

Mr. Chairmen, Conference Delegates, Distinguished Guests.
I am honoured to open this conference. To our visitors from Botswana, Tanzania, and Zimbabwe, Karibuni Kenya! I ex-

- Secondly, the conference is oriented toward problem solving. It brings together for frank and open exchange representatives of key governmental, nongovernmental, and academic institutions, in addition to important bilateral, multilateral, and philanthropic organisations.

- First, the conference is international in scope, which accurately reflects the broad challenges of natural resource conservation and utilisation.

In three important respects, your next five days promise to yield major conclusions:

- And at root the basic poverty of many African peoples which must be overcome if we are to attain any of our other developmental goals.

- The fragile qualities of Africa's varied ecosystems, which must be respected if we are to prosper at all.

- Domestic economic constraints and international economic uncertainties which make it extremely difficult to realise the vast potential of Africa's human and natural resources.

- High rates of population growth, rural land pressure, and urban immigration, which outstrip productive capacities and give rise to pressing short-term issues of food sufficiency, health care, and employment.

To suggest a few that concern your conference:

It goes without saying, Mr. Chairmen, that the subjects of this week's discussions are of vital importance to all of Africa. Events of the last fifteen years have forcefully driven home the crucial links that exist between our societies and their living habitats. These links must be protected if we are to achieve a level of development sufficient to meet the needs of this generation and of those to come. We are well aware of the problems threatening to disrupt these balances.

I end an equally hearty welcome to those of you from Kenya and to our friends and colleagues from other parts of the world. Finally, at the outset, Mr. Chairmen, I also want to express my appreciation to five organisations for making this conference possible: to the African-Caribbean Institute for organising it; to the Ford Foundation and the United Nations Environment Programme for supporting it financially; to the International Union for Conservation of Nature and Natural Resources for providing additional administrative support; and to the United Kenya Club for extending its generous hospitality.

All share a concern for Africa, its people, and their development.

- Thirdly, Mr. Chairmen, the conference's deliberations will properly focus on eastern and southern Africa's *self-expressed* needs and goals in natural resource conservation and utilisation.

This last point is especially significant. The conference is designed to put African priorities first, to have Africans set these priorities, to have African institutions provide the leadership.

My understanding is that you will approach your work from three perspectives, which also seem commendable:

- First, an analysis of applied research needs in natural resource conservation and utilisation.
- Second, an analysis of manpower needs, training, and training materials.
- Third, an analysis of problems surrounding how public policies can be made and administered more effectively.

I trust that your deliberations will arrive at long-term programmes to attack these problems systematically. I see you are to discuss the possibility of an African fellowship programme to serve such purposes, and I ask that each of you put some of your best thinking into how this plan can be brought into being. The goal should be to train and otherwise support young Africans in natural resources fields, and thereby to ensure their future contributions from a broad, integrated standpoint. This is your greatest challenge.

In closing, Mr. Chairmen, I should stress that this conference is designed to encourage a completely candid, open-ended exchange of ideas. This is a free seminar to express the problems and needs of Africa. We all look forward to your conclusions and recommendations, and to the good work that can flow from them.

Mr. Chairmen, I now declare this conference open.

The 14 project research associates served as formal delegates to the Natural Resource Conference, and delivered their position papers in the first six substantive sessions extending over the first two days. In the last session of the second day, the delegates divided into three working groups according to their specialty areas and developed preliminary lists of national and regional fel-

lowship recommendations in research, training, and policy analysis. These recommendations were distilled from the position papers and, as such, reflected extensive prior input - if not final endorsement - from the governmental and academic institutions which most delegates represented.

The lists were reproduced and distributed at the next morning's opening session. The delegates explained their recommendations during this session, and invited comment and suggestion from the other participants. These were asked to respond in terms of their own organizations' approaches toward furthering natural resource conservation and sustainable utilization.

Beginning with the bilateral donor agencies, the respondents outlined their institutions' program and project-level priorities in African resource conservation. They also offered advice on how the delegates' fellowship recommendations could be operationalized to make them compatible with public and nongovernmental development activities funded in part from external sources.

One unavoidable limitation to these discussions lay in the fact that most of the respondents' programmatic responsibilities are limited to Kenya. This artifact of the conference location made it difficult for the respondents to comment specifically on many of the Botswanan, Tanzanian, and Zimbabwean recommendations. The third and fourth-day sessions proved very useful, however, in that they enabled the conference to highlight the kinds of natural resource activities that (a) seem applicable in more than one country, (b) are currently receiving the attention of governmental, foreign assistance, and nongovernmental agencies, and (c) can be productively supplemented through an African fellowship program.

It was generally concluded in these sessions that such opportunities attach especially to the following:

1. Selected technical assistance projects and locally funded programs in rural land use, soils, water, forestry and agroforestry, and wildlife.

2. Staff preparation and educational materials development in connection with these programs.

3. Performance evaluations of domestic laws and administrative policies governing program activities in the natural resource sector.

It was also agreed that most of the final conference recommendations should be viewed as priority areas of concern rather than as specific proposals for action.

The next task of the Natural Resource Project, in this view, should be to operationalize these recommendations by aligning individual research and training activities with larger developmental initiatives endorsed by the respective national governments and undertaken with foreign and/or domestic funding.

The closing sessions of the conference were limited to the delegates, the Natural Resource Project directors, and other representatives of the participating African governments who attended the conference. During these sessions, the delegates' recommendations were put into finished form and a method was devised for their realization through a five-year African fellowship program.

Based on the results of the Natural Resource Conference and on later advice from individuals in a variety of governmental, academic, and donor institutions, the African-Caribbean Institute is devising a five-year program that can be extended to 10 years. The program's underlying philosophy stresses "Africa first," encouraging Africans themselves to set natural resource research, educational, and policy agendas. A broadly integrated intersectoral approach is likewise conceived, one that emphasizes conservation through well-informed resource utilization. Marginal lands, particularly in arid and semiarid environments, and other fragile ecosystems (e.g., forests, coastal and riverine zones, lake basins, and grassland savannas) form the program's grass-roots focus.

The African fellowship program is intended to become financially self-sustaining in a very short time through the implementation of a multi-donor system. It is planned that contributors will join the program by offering small grants for research and training fellowships in their own projects, with the funded fellows playing a significant role in project refinement as well as execution.

The program's regional focus will remain eastern and southern Africa, with the first fellowships planned for the four countries examined in the initial field survey and possible subsequent fellowships for other eastern and southern African countries. Operational responsibility for the African fellowship program will lie with the African-Caribbean Institute, which will administer the program from its Nairobi office. An international staff, predominately African, will carry out day-to-day operations, following the lead of governmentally appointed national advisory boards that will coordinate the selection of fellowship activities and the recruitment of individual fellows.

Conference Working Papers Summaries

Botswana

Natural Resources Policies and Activities in Botswana

Seeiso D. Liphuko

Ministry of Local Government and Lands

Two-thirds of the land area of Botswana has a harsh climate, is covered with thick Kgalagadi sands and has almost no surface water. The remaining third, in the eastern part of the country, contains all the perennial water sources and fertile land the country has, but still suffers from inadequate rainfall. Drought is endemic. The country has been drought stricken for the past four years. The majority of the country's population lives within this confined area, and is growing at a rate of 3.49% per annum. Population and livestock growth has led to extreme pressure on areas where natural resources are accessible. Botswana has traditionally been considered an underpopulated country; this perception should be reconsidered in light of its extremely limited natural resources.

Botswana's economy is reliant on beef production, which used to be the country's primary source of foreign earnings, but is now second to mining. Although some 5% of the population own about 70% of the national herd, about 70% of the population derive their livelihood directly or indirectly from livestock. The people consider livestock a store of wealth; therefore even careful stock control legislation fails to reduce the increasing cattle population. The mining sector is the country's major foreign exchange earner, the driving force behind the 9-10% yearly economic growth rate the country has had since 1966. The mining sector employs only 7.2% of the population. The economy is extremely vulnerable to mineral price fluctuation.

Natural resources planning is dealt with sectorally by the main line Ministries of the Central government: the Ministry of Agriculture, the Ministry of Mineral Resources and Water Affairs, the Ministry of Local Government and Lands. Each Ministry has its own policy, goals, and objectives for its sub-system of the ecological whole. The government has established a number of inter-ministerial committees; these committees provide a good forum for inter-ministerial discussion, interchange of information and ideas, and negotiation and compromise in areas of conflict. The system operates on the basis of consultations.

At the local level, natural resource planning is coordinated through the District Development Committee and the District Land Use Planning Units. The purpose of these groups is to improve coordination by bringing planners from all District sources into a cohesive action unit. Central Government policies are implemented through these structures. At the grass roots level natural resource planning is done through Village Conservation Committees, Farmers Committees, Village Development Committees, etc. Ministerial extension staff provide contact between the policy makers and the actual natural resource users; this link could be significantly improved. The problem with this overall structure is that it is top-bottom-policy formulation is initiated only at the top.

The existing NGO's in Botswana play a significant role in the management of natural resources. They are most active in the field of gathering data, conducting seminars, workshops, lectures, tours, etc. They have little contact with people at the village, land and cattlepost level. There is a clear need for an NGO which could implement environmental education at this level.

Botswana's National Conservation Strategy is currently in preparation. The government's four national policy objectives are: rapid economic growth, social justice, economic independence, and sustained development. It aims to achieve rapid and large returns from intensive investment in mining, then re-invest to improve living standards. The primary theme for the development of the country's natural resources is to achieve rural development and employment creation. This will be constrained by lack of trained manpower and reliance on foreign expertise, lack of finance capital, and lack of adequate data and information. Another problem is the citizen's lack of awareness of the implications of their present natural resource management practices. Environmental awareness is lacking through all levels of society; a national environmental education strategy is needed to address this problem.

Although it does make statements on natural resource conservation, the National Development plan is a development strategy. The National Conservation strategy will address basic environmental issues that the Development plan fails to cover. The government is currently preparing the National Conservation Strategy (NCS), and is using a down-up approach to policy formation; the policy is coming from the people. There are widespread consultations at the district level. It is hoped that the people's views, concerns, attitudes, needs, etc. will be identified and reflected in the NCS, and that it will include the ap-

proaches and techniques of resource conservation that the society has developed over generations.

The immediate concerns the NCS will have to address include manpower training, environmental education, anti-poaching measures, wide-scale sanitation programs. In the long term, the NCS must have desertification, range management, deforestation, wildlife utilization, and land use policies. It can be expected that some of these proposals will be controversial and politically sensitive. The government will have to show a strong political will to overcome its fear of unpopularity. A strategy of national environmental awareness will be needed in tandem with the implementation of conservation projects. To help the government an NGO could provide conservation education materials for display at the village level, promote conservation training in universities, and fund natural resource research.

Inventory of Botswana Laws and Administrative Policies in the Areas of Natural Resources Conservation and Agricultural Development

Dipholo K.P. Dipholo, Ministry of Agriculture

Botswana has a number of reasonably good environmental laws. The laws are implemented by different authorities and ministries, causing gaps, overlaps and sometimes conflicts. A UNEP mission to Botswana identified this problem and recommended that the government pass legislation to establish an environmental authority responsible for the protection, enhancement and management of the total environment. The mission also recommended that Botswana's environmental legislation be collated, streamlined and updated.

Many of Botswana's environmental laws are not implemented. The government strongly believes that the people must be educated, persuaded and encouraged to improve the environment rather than be forced to by laws. It feels that the laws should be used to support environmental education efforts. In some cases the government tries to offer people opportunity to try other, less environmentally damaging activities, rather than passing legislation that tries to stop people from continuing to over-utilize resources. The government is encouraging agricultural diversification, hoping to persuade farmers to try agricultural activities which have a lesser impact on the range land resource than activities such as grazing. Many environmental laws are not implemented because the government lacks the financial and manpower resources to enact them. Also, many people who are

affected by these laws do not understand them, or do not even know that such laws exist.

Natural resource policies are founded on four national principles which are rooted in Botswana's traditional culture: democracy, development, self reliance, and unity. Based on these principles, Botswana has four main planning objectives: rapid development, social justice, economic independence, agricultural and rural development. Agriculture is the backbone of the rural economy, directly involving four-fifths of rural households. Botswana's agricultural policy aims to help farmers earn a secure livelihood, to raise national income by increasing the value of agricultural production, and to maintain agricultural land for future generations.

Research and Training Trends and Needs in the Field of Natural Resource Conservation in Botswana

R.M.K. Siliishena, University of Botswana

If African countries are to successfully grapple with the problems of environmental degradation and resource depletion, they need to have properly trained and motivated manpower. In Botswana basic low level training is available in the fields of agriculture, soils, land use and surveying, range management, wildlife and wildlife management, local government and land board administration.

The Botswana Agricultural College (BAC) offers a diploma in agriculture and related fields, and a certificate programme for extension officers or agricultural demonstrators. The students receiving diplomas work as supervisors of extension staff. The programmes of BAC include science, animal production, veterinary studies, land use, agronomy and socio-economic studies such as agricultural economics and extension. Some environmental training is included in soil science and management, land use, soil conservation, and range management. The facilities of the college have been improved recently; it has the capacity to increase enrollment.

The Wildlife Training Centre at Maun offers a two year certificate course for game scouts. For training past this level, students must go outside Botswana to institutions such as the College of African Wildlife Management in Tanzania.

The Polytechnic runs a one year certificate course for the Land Board technical staff. The course upgrades the academic level of the

entrants in science, math and English, then teaches soil science, land law and tenure, land use planning, surveying and practical techniques such as cartography and photogrametry.

The University of Botswana specializes in training at the tertiary level, although it does have certificate and diploma courses that produce low and middle level manpower, for example, a short course in Land Board Administration. The subjects include local government, general administration, land board administration, land law, financial administration and personnel management. The University also has degree courses in the Departments of Environmental Science, Biology, Public Administration and Law that include environmental training.

These institutions face several problems. There is a shortage of qualified candidates who have an adequate academic background. The G.C.E. "O" Level graduates are readily absorbed by other tertiary institutions such as the University. This problem could be addressed with a special programme to raise the academic level of potential entrants. Another problem the training programmes face is the limited number of jobs available for graduates. For example, so few game wardens are needed in the country that it does not warrant offering a full course. Often there are not sufficient funds to send students to training programmes outside the country.

It does not seem possible at the moment to attract G.C.E. "O" level graduates into these courses, therefore it will be necessary to continue to recruit those with J.C. qualification and upgrade their academics. There is a need for in-service training within the country for staff at all levels. These courses could be taught by local experts, augmented by outside experts if necessary. This would ensure that the training is directly relevant to the work and would minimise the officers' time of absence.

A great many areas of research need attention. Current research projects tend to be of short duration. There is a need for monitoring of developments over a long period of time. Soils need to be mapped; the country must be divided into agro-ecological zones. The consequences of tsetse spraying must be investigated. Breeding of better millet, maize, and sorghum plants suited to the natural environment must be increased and germ plasm conservation of local plants done. Legislation relating to urban and industrial pollution must be reviewed to learn if it is adequate to deal with problems that will arise out of future industrial development.

Current Research on Botswana's Natural Resource Conservation

One million people and three million cattle are distributed across Botswana. The natural environment is best described as marginal-rainfall is deficient and drought endemic. The soils are poor, and 80% of the country is blanketed by the Kalahari sands. The vegetation is fragile and susceptible to degeneration if over-exploited.

The traditional economy of Botswana is based on livestock, which was the cornerstone of the economy at independence. Since the discovery of mineral resources, especially diamonds, the economy of the country has been transformed to a mineral-led economy. The mineral industry has boosted foreign exchange earnings and government revenue, however it has not solved the country's unemployment problem. Most people continue to reside in the rural areas and expect to depend on agriculture for their livelihood in the future. Thus the resources that have sustained the population in the past-land, soils, vegetation, water and wildlife-must be exploited in a manner that ensures sustained development.

Work is underway on the drafting of a Conservation Strategy. UNEP has encouraged the Environment Development Linkages Project, which has several objectives: compilation of an overview of the State of the Environment in relation to economic development, review of present and anticipated problems and the options to alleviate them, and surveying the current conservation related institutions and laws. Conservation related research is being done in many areas.

The Geological Survey Department has done a considerable amount of research in the area of minerals and water resources. Regional geological mapping has provided a better understanding of Botswana's geological framework, laying the foundation for mineral and groundwater exploration. This revealed that groundwater provides at least 80% of the country's rural water supply. Research has been done on the dynamic behavior of groundwater reservoirs-their response to rainfall, droughts, pumping and human activity. Hydrogeological reconnaissance mapping has been done over the entire country to show groundwater development prospects. Groundwater pollution from pit toilets has been studied. "Demand initiated studies" were done to locate reliable water supplies for human settlements. The research done on Botswana's soils is "limited and patchy"-most of the country remains to be analyzed. Land use studies have found that human and livestock numbers have increased much faster than crop production, and that the population increase was absorbed

by previously unused land opened by new technology—for example, the boreholes in the Kalahari. Cash employment opportunities in cities have encouraged urban migration and increased the inequality between rural and urban areas. Research has found that the power of traditional authorities in resource allocation and management have been reduced and replaced with new, more democratic, but untried institutions. It has also been found that the traditional spatial segregation of livestock and crop production has collapsed. "Mixed farming" has emerged; the areas where it is practiced are generally overcrowded. Research on landlessness has shown that it is not caused by land shortage, but by the lack of means to farm. Many farms are unoccupied because they have not been reallocated.

Most rangeland research has been done by the Animal Production Research Unit of the Ministry of Agriculture. Range assessment techniques have been developed, both ground based and using satellite imagery. Research has been done to determine stocking rates in relation to ecological carrying capacity, and to compare the traditional continuous grazing system practiced in the communal lands with a rotational system. A study done on pasture improvement has resulted in greater use of legumes.

Forestry and firewood resource research suggests that large scale cutting should be reserved for wildlife-commercial forest in Kasane and Ngamiland, where the total amount of timber available and rate of exploitation on a sustained basis have been determined. Firewood research at the National Institute of Research found that people were walking twice or three times as far to collect fuel as they did 10 years ago, and that village people were well aware of dwindling firewood resources. There is debate as to how to deal with the fuelwood shortage. One researcher supports eucalyptus woodlots, while others feel that eucalyptus lowers the water table. The Botswana Renewable Energy Technology Project has approached the problem from a different direction, developing retained heat cookers and village solar water heaters. It is critical that these technologies be disseminated throughout the rural areas.

Wildlife is one resource that is still available to a considerable extent. It is the cornerstone of the tourist industry. The Countrywide Animal and Range Assessment Project estimated the numbers of the different wildlife species found in the country, the allowable harvest rates, and the income that could be made. An important study was done of public attitudes towards wildlife, finding that the Botswana people had a generally utilitarian attitude towards wildlife. People

perceived animals as meat, and regarded conservation as a theistic responsibility. The idea of regulated hunting is alien to the traditional culture. It was found that the benefits of tourism are not visible to most people, who therefore can't understand why potential grazing land should be reserved for wildlife.

Kenya

Natural Resource Conservation Policy in Kenya

D. Kamau, *Ministry of Environment and Natural Resources*

Most of Kenya's land area is either arid or semi-arid; only 17% of Kenya's land has high agricultural potential. This high potential land contains about 80% of the total population of 20 million people. Kenya has a high fertility rate; population has been increasing at a rate of 4% per annum. By the year 2000 the population is expected to be about 35 million people. The rising population in the high potential areas and increasing sub-division of land have driven people to the marginal areas where attempts are now being made to grow agricultural crops. 80% of the population of Kenya lives in rural areas; 75% of the people depend on agriculture and livestock, have a low per capita income and rely mostly on fuelwood for cooking and heating. The existing conditions of high population densities in the relatively small proportion of land, rapidly increasing population and movement into arid and semi-arid areas give rise to serious conservation problems.

Concern over soil loss from wind and water erosion began in the 1930's; before Kenya's independence in 1963 the existing laws and regulations on proper land use were strictly enforced. As Africans were dissatisfied with the enforcement methods, after independence enforcement was almost impossible. Currently farm planning and management for the purposes of soil conservation depends on extension services to farmers and public demonstration projects. Information and education is stressed in promoting soil conservation. The Agriculture (Basic Land Usage) Rules, 1965 provide regulations restricting cultivation on steep slopes and in water catchment areas. Despite these regulations, soil erosion is visibly increasing. "There seems to exist a strong case of invoking the soil conservation regulations on at least some extreme cases of bad land use."

3% of Kenya's total land area is forest. Current forestry conservation policy aims at promoting forestry as an important economic resource

as well as a means of conserving soil and protecting water catchments. The policy aims to increase the area of gazetted forests, promote the establishment of industrial wood plantations, promote tree planting on private land, and encourage forestry research. The need for conserving indigenous forests is recognized; exploitation of indigenous forests is on a sustainable basis and measures are taken to limit exploitation of areas and identified species. In the early 1970's the Forest Department began a programme of rural afforestation service to promote the planting of trees on private land so that farmers would have their own wood supply. Kenya has established a Permanent Presidential Commission on Soil Conservation and Afforestation which has promoted conservation measures throughout the country and identified areas which require urgent action.

Kenya's wildlife conservation policy seeks to optimize returns—not only economic returns, but intangibles such as scientific, aesthetic and cultural gains—from the wildlife resource. In the late 1970's a total ban was placed on hunting and trade in game trophies; the ban remains in effect. Most of the existing wildlife conservation areas are in the rangelands, however current policy seeks to set aside areas of the main type of habitats found in Kenya. Selection of new areas for wildlife conservation is limited by high population densities on the high agricultural potential areas. Even when there are large uncultivated tracts of land in these areas, the economic and social value placed on agricultural land makes it almost impossible to set aside such areas for conservation.

There are two major types of conservation areas—parks and reserves. Parks are managed exclusively for the preservation of a "natural" state of habitat. Agricultural, pastoral, forestry and consumptive wildlife utilization activities are strictly prohibited. Reserves are similar to National Parks, except that other land uses may be allowed. The incompleteness of Parks and Reserves as habitats for some of the wild animals has made it necessary to pay landowners for grazing wildlife on their property and compensating for damage by done by migrating wildlife. Compensation payments are made to minimize antagonism towards wildlife. The Wildlife Department conducts public education of conservation, promotes Wildlife Clubs in schools, and endeavours to have more and better materials on ecology and the role of wildlife in schools' curricula.

In conclusion, education of the general public is a significant component of the conservation policies of the various natural resources. In a country with limited transport facilities and public media, it is

difficult to reach, communicate and influence public opinion on matters which are not of immediate concern to the public. There is a lack of adequate knowledge of the state of the various resources and of effective and appropriate techniques of managing the resources. More applied research is needed, as is an increase in the funds, manpower and motivation of personnel already employed so that the necessary knowledge can be gained.

Natural Resource Conservation and Utilization in Kenya with Particular Emphasis on Agroforestry, Fisheries, Land Use, Soils, Water and Wildlife

Jimoh Omo-Fadaka, African NGOs Environment Network,
and K. Kakuyo, IUCN

"Kenya has almost all the resources it needs, both human and physical, to cater for its increasing population. What it urgently requires is the wise management and conservation of these resources."

Kenya's fragile ecosystems are under continuous pressure from the growing population and their consequent need for accelerated economic growth. Long term considerations are being neglected; as a result the natural resource base is eroding. The Kenyan government must inform citizens of the dangers inherent in unsound exploitation of the country's natural resources, and promote sustainable use of them. Conservation does not mean leaving resources untouched in their natural state—it means using them in the most rational way, a way that doesn't damage the environment or people's way of life. Conservation is using natural resources to meet the needs of both the current population and future generations. Kenya's natural resource base—water, forests, land, and wildlife—is currently under tremendous pressure.

All areas of Kenya suffer from extreme rainfall variability. Kenya has considerable surface water resources; however they are unevenly distributed, which makes the planning of effective development of water resources problematic. Two-thirds of the country is arid or semi-arid—it receives inadequate rainfall and has no permanent rivers or streams. Groundwater is the only inexpensive source of water available in these areas. Research in water management is needed to pursue the goal of constructing a water grid of small dams, canals, artificial-

cial lakes, and rainfall collection. Research is also needed to improve water lifting technology.

Kenya's forests cover 3% of the total land area and about 25% of the high potential agricultural land. Forests are a crucial element of the natural ecosystem. They ameliorate local climate, preserve surface water catchments, and provide people with fuel and building materials. Forestry management policies in Kenya have promoted forestry as an important economic and social resource. The objectives of the basic policy framework, however, are the preservation of water supplies and soil conservation. Forests protect almost all the water catchment areas in the Kenya Highlands, which are the most productive agricultural areas in Kenya. Over 1.3 million hectares of national forest have been designated as catchment protection areas.

In the future, forestry research should pursue the development of agro-forestry systems, which meet the social and economic needs of the local people without harming the environment. Effort should also be made to disseminate agro-forestry knowledge and methods.

Present land use is leading to a decline in productivity and causing adverse and far reaching effects on the environment. The greatest changes in land use are due to the rapid increase in both human and livestock populations, a result of improved disease control measures. More land is being placed in agricultural uses to support these populations. Forests and bush are being cleared; steep land and valley bottom are being put under crop. More land is in continuous cultivation; more cash crops are being planted. In fact, continuous cropping without return of nutrients has become a characteristic feature of land use in Kenya. Fertilizers are applied to cash crops, but rarely used in subsistence farming.

These changes lead to depletion of soil nutrients, erosion, and deterioration of soil nutrients. The breakdown of the soil resources can easily lead to the sedimentation of water resources. Research emphasizing soil conservation and sound agricultural practices such as intercropping, crop rotation, and natural fertilizers is needed

The survival of national parks, nature reserves, and the wildlife in them depends on the way of life of the people living outside them. These wildlife sanctuaries must be integrated into the overall development of the surrounding areas if they are to survive. The people living around these areas are mostly poor, less educated, subsistence farmers. An increase in their population results in a great demand for land; they begin to encroach on the parks and reserves. In order to reduce this pressure on the parks, government should

provide local communities with substitutes which will generate more income for the people than the shifting agriculture and forest product harvesting they would resort to in the parks. An interdisciplinary approach, involving many government ministries or departments, should encourage communities to find other economic activities, activities which are not dependent on park or reserve land, but would allow peasants to be self sufficient.

The protection of the parks must be coordinated with the people who live around them. These people must fully share the parks' benefits, so they can truly appreciate their value. If the local people do not benefit from the park they will simply wait until a change in government or a relaxation of protection allows them to invade the park. "Conservation campaigns, to make lowly educated and poor people in rural areas aware of the importance of parks and reserves or conservation areas on the basis of scientific and long-term benefits considerations, will not be successful. Conservation activities in Africa should be able to create something concrete and directly beneficial to local communities."

Training Needs in Natural Resources: Conservation at Primary and Secondary School Levels in Kenya

Michael Korir-Koech, Kenyatta University

Natural resource policy issues have been translated into various school curricula in many countries, including Kenya, with the goal of controlling human activities that harm the environment. The United Nations Conference on Human Environment, held in Stockholm in 1972, called for a global strategy of combating environmental degradation through a variety of formal and informal educational activities. The continent of Africa has many environment problems—soil erosion, deforestation, over-grazing, industrial pollution, and drought. Ways of managing and protecting the environment have been greatly debated and discussed.

One result of these discussions is UNEP's Programme of Action for Environmental Education and Training in Africa. The ultimate goal of the programme is to initiate a viable environmental literacy campaign for conserving, protecting, and improving the environment for the present and future generations. To accomplish this objective, UNEP's Environmental Education and Training Unit pursues four vital goals:

- institutional (government) coordination of environmental education and training activities.
- curriculum development incorporating environmental education into the existing curricula.
- training programmes, including the preparation of teaching guides, bibliographies and diversified instructional materials to aid educators in the implementation of the programmes.
- research in institutional and methodological changes needed to incorporate environmental education and training into educational and training systems.

UNEP and other related agencies dealing with environmental education programmes have had a significant impact on policy making in Kenya. The Government of Kenya's policy is to preserve, improve, and prevent detrimental effects on the environment. Preventive measures are more economical than costly corrective measures; the government has realized the value of environmental education programmes in both formal and informal settings. The Kenya Development Plan 1984-88 states:

"The main concern with environment at this stage of our development is to control human behaviour so as to achieve a balance between the development needs of the nation and the enhancement and protection of the environment."

The 1979-83 plan insists:

"environmental considerations must come to pervade development decisions taken at every level from family to the Government; these considerations must be brought to the attention of every citizen. Hence EE will be introduced in the schools, not as a separate discipline but as a dimension to be considered in various aspects of the curriculum."

The Kenyan school curricula are already "crowded," thus the teaching approach and instructional materials for environmental education will be within the existing school curricula- a multidisciplinary and integrated approach.

The initiatives of introducing environmental education at the primary school level in Africa, and especially Kenya, were developed by Science Education Programme for Africa (SEPA), which produced A Guide to the Study of the Environment in 1971. The guide deals with broad man-made and natural environmental concerns. Kenyan educators have been active in the development of SEPA and its organizing, disseminating, and teaching of environmental science. These activities have been funded by UNEP and UNICEF.

The Kenya Institute of Education (KIE) is the major agency that researches and develops curricula for education at all levels—primary to adult and continuing education. KIE also designs syllabi and develops appropriate materials for each subject taught in the Kenyan schools. KIE has developed approaches to incorporating environmental education into the existing school curriculum. At the Secondary/High School level KIE has designed key concepts and themes that have been integrated into syllabi. Courses in Agriculture, Biology, Physics, Chemistry, Geography, Religion, Commerce, History, Art, Music, Mathematics, and Technical Studies have been developed to incorporate environmental themes.

Based on the information at hand, particularly in the Kenyan formal education sector, environmental education is being incorporated in the school curricula. Even though there is no 'special certification' on natural resource conservation and utilization in primary and secondary school education at this time, the incorporation of environmental education is well documented in the course offerings."

Teaching materials for natural resource conservation and utilization education are needed. Relevant handbooks, textbooks, films, etc need to be developed to augment existing materials in other subject matters. Also needed are workshops to train the implementers of curriculum, the teachers. Workshops could train teachers to improvise material and teaching techniques.

Training Needs in Natural Resource Conservation at Tertiary-Level Institutions in Kenya

C. G. Gakahu, *Moi University*

Few developing countries have enough expertise or fiscal resources to conserve their natural resources. Outside experts have failed to transfer the ability to design effective conservation strategies to personnel within the developing countries. Training is critical, as the capacity of the indigenous people to understand their environment and to develop conservation strategies is crucial to the sustainable use of natural resources. The solutions to conservation problems must come from the developing countries themselves.

After independence a vacuum was created in the area of conservation by the departure of colonial personnel in charge of conservation programs. The government rushed to train Kenyans to fill the vacancies, however there were no institutions equipped to provide the

necessary high-level training. The first generation of conservation personnel was trained in different environments in different overseas countries. They returned home with different experiences, ideals, and values. Their education did not take into account the cultural, political and socio-economic needs of Kenya's citizens.

The revolution in environment and conservation awareness that occurred in the early seventies led the Kenya government to hurriedly initiate training in natural resource management and conservation at the University of Nairobi. The program was offered by the departments of agriculture, geography, and biology. These programs produced graduates who knew ecological principles but did not know how to apply them— they did not know how to interact with citizens, nor how the government functioned. As a result, both citizens and government were unhappy with their performance. The government later began the departments of forestry and range management at the University of Nairobi, under the Faculty of Agriculture. Training in these departments concentrated on western world forestry, and were also overspecialised.

Due to this lack of adequate, coordinated and integrated training, natural resources continue to be used irrationally. Training programs at the tertiary level must incorporate the following components:

- understanding the emotional, cultural, and intellectual background of the local people, the custodians of natural resources.

- the ability to communicate with both ordinary people and policy makers and make them appreciate their mutual dependence on natural resources, and the need to utilise them rationally.

- an integrated approach to conservation, management, and sustained use of natural resources, based on a firm scientific foundation.

- broad knowledge of the cultural, political, socio-economic, and ecological factors that affect natural resources.

- vocational, rather than indoor approaches that would expose the trainees to their real future working conditions.

- professional responsibility and ability to develop new ideas and concepts; the opportunity to identify alternatives and test those considered most rational.

Current training programmes will require great input to achieve these goals. The curricula must be re-structured to incorporate new approaches to conservation. The goal should be to produce a graduate with a broad, integrated knowledge encompassing all natural resources, not to train the traditional forester, game warden, or agricultural officer. Vocational training must be emphasized, in order

to produce a graduate who is an opinion leader, and an ordinary member of the local community.

The universities do not have adequate trainers. The development of indigenous trainers must be a top priority. In the short term trainees with strong local background should be given overseas fellowships; however they should do their research at home. Foreign personnel with local experience should be attached to Kenyan institutions, and train indigenous Kenyans. Training resources—classrooms, laboratories, field equipment, audio visual aids, libraries, and research funding—are also urgently needed.

To help achieve coherence in regional objectives, the institution(s) which receives these inputs should draw students from East and Central Africa. A long term commitment—at least 10 years—to these projects would be necessary to fully realize them.

Tanzania

Natural Resources Conservation on Some Aspects of Agriculture and Livestock Industry in Tanzania

E.N. Ruzika

Ministry of Agriculture and Livestock Development

Tanzania has a mainly tropical, semiarid climate. The soils are varied, from the rich volcanic mountain slopes to the good soils of the river valleys, in between the moderately productive soils that characterize most of the country's area. The coastal areas receive bi-modal rainfall, while the large area of central Tanzania receives little, poorly distributed rainfall. The general agro-ecological zones include the Coastal plains, which are hot, humid, and receive 800 mm annual rainfall. The Central plateau is hot and semi-arid to arid. The High-lands are temperate, with 750-1250 mm of rain annually. Forests provide energy, timber, and wildlife resources; they are estimated to be diminishing at a rate of 4-5000 sq km annually from the presently available 280,000 sq km.

At Independence, 25 years ago, there was about 11 hectares of land per person. The 1978 census showed that the number had been reduced to 5.2 hectares; it is estimated that by the year 2000 there will be 2.6 hectares per person. In 1978 88.8% of the people were engaged in agriculture and other related rural activities. Women comprise 56.5% of the people engaged in agriculture, and therefore play a

central role in natural resources conservation and development.

Tanzania's economy depends on agriculture to earn foreign exchange and to provide the domestic food supply. The major export crops are coffee, cotton, tea, tobacco, pyrethrum, cashewnuts and sisal, while the major food crops include maize, rice, sorghum, millet, cassava, bananas, wheat. Livestock provides a large share of the domestic food supply, but is not an important export. Agriculture provides 40% of the gross domestic product. The national economy depends on the sustained exploitation of the country's natural resources. Currently population growth is higher than economic growth—population is estimated to be growing at a rate of 3.4% per year, while due to poor agricultural performance during the last decade the economy is only growing at an annual rate of 2.7%.

Until about six years ago agricultural research in Tanzania was undertaken directly by the Research Department of the Ministry of Agriculture through a network of a dozen research stations. After the demise of the East African Community the former Community research stations were added, and three parastatal organizations created—Uyole Agricultural Centre, Tropical Pesticides Research Institute, and Tanzania Agricultural Research Organization. The Tanzania Agricultural Research Organization is the largest of the three, and inherited almost all the stations and substations previously under the administration of the Ministry of Agriculture. Research operates on a crop basis; each crop has a specific research technical coordinating committee which plans, reviews, and approves crop research programmes. There are also four non-crop coordinating committees: Farming System Research, Resource Efficient Farming Methods, Plant Protection, and Soils and Fertilizers. The major research programmes generally aim at making use of the available resources and increasing crop productivity.

In 1980 the Tanzania Livestock Research Organization was created to research livestock resources. The contribution of livestock production to the economy is generally below expectation due to poor nutrition, poor water supply, disease, and low genetic potential. Nearly 40% of the country's area is permanent pasture, however most of this area is infested by Tse-tse fly. Improving livestock production in this area is a major priority, along with research in livestock breeding, animal nutrition, and pest and disease control.

There are ten institutes run by the Ministry of Agriculture and Livestock Development which provide technical and sub-technical training in agriculture and related fields. Professional training is done

at the Sokoine University of Agriculture. There are five Livestock Training Institutes providing technical and sub-technical training in the field of livestock. The goal of the Ministry of Agriculture and Livestock Development is to provide every village with an agricultural technician. There are 9000 villages and about 3000 technicians working in the field, so they are far from their goal; there are even fewer livestock technicians. The training institutes graduate about 1500 agricultural technicians and 500 livestock technicians each year for the entire Tanzanian agriculture and livestock industry. To reach the target of technicians in every village, the training capacities must be increased.

Tanzania Resources Applied Research: Inventory

R.N. Muheto

Ministry of Natural Resources and Tourism

The Tanzania Forest Research Institute was established in 1983 as a parastatal. The temporary head office is at Kibaha, with research centres in Tabora, Dodoma, Mufindi, Rondo, Kibaha and Lushoto. It conducts both research into silvicultural practices and research into the utilization of tree products. There are programmes to establish and improve both indigenous and exotic species, agroforestry studies, studies of the conservation of genetic resources, study of forest protection and research to utilize previously unused tree species. Beekeeping research is carried out in both basic and applied aspects. The work of the Tanzania Forest Research Institute is limited by its lack of funds, equipment, vehicles and quality scientists capable of performing independent research.

Wildlife research is conducted by the Serengeti Wildlife Research Institute, established in 1980. The temporary head office is in Arusha; it will be supported by research centres in national parks. Plenty of basic wildlife research has been done in Serengeti by foreign scientists, however wildlife applied research has been neglected. More applied wildlife research must be done by national scientists in ecosystems other than Serengeti. The priority areas of applied research in wildlife are: wildlife diseases, range land utilization, assessment of wildlife as a resource, and wildlife utilization. Currently these programmes are limited by the acute shortage of national research scientists. Existing research is undertaken in total lack of facilities, vehicles and funds. The equipment is so inadequate that resource assessment has not even

been done to the level of 15%. Vehicles and light planes are needed for wildlife inventory. There also must be better administrative organization— since its inception, the Institute has not even had a director general.

The Tanzania Fisheries Research Institute was enacted in 1980 and is the sole organization conducting fisheries research in Tanzania. Its head office is in Dar es Salaam. Its major areas of research are stock assessment and distribution, methods of stock exploitation, and fish processing, preservation, distribution and marketing. Again, there is a lack of facilities at all levels— for example, inadequate research boats, laboratory materials. There are not enough quality national research scientists, and there are not enough funds to support research programmes.

Several different types of forestry training programmes are available in Tanzania. There are 3 month vocational training courses available for employees working on forestry projects. A 2 year post-secondary certificate course is held at Olmotonyi in Arusha, and takes about 50 students every year. There are 2 diploma courses, and degree programmes are conducted at Sokoine University of Agriculture (SUA). The degree programmes take 25-30 students a year, and offer courses in forest biology, forest engineering, forest measurement and management, wood utilization, and forest economics. All beekeeping courses are conducted at Tabora Beekeeping Institute in Tabora. Courses are modelled on the same framework as forestry.

There are three institutions offering fisheries training. The Nyegezi Fisheries Institute conducts 2 year certificate courses for about 60 students per year. The Kunduchi Fisheries Institute admits 60 post secondary students per year for a two year diploma course. The Mbegani Fisheries Centre conducts specialised three year diploma programmes in Marine Engineering and refrigeration, boat building, nautical sciences, and fish processing and marketing. Each course admits about 15 people per year. Training in wildlife is conducted at two Institutes in Tanzania: the Pasiansi Institute in Mwanza and the College of African Wildlife at Mweka. There are certificate, diploma, and post-graduate diploma programs available.

These training institutes face common constraints. They lack training facilities— vehicles, visual aids, and general facilities. In some cases they lack basic infra-structure. There are insufficient numbers of good quality teaching staff. In some sectors this shortage is acute. The operation of these institutes is also limited by a lack of funding.

Research and Training Inventory in Tanzanian Natural Resource Conservation

H.Y.D. Kiwira, *University of Dar es Salaam*

Training Facilities:

University of Dar es Salaam

The Wildlife Ecology course began at the University of Dar es Salaam in 1976. It accepts 5-8 students per year; only students with a diploma from Mwaka College who are already working with the Ministry of Natural Resources, Tanzania National Parks and Tanzania Wildlife Cooperation are encouraged to apply.

Institute of Resource Assessment

The IRA was established in July 1982 and was formerly known as the Bureau of Resource Assessment and Land Use Planning. IRA is now an independent Institute with the University of Dar es Salaam. It is an applied research organization and does research in the fields of land use and environmental problems, population and women's studies, food and nutritional issues, rural water supply, and regional planning. It is also the focal point for the application of remote sensing technology as well as demographic studies.

Institute of Marine Sciences

This is an independent Institute within the University of Dar es Salaam. Its primary objective is to undertake research in all aspects of Marine Sciences, and provide postgraduate studies in Marine Sciences. Its research activities focus on: fisheries studies, oceanography, marine botany, pollution, food technology, and resource economics and management.

Training Materials Needed:

The Zoology and Botany Departments need vehicles to take students out into the field. The Faculty of Science needs film projectors, a slide projector, and an overhead projector. The University gets little foreign currency to buy books; money is needed for new books and journals.

Marine Biology: Research Proposals

New mapping is needed of the coral reefs, sea grass beds, and mangrove areas in Tanzania; this mapping will require remote sensing and direct observation. Study of the organisms living in the mangrove ecosystems, the nutrient recycling and biological produc-

tivity in mangrove areas is needed. The impact of dynamite fishing on the coral reef ecosystem must be examined. Beach erosion must be studied: why it occurs and how to prevent it. Some of these will be done in order to gain information leading to the establishment of marine parks and partial reserves for protecting endangered animal species such as the Ingon and sea turtle.

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Zimbabwe

Natural Resources Conservation Survey Zimbabwe: Past Accomplishments, Present Enlightenment and Future Frustration

Davison J Gumbo

Ministry of Natural Resources and Tourism

"The history of conservation in communal areas is a chronology of neglect, piecemeal conservation programmes and resistance on the part of the land user."

In Zimbabwe's Communal Areas, which cover 41.8% of the country, population pressure and land tenure policies have combined with misunderstanding of conservation policies to result in degradation of the land's resource base. Some 170 defined land units, they are scattered throughout the country and held under traditional forms of title. The Communal Areas were delineated by the colonial government and illustrate how one group of politically and economically aggressive people could dominate and exploit another group.

Most communal lands were sited on marginal land. The prevalent soils are lithosols, shallow with a low moisture retention capacity—soils best left to grazing. Zimbabwe's Natural Regions I and II, about 17% of the country's surface area, receive good, reliable rainfall. Natural Region III, which covers 18% of the area, has low, variable rainfall. The remaining 65% of the country, Natural Regions IV and V, has low rainfall and is marginal for crop production. Much of the communal land falls in these regions.

In National Parks, State Forests, and in the Commercial Farming Sector, land use management has long paid close attention to wise resource use, however in the communal areas resource conservation policies have failed. Past policies dictated stock densities and farming practices to the African population, however they neglected the "Human factor" and assumed the Africans would welcome the imposition of these restrictions. The Zimbabwe government's Communal Lands Development Plan aims to improve the livelihood of the people in the communal areas by "carrying out well planned and purposeful development programmes... the most important component of this strategy is to change the communal land dwellers' attitude towards the resource base." This is being done through massive education and extension programs.

Population pressure is the single greatest contributor to resource

degradation in the communal areas.

"Between 1931 to 1941 the estimated population in Communal lands grew from 986,000 to 1.4 million, while the hectarage under cultivation increased marginally from 11.8 million ha to 12.4 million ha, not enough to cater for the huge population increase. Correspondingly the average population density per square km rose from 8.3 to 11.1. These densities set in the dry areas of the country contributed to the degradation on the land."

As population pressure increases and more communal land is forced into cultivation, available grazing land has shrunk. Due to the position cattle play in their lives and lack of economic incentives to de-stock, livestock owners operating under communal tenure have not reduced their livestock numbers. "The result has been serious overstocking and the destruction of the land's vegetation cover leading to extensive sheet and gully erosion." Concurrent to this has been a rising demand for fuel wood and construction poles; the loss of tree and bush cover further degrade the resource base.

At Independence, the government instigated resettlement. Former commercial farm land was sold to the government and then made available to new settlers. By April 1985 less than 2 million ha had been settled, involving the resettlement of 30,000 families. Many of these landless families had little, if any, farming experience. As a result, many of the farms have been "reduced to second rate communal lands" in less than 3 years. From this experience the government has learned that resettlement programs alone—without an education component—will not solve the problems of population pressure and land degradation.

A pragmatic response to the communal land problem lies in Provincialisation, called for in the Prime Minister's 1984 Directive and Statement of Policy. Provincialisation outlines the role and function of the local governments—in particular, the Village Development Committees (VIDCO's) and the Ward Development Committees (WADCO's)—in local natural resource management. The major obstacle preventing the implementation of this policy is the demarcation of village boundaries. In most cases the boundaries drawn have been arbitrary and have caused animosity between villages.

Forest Resources: "The degree of shortages of timber is directly related to population density and duration of settlement in given areas; the most acute shortages occur in densely and long settled communal areas." About 20% of the communal areas are experiencing a critical shortage of forest products. Land degradation on many

communal areas has reached such advanced stages that regeneration of the vegetation under existing population pressure is unlikely. Re-afforestation is urgently needed, not only to provide woodfuel and construction materials but also to bring the land degradation under control. The Rural Afforestation project has been fairly successful however the mortality rate of trees has been very high.

Wildlife: The wildlife resource found in some communal lands is not properly managed. "It belongs to everybody but is not a responsibility of anybody." The lack of management is due to people's attitudes towards wildlife. Many areas previously inhabited by tsetse flies have recently been opened to livestock. Operation Windfall has tried to teach people the economic value of wildlife in hope of promoting better management. All profit obtained from game within a district is ploughed back into the community in the form of infrastructure, such as schools and clinics.

Future Frustrations: The Education and Extension programme in Resource Use in Communal Areas was begun in 1981; it has yet to be fully evaluated. The current constraint on the program is the lack of support from political leadership, reflected in the Department of Natural Resources' low budget allocation for this type of work. There has been a failure to fully reinforce the conservation education done in schools and clubs. Conservation work is "being sacrificed at the mercy of politics." There is a need for extensive evaluation to learn if the programme is reaching the target audience.

It is hoped that once a village's boundaries are decided under the Prime Minister's policy statement on Provincialisation, the limits of its resource base will also be known, and a plan for each village will be produced. As there is currently a lack of baseline information for the land use planner, it is crucial that surveys and District resource inventories be carried out. Such inventories would make it easier to share the resources equitably. "The ultimate 'aim' is, through close consultation and involvement of the people, the villagers feel that the plan is their own which they will be required to implement with the assistance of the government." The replanned villages will have areas for cultivation, residence and grazing.

In 1980 the Zimbabwe Prime Minister announced that Zimbabwe would honor the World Conservation Strategy by producing their own National Conservation Strategy. The current working document states broad objectives—"in its present form is inadequate in content, scope, detail precision and outlook." This draft does not address Zimbabwe's most pressing problem—that of communal lands and their

development—and lacks grassroots input and approval.

Conservation accounts of .04% of the National Budget; the government must increase funding. Not only are there insufficient funds to cover major natural resource rehabilitation, there is a lack of properly qualified manpower to carry out the major tasks. It is recommended that the government take a positive stance on population growth and take real action to reduce the birth rate.

Natural Resource Policy and Law Realities: Zimbabwe

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A dual system of agricultural development and resource conservation was created in Zimbabwe's recent colonial past. The body of Zimbabwe's direct and indirect legislation relating to the conservation of natural resources is part of its colonial heritage, and reflects the colonial socio-economic structure. Land classification designated access to, use and/or ownership of specific land areas along racial lines. The white population gave itself the richest areas of land—known as "commercial lands"—while the indigenous African people were restricted to the poorest and marginal areas of land, the "communal lands."

All agrarian investment, conservation policies and enacted laws were channelled towards better management and utilization of the commercial lands. Legislation to enforce conservation measures in the communal lands failed because of land scarcity in the communal areas, local resistance to the imposition of "white" laws, and the fact that all conservation related works were implemented in the communal lands by whites with maximum force and a minimum of explanation. "The challenge for independent Zimbabwe therefore, is to concentrate on redressing this imbalance in conservation strategies by focussing on the development of the communal lands within the context of a comprehensive national conservation policy encompassing both the commercial and communal land areas."

The base of the problems of development and conservation in the communal areas is land. The problems directly connected to land degradation—over cropping, over grazing, soil erosion, siltation, deforestation, and desertification—rise from the issues of population density and land tenure.

The present land tenure system in the communal areas hampers rural development and encourages natural resource degradation. Each

of the 170 communal areas is populated by families of the same clan. Individual title to the land is determined by a person's place within the clan and most commonly takes the form of "right of avail." Each "right"—to cultivate, to graze livestock, to take timber, to use water, to mine, to build, is distinct. There is no concept of "farm." The right to graze livestock is considered fundamental; no limitations are placed on herd size. These "rights of avail" are not part of Zimbabwe's written law, but are enforced through society pressures; consensual decision-making is the rule. As a result innovation and individualism will take a long time to evolve, while traditional rules will continue to contribute to the overuse and degradation of the environment.

Zimbabwe's population is currently estimated at 8.25 million—6 million reside in rural areas, 4.1 million in the communal lands, 60% of the communal lands have poor to very poor agricultural potential. Two thirds of the communal lands have human and livestock populations in excess of their current carrying capacity. This will be exacerbated in the future by Zimbabwe's 3.0% population growth rate—the population will double by the end of the century. "The existing traditional land tenure and farming systems currently pursued in most areas of the communal lands are simply not sustainable at today's population levels and certainly will not be tolerable in the future if measures are not taken now to reform these systems."

The Zimbabwe Government has made it clear that it will not repeat the mistakes of the colonial regime by enforcing unexplained and therefore unwanted conservation laws on the people. Any law enacted must be enacted with grassroots support—the people must see the need for it in order to stand behind its implementation. The government is "people oriented," and wants conservation laws to be enforced by people in their own interest. This will require long term, intensive education. In the meantime resource degradation must be checked.

From the success of conservation policies in the commercial lands during the colonial period, the current government learned the importance of the existence of grassroots organizations. To give the communities responsibility for their own development District Councils were created. The Communal Land Act of 1982 empowered them to allocate land in communal areas and regulate their occupation and use. District Councils provide the closest institutional infrastructure between the Government and the rural population. The District Councils establish and oversee the Village Development Committee (VIDCO). The defining of the VIDCO's is an attempt to define the

resources of a rural community, and then give the local people control of their resources—the VIDCO determines the limits of the resource and how it will be managed. The VIDCO will address destocking, delineate area for residential use, and designate woodland.

The VIDCO will also have responsibility for local wildlife resources. "It is hoped that Government's new policy of placing this responsibility within the community itself will foster an understanding for and an appreciation of the value of wildlife within the local community, thereby forcing it to create its own control measures."

Natural Resources Conservation and Utilization: A Challenge for Research in Zimbabwe

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The world population is constantly increasing and, as all nations proceed on the path of "development," the pressure on natural resources continues to increase. The crucial question that remains to be answered is to what extent can we utilise and conserve our natural resources. In other words "when will we reach the bottom of the barrel and are there any ways we can avoid hitting the bottom?"

Which should come first, conservation or utilisation? Classical conservationists have insisted that natural resources be conserved to the total exclusion of the utilisation of these resources. "These same conservationists have shed crocodile tears at the felling of one tree by a tribesman practising shifting cultivation, and more such tears are shed when the same farmer snares a buck because the buck was intent on destroying his crops." The challenge for researchers is to find ways of maximising utilisation while at the same time enhancing conservation of our natural resources. Natural resources are there for the utilisation of mankind and all conservation issues must relate to the utilisation of the natural resource in question.

Zimbabwe can be divided into three major land tenure systems which also represent three land use systems. The National Parks, wildlife hunting areas and National Forests are uninhabited by people. The Commerical farming areas cover 15 million ha, and are owned and run by individuals or companies as commercial units. The Communal Areas cover 18 million ha and support a population of 5 million people. Population density in the Communal Areas range from 35-55 people per square km; these high densities cause great problems in land use and natural resource conservation. Where com-

munal lands are situated next to national parks, conflict arises between the farmers and park managers. Each of these three land use systems has a different set of natural resource utilisation and conservation problems. A large amount of natural resource research has been carried out in Zimbabwe in the last three decades. Most of this research has been basic in nature and aimed more at utilisation of natural resources. Often the incorporation of conservation issues has been more incidental than planned. Thus in reviewing research of natural resource utilisation and conservation the two must be separated.

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Appendix II

Local Organizations Concerned With Natural Resource Conservation

Botswana

Botswana Society

Kalahari Conservation Society

Ministry of Agriculture

(Agricultural Resources Board, Arable Lands
Development Programme, Department of Agricultural Field Services,
Department of Agricultural Research, Division of Land Utilisation,
Division of Planning and Statistics, Institute for Development
Management, Rural Sociology Unit)

Ministry of Commerce and Industry (Department of Wildlife, National
Parks and Tourism)

Ministry of Finance and Development Planning (Central Statistics Office)

Ministry of Local Government and Lands (Division of Lands, Department
of Town and Regional Planning)

National Museum

University of Botswana (National Institute of Research, Department of
Environmental Science)

Wildlife Training Centre, Maun

Kenya

African NGOs Environment Network

Environment Liaison Centre

Integrated Project for Arid Lands

International Council for Research in Agroforestry

Kenya Energy Non-Governmental Organisations

Kenya Rangeland Ecological Monitoring Unit

Kenyatta University (Environmental Education Programme)

Ministry of Environment and Natural Resources (National
Environment and Human Settlements Secretariat)

Moi University (Department of Wildlife Management)

National Council for Science and Technology

Population Studies and Research Institute

Public Law Institute

University of Nairobi (Department of Geography, Institute
for Development Studies)

- Tanzania**
 College of African Wildlife Management, Mweka
 Ministry of Agriculture and Livestock Development (Research and Training Division)
 Ministry of Natural Resources and Tourism (Forest and Beekeeping Division, Wildlife Division)
 Tanzania National Parks
 University of Dar es Salaam (Institute of Resource Assessment, Wildlife Ecology Section of the Department of Zoology)
- Zimbabwe**
 Agricultural and Rural Development Authority
 Environment, Development Activities (ENDA, a nongovernmental organization)
 Forestry Commission
 Ministry of Agriculture and Lands (Department of Agricultural and Technical Services, Institute of Agricultural Engineering)
 Ministry of Natural Resources and Tourism (Department of National Parks and Wildlife Management, Department of Natural Resources)
 National Conservation Trust
 Natural Resources Board
 University of Zimbabwe (Centre for Applied Social Sciences, Department of Agricultural Economics, Department of Land Management, Faculty of Law)

The manuscript for the text portion of this book was scanned using a Kurzweil OCR document reading machine at Dartmouth's Kiewit Computation Center and converted into magnetic memory files. Text composition and repagination was accomplished at Dartmouth's College Printing service using an Apple Macintosh computer running a text preparation program called JustText. Finished, camera-ready pages were output on the Apple Laser-

Africa's Conservation For Development

Botswana, Kenya, Tanzania, and Zimbabwe

- Biological Diversity
- Energy
- Forestry & Agroforestry
- Soils
- Water
- Wildlife
- Policy Analysis
- Research & Training Recommendations
- Conference Reports
- Resource Bibliography

Africa's Conservation for Development is the product of a Ford Foundation funded program in natural resource conservation carried out by the African-Caribbean Institute. This text combines an analysis of natural resource realities in four African countries with summary papers from fourteen African authors. A major resource bibliography is provided for the region in general, and specifically for Botswana, Kenya, Tanzania and Zimbabwe. The text is partially the result of a conference entitled Natural Resources Conservation in Africa convened by ACI in Nairobi during April 1986. Over 80 participants from 50 organizations took part in the deliberations. Their names and organizations, along with those interviewed in the previous research for the project, plus a conference summary, are included in this volume.

Dr. Rodger Yeager, a professor of Political Science at West Virginia University, has been concerned with East African development issues for over two decades. He has published extensively on Africa, including two recent books—*Tanzania: An African Experiment* (Westview) and with Norman Miller, *Wildlife, Wild Death: Land Use and Survival in Eastern Africa* (SUNY and African-Caribbean Institute).

African-Caribbean Institute

The African-Caribbean Institute is an educational, non-profit organization dedicated to the increased understanding of these two important regions. Its objective is to stimulate cross-cultural awareness through research, analysis, publications and the production of films and audio-visual materials. The Institute's twin foci are environment and communications.

Environmental concerns include issues of food and agriculture, environmental health, natural resource conservation and wildlife management, human shelter, ocean and coastal zone management, and others. Issues that relate comparatively to both regions are also addressed.

Communication activities include a concern for the ways in which environmental information is generated and transmitted across cultures. A particular concern is the effective dissemination of the work of the Institute. The latter includes production of 16mm film, videotape, radio and print-based materials, plus the arrangement of seminars, consultancies, and outreach programs.

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